JNIOR USERS MANUAL

JANOS Help System

31 Dec 2024

```
     Website : integpg.com

JANOS Version : v2.5.1

Help Revision : 31 Dec 2024 08:00

     Includes : JBakup, FtpClient
```

JANOS - JNIOR Automation Network Operating System

TABLE OF CONTENTS

Product Overview 1

Formalities 6
    Trademarks 6
    Licensing 7
    Limited Warranty 8

Getting Help 11
    Help System (HELP) 11
    Technical Support 13

Getting Started 14
    Power UP 14
    User Interface 14
        Network Access 14
        Command Line Interface (CLI) 16
        Secure Shell (SSH) 16
        Serial Access 18
    Networking Basics 19
        IP Settings 20
        Time Synchronization (NTP) 23
    Factory Configuration 23
        Firmware 23
        Files 24
        Factory Reset 27

Security 28
    Default Accounts 28
    Limit Connectivity 30
    Secure Communications 31
    Cyber Defenses 33
        Greylisting 34
        Visibility 35
        Blacklisting 36
    Summary 38

User Commands 39
    Command Line 39
        Command History 39
        TAB Auto-Complete Feature 40
        Current Working Directory (CD) 45
        Command Line History (HIST) 45
    Configuration 46
        Setting Date and Time (DATE) 46
        Network Addresses (IPCONFIG) 48
        Setting the Hostname (HOSTNAME) 50
        Registry Settings (REG) 51
    File Management 53
        Listing Files (DIR/LS/FIND) 53
        Removing Files (RM) 55
        Copying Files (CP) 56

TABLE OF CONTENTS (cont'd)

Moving Files (MV) 57
Renaming Files (REN) 57
Creating a Directory/Folder (MD) 58
Removing a Directory/Folder (RD) 59
Library Manager (ARC/JAR/ZIP) 59
Modifying Permissions (CHMOD) 61
Changing Ownership (CHOWN) 62
Command Line Tools 63
Displaying Text Files (CAT/TYPE/HEAD/TAIL) 63
Searching File Content (GREP/EGREP) 65
Locally Editing Text Files (EDIT/ED) 67
Issuing an Email (SENDMAIL) 73
Making a Log Entry (LOGGER) 74
Accessing Peers (TELNET) 75
Update File Timestamp (TOUCH) 75
Batch Scripting and Program Execution 76
Executing an Application (JAVA) 76
Executing Scripts and Batch files (RUN/EXEC) 77
Process Environment (SET) 79
Batch Mode Text Display (ECHO) 80
Process Management 80
Displaying Activity (PS) 80
Detailed Application Status (THD) 81
Stopping an Application (KILL) 82
JNIOR Digital and Analog I/O 85
Managing External Modules (EXTERN) 85
Logging (IOLOG) 86
Locally Controlling I/O (JRMON) 87
User Accounts 90
Listing Users (USERS) 90
Setting Passwords (PASSWD) 91
Modifying Permissions (USERMOD) 91
Adding Accounts (USERADD) 92
Removing Accounts (USERDEL) 93
Displaying User Groups (GROUPS) 93
Adding a User Group (GROUPADD) 93
Removing a User Group (GROUPDEL) 94
Modifying a User Group (CHGRP) 94
Network Utilities 95
Network Status/Packet Capture (NETSTAT) 95
SSL/TLS Certificates (CERTMGR) 100
Testing Connectivity 102
System Maintenance 105
Rebooting (REBOOT) 105
System Statistics (STATS) 105
File Monitoring (MANIFEST) 106
Performing Updates (JRUPDATE) 108

Registry **111**

System Configuration **112**
Built-in Dynamic Keys 112

TABLE OF CONTENTS (cont'd)

Device Keys (Device/) 114

Network Configuration 115

Secure Communications Using SSL/TLS 132
Basic Authentication 132
RSA Keys 135
SSL Certificates 136

Event Management 141
Startup Events (Events/OnBoot) 141
Alarm Events (Events/OnAlarm) 143

Email Configuration 146
Custom Email Notifications 146
General Settings 149

Server Configuration 152
World Wide Web (Web) Server 152
Websocket Interface 156
JANOS Management Protocol (JMP) 158
JNIOR Protocol (Deprecated) 159
File Transfer Protocol (FTP) 162
Telnet Server - Console Access 163
Secure Shell (SSH) Server - Console Access 164
BEACON Protocol Service 164

Input/Output (I/O) Configuration 166
Digital Inputs (DIN) 166
Configuration by Input (IO/Inputs/[DIN]/) 171
Relay Outputs (ROUT) 182
Configuration by Output (IO/Outputs/[ROUT]/) 183

Serial RS-232/RS-485 Ports 187
AUX Serial Port 187
COM RS-232 Port 190

ZIP/JAR Compression 193

JANOS Management Protocol (JMP) 195
Secure Communications 197
Initial Connection 198
Messaging 199
I/O Monitoring 201
Control Messages 203
File System Commands 207
Registry Commands 213
Console Access 217
External Devices 221
Realtime Clock 225
Shutdown/Reboot Notification 226
System Logging (Syslog) 226

TABLE OF CONTENTS (cont'd)

Auth-Digest Calculation 228

Application Programming 229

Java Virtual Machine (JVM) 229

Compiling Program Files (JAR) 230

Web Development 231

Scripting (PHP-like) 234

Script 234

Variables 236

Statements 239

Expressions 241

Functions 247

User-Defined 247

Built-In 249

Rendering & Output 249

String Operations 250

Array Operations 252

Math Functions 253

Conversions 255

Date & Time 256

File System Functions 257

JSON Functions 259

Language Support 259

Registry Access 260

System Functions 260

Regular Expressions (REGEX) 261

Including Files 262

Error Handling 262

Example: Batch Scripting (CKSUMS) 264

Hardware 268

JNIOR Models 268

Power Supply 268

Relay Outputs 270

Digital Inputs 270

COM Serial Port 271

AUX Serial Port 272

Sensor Port Expansion Bus 273

Memory Areas 274

References 276

Users Manual 276

Timezones 276

System Logs 279

Process Environment 280

Network Filtering 282

SafeMode 285

Regular Expressions (REGEX) 286

Printf Format Specifiers 287

ASCII Table 290

TABLE OF CONTENTS (cont'd)

UTF-8 Encoding 291
Morse Code 291
Javascript Object Notation (JSON) 292
JNIOR Protocol 293
VT-100 Terminal Compatibility 293

JBakup Log Archiving Application 297

FTP Client Application 298
Command Line Syntax 298
Interactive Mode Commands 299

INDEX 301

PRODUCT OVERVIEW

JNIOR is general purpose single board computing device designed to flexibly interact with other devices, collect data, initiate complex actions, and to support remote users and systems. Unlike the personal computer the JNIOR does not utilize a screen, keyboard or mouse. It has been developed to be integrated/embedded into other systems. One uses, maintains and programs the JNIOR through the network using a web browser or other application. The product line offers a number of JNIOR models and accessories.

The JNIOR is a highly stable and reliable product. It offers a low cost of ownership with no intended obsolescence, no need of periodic replacement, and no ongoing charges. It is ideal for incorporation into any system where you need confidence that it is fully supported by the company and will be available for years to come. In fact JNIORs shipped in 2005 (Series 3) are still in operation today.

Support is both free and frustration-free in that no AI or contract support people are ever involved. When you need help you are assisted by the actual product and application developers. There is no need to elevate any issue as there is no one better suited to address the problem than those helping you. Your needs can be quickly addressed even if it requires a software/firmware change.

Uniquely, JNIOR has been completely developed by INTEG and those people remain directly involved today. The product is produced in our own facility. The operating system (JANOS) for the Series 4 was developed by a single author and involves absolutely no third party code or open source ensuring that any (replicable) issue can be immediately corrected. Even the more complex random concerns can be eventually hunted down and extinguished. There is just no where to point fingers. No one else to blame.

The product reflects decades of experience with equipment interfacing, low-level network communication protocols, monitoring and automation. As a result there are numerous diagnostic capabilities built into the system providing the tools you need to maintain the performance of any application. These include a network sniffer (see NETSTAT), I/O log, serial transmission logs, performance monitors and more.

The JNIOR is a technologically advanced tool, an inexpensive Programmable Logic Controller (PLC), that can be easily configured and optionally programmed by the user to handle automation, control and data collection tasks. The product has the capacity to handle multiple simultaneous tasks efficiently and to serve custom websites robustly through its full-featured webserver. The JNIOR has found a wide range of uses in locations all across the globe.

FUNCTION

The Series 4 JNIOR utilizes a single 32-bit microprocessor supported by a variety of memory components creating an ideal environment for a general purpose operating system. The JANOS operating system was developed to be optimized for such a device and to be as consistent as possible with the earlier Series 3 product.

There are various input and output (I/O) capabilities. Each JNIOR supports 4 to 12 low voltage signal relays (1A/30V). These are available to make or break external logic circuits as might be needed to cause action. Similarly there are from 4 to 12 digital inputs that generally accept a low voltage to indicate either an ON or OFF state. These inputs can be used to status the world around the JNIOR and each supports counting and metering capabilities.

Each JNIOR has 2 serial channels. These can be used to communicate with other devices and systems. You might transmit a command to prompt another device (such as a projector) into action. Or you might request/receive information that can be passed on to other systems or used to trigger some programmed action. One serial port (RS-232 COM) provides terminal access to the JANOS command line. The command line is the heart of any operating system.

Importantly the JNIOR has a 10/100 Mbit Ethernet LAN port. The product supports a complete TCP/IP stack and is thereby accessible from the local network as well as through the Internet if desired. JANOS supports a range of protocols such as HTTP, HTTPS, FTP, SSH, and Telnet including the JNIOR Protocol and the JANOS Management Protocol (JMP). INTEG supplies the Support Tool which is an application for the PC that can greatly assist in the management of any number of JNIORs at any one site.

And finally there is the Sensor Port or Expansion Bus that allows the JNIOR to communicate with a number of external modules. Those accessories can provide additional relays (10A/220VAC), 10V analog signals, and 4-20ma current loop. There is also a 3-channel LED dimmer and a rack mounted switch panel with indicators.

UNPACKING

The JNIOR is sold in quantity to integrators and system providers. It is not sold in retail outlets. It is therefore not packaged in typical retail form.

The JNIOR is quite literally a *Black Box* given that its enclosure is black but also as according to the *Oxford Dictionary* it is a "complex piece of equipment, a unit in an electronic system, with contents that are mysterious to the user". This book hopes to eliminate the mystery.

Each JNIOR should be accompanied by 5 screw-terminal connectors (1 4-pin and 4 8-pin) providing connection to the various I/O and power ports. These are typically shipped in a separate bag. Care should taken to not lose those and to keep them with each JNIOR.

The standard supply available from INTEG is 12VDC at 1A. As these units may be incorporated in larger systems customers are allowed to provide their own source of power. We recommend that the power source be capable of supplying at least 1A to each JNIOR. The voltage may also vary in the range from 10V to 24V. The 410, 412 and 414 models can be alternatively powered by an AC voltage.

When powered a blue LED will be illuminated on the Series 4. A green power LED was used on the Series 3.

OS CAPABILITIES

When power is applied the JANOS operating system boots. The boot procedure initializes and starts the various background services required by the product.

Multi-Tasking

JANOS is a preemptive multi-tasking system. It can run up to 16 individual programs simultaneously. The boot process completes and becomes the *Idle* process. This is where the product spends its time when it has nothing to do. A *System* process is created to perform background tasks as might be needed from time to time. And JANOS also creates a *Network* process which gives priority attention to the network and any communications that may be necessary.

Processes are created and terminated as required. For instance when a browser opens a webpage on the JNIOR the *WebServer* process is started. The JANOS Web Server can handle multiple simultaneous connections from any number of users and client systems. This one process works to service all of the transactions required. The process is terminated after a few minutes without a connection.

Applications provided by INTEG, or written by the customer, are created using Java. JANOS can execute Java programs directly out of the JAR files created by the Java compiler. These must be built against the JanosClasses.jar runtime library. Applications may be started automatically at boot or run as needed from the command line. Application programs can be written to perform automation tasks, collect data, perform maintenance tasks, augment the set of user commands or even implement a network server and custom protocol.

A command line connection or *Console Session* is handled in its own process. Multiple console sessions may be opened simultaneously since JANOS can support multiple simultaneous logins. Up to 32 users can be defined and given various permissions. Typically you only need the one main administrator account.

Applications

Application programs are available from INTEG and can be easily developed by users with available free interactive development environments (IDEs) like Netbeans. In order to maintain stable and reliable performance, in the face of software obtained potentially from many sources, a *managed language* is used. A managed language basically is one that generally handles all access to memory for the programmer limiting the chance of error that might cause a system breakdown. For instance there is no method by which a random memory location, one that is used by other system activities, can be accessed by an application. No *pointers* as there are in the C language. JANOS uses the Java programming language.

Java is a compiled language. Programs written in Java are compiled by the IDE into library files with the JAR extension. Note that a JAR file is the same format as a ZIP file. Tools for the latter can be used to examine the former. The compiled program files contain *bytecode* in the form of *classes* which are loaded and executed by the operating system when called upon to do so.

JANOS supports its own Java Virtual Machine (JVM). Each application runs in its own process with its own instance of the JVM. From the command line you can view the processes using the PS command. Use the -V option for details.

Networking

The JNIOR supports a Local Area Network (LAN) connection and JANOS contains a full-featured *network stack*. The operating system can receive and send packets (UDP) as the various services may require. This also supports incoming and outgoing TCP/IP *connections*. The OS and applications can configure the network to listen for incoming traffic and process outgoing exchanges as needed.

Security is critical these days. The JNIOR is challenged in that the industry continues to strengthen the levels of required security and this becomes more and more computationally expensive (i.e. slow to calculate). The Series 4 does support TLSv1.2 and can establish encrypted channels. These are *secure* even though a browser might complain given that the *certificates* supplied by the JNIOR have not been *signed* by a paid-for authority. JNIOR supports HTTPS web access.

WEBSERVER CAPABILITIES

The Web Server supports both user authentication and public page services. Both plain text and TLSv1.2 secure (encrypted) communications are possible. The JNIOR is supplied with a default WebUI providing for configuration and status of the product.

You can create your own custom websites to replace the default WebUI. The WebUI would then be accessible through the /config subfolder. JANOS supports a PHP-like server-side scripting language (compiled) for dynamically rendering web pages. Websites rendered by server-side scripting that utilize JavaScript can create a very powerful user experience. The WebUI is an example. Code can be extracted from the ZIP file and reviewed for reference.

JANOS uniquely can serve an entire website out of a single ZIP library file. The WebUI. for example, is distributed in the **/flash/www/config.zip** file which is not ever expanded. Each individual file required by the website is read from the ZIP library as needed. This means that all of the files associated with, and required by, a website implementation are kept together in a single library file. This affords a level of source control ensuring that all of the files for a particular website are of the correct version and never become missing or fall out of sync.

The webserver supports *Websockets*. This allows a standard web connection to be *elevated* beyond the HTTP protocol supporting a more general binary exchange. JANOS by default offers the JMP Protocol through this capability. An application can be written to handle other protocols through Websockets. The JNIOR can be completely managed through a web connection. External access to the standard ports (80/443) is all that is needed. The supplied WebUI relies upon and completely demonstrates this.

The capabilities of the JANOS WebServer are sufficiently robust that the JNIOR has found use in network-facing applications in which the built-in digital I/O are secondary.

THE BOOK OF JANOS

JANOS includes a HELP system which is both accessible from the WebUI and the command line. This text therefore requires minimal formatting so it can be displayed in textual form at the command line. The content is contained in the **/flash/manpages.zip** file written in a document styling language. The MAN command is an alias for HELP.

HELP content is broken down into *Categories* and *Topics*. There are hundreds of individual topics and the system includes a *search* facility to assist in locating the information that you are seeking.

From the WebUI you can generate a **printable manual** which renders all of the HELP content in book form including a Table of Contents and Index. All of this with functional links which can be save/printed to a PDF for general reference. Applications loaded on your JNIOR can supply additional help detail which will be included in this manual. Each manual is customized to configuration of its source JNIOR.

The Book of JANOS available from INTEG contains this users manual content and includes a faux leather cover with this title. While the physical book may be a novelty it does come in handy. It also adds considerable value to any bookshelf.

SUMMARY

The Series 4 JNIOR running JANOS is highly capable and can be applied in a very wide variety of situations. This was designed to be generic and not developed specifically for any one market. In contrast application programs have been created and are supplied at no charge some of which create the product environment for a specific market (such as digital cinema).

There is additional information, and an online store, on the INTEG website located at integpg.com or jnior.com.

SEE ALSO

HELP Topics: JMPConnect, websocket, JProtocol, Java, Compiling

JNIOR

JNIOR(R) is a Registered Trademark of INTEG Process Group, Inc. This acronym stands for the   Java Network I/O Resource   and is pronounced "Junior". The JNIOR is the heart of INTEG Automation and has been available in various models since 2005.

JANOS

JANOS(R) is a Registered Trademark of INTEG Process Group, Inc. This acronym stands for the   JNIOR Automation Network Operating System   and is pronounced "Jan-Us". JANOS is the INTEG developed real-time operating system first introduced with the Series 4 JNIOR.

JANOS was named after *Janus* who in myth is the god of comings and goings, beginnings and endings, passages, gates, transitions and time. All of these relating to the role of the JNIOR as a data interface/integrator between systems, devices and hardware of all forms.

INTEG

INTEG(R) is a Registered Trademark of INTEG Process Group, Inc.

INTEG Process Group (also known as INTEG) is located in Gibsonia, Pennsylvania USA. The company has been developing, manufacturing and supplying automation products and software since 1999. These products are in use worldwide in markets such as Cinema, Energy, Transportation, Manufacturing, Security, Utilities, and Recreation.

TERMS OF USE

INTEG grants the end-user or business entity ("Customers") using INTEG products full license to employ these products as desired provided that the use is completely legal as per any and all applicable laws and regulations. These products are not certified for, and therefore not licensed for, use in any life safety situation wherein the operation of the product could place any person(s) or animal(s) at risk of injury or death.

FIRMWARE LICENSE

The JANOS operating system ("Firmware") remains the property of INTEG Process Group. The operating system code and associated runtime libraries (such as JanosClasses.jar) as well as any future updates are licensed for use only with INTEG products. INTEG reserves all associated Rights. This Firmware is proprietary to INTEG and is protected under Copyright law. Reverse Engineering and any use of any portion of the Firmware in any situation unrelated to INTEG products is strictly forbidden.

APPLICATIONS

Applications, developed for the JNIOR and generally made available by INTEG to all Customers, are fully licensed for use with any INTEG product.

Custom applications developed specifically for individual Customers under paid contract are thereby property of Customers. INTEG will not distribute such applications directly.

INTEG encourages Customers to develop their own applications and will support their efforts.

JNIOR LIMITED WARRANTY

NOTICE TO USERS

THE JNIOR, A PRODUCT OF INTEG PROCESS GROUP, INC. ("INTEG"), IS A MICROPROCESSOR CONTROL DEVICE INTENDED TO BE UTILIZED WITH A CUSTOMER'S NETWORK TO MONITOR AND/OR CONTROL DEVICES AND/OR PROCESSES VIA REMOTE LOCATIONS. IN ORDER TO PREVENT INJURY TO PERSON OR PROPERTY, IT IS THE SOLE RESPONSIBILITY OF THE CUSTOMER TO INCORPORATE IN THE CUSTOMER'S SYSTEM, REDUNDANT PROTECTIVE MECHANISMS AND SAFEGUARDS APPROPRIATE FOR THE RISK INVOLVED. CUSTOMER IS SOLELY RESPOSIBLE FOR THE PROPER INSTALLATION AND USE OF THE JNIOR.

HARDWARE WARRANTY

The JNIOR product ("product") is warranted by INTEG, to the original purchaser, to be free of defects in materials and workmanship, under normal use, for a period of two (2) years from the date of original purchase. If during the warranty period, the product is proven to be defective, INTEG's sole obligation under this express warranty shall be, at INTEG's option and expense, to replace the product or part with a comparable product or part with no charge for parts and labor, repair the product or part with no charge for parts and labor, or if neither repair nor replacement is reasonably available, INTEG may, in its sole discretion, refund to Customer the purchase price paid for the product or part. Replacement products or parts may be new or reconditioned. INTEG warrants any replaced or repaired product or part for a period of ninety (90) days from shipment, or through the end of the original warranty, whichever is longer. All products or parts that are replaced become the property of INTEG. INTEG shall not be required to install, or be responsible for the costs associated with the installation of, the replaced or repaired product or part.

SOFTWARE WARRANTY

INTEG warrants to Customer that the JNIOR software ("software") licensed from it will perform in substantial conformance to their product specifications for a period of two (2) years from the date of original purchase from INTEG. Any software upgrades that may be made available by INTEG shall be available to Customer via CD, E-Mail, and/or INTEG's website at integpg.com with no charge to Customer during the warranty period. The installation of software upgrades shall not extend the warranty period of two (2) years from the date of original purchase. INTEG does not provide any warranty for any custom application software developed by the Customer or any other third-party application software that is licensed to Customer by the third party. In the event that the JNIOR software as originally provided to customer, and any upgrades that may be made available by INTEG, shall fail to perform in substantial conformance to the product's specifications, then INTEG's sole obligation with respect to this express warranty shall be to refund the purchase price paid by Customer for the product. INTEG makes no warranty or representation that its software will meet Customer's requirements or will work in combination with any hardware or application software added or developed by the Customer or provided by third parties, that the operation of the software will be uninterrupted or error free, or that all defects in the software will be corrected.

THIS INTEG PRODUCT MAY INCLUDE OR BE BUNDLED WITH THIRD PARTY SOFTWARE, THE USE OF WHICH IS GOVERNED BY A SEPARATE END USER LICENSE AGREEMENT. THIS INTEG WARRANTY DOES NOT APPLY TO SUCH THIRD PARTY SOFTWARE FOR THE APPLICABLE WARRANTY. PLEASE REFER TO THE END USER LICENSE AGREEMENT GOVERNING THE USE OF SUCH SOFTWARE OR THE ACCOMPANYING DOCUMENTATION RELATING TO SUCH SOFTWARE.

OBTAINING WARRANTY SERVICE

Customer must contact INTEG within the applicable warranty period to obtain warranty service. Dated proof of original purchase from INTEG will be required. In the United States, INTEG may ship a replacement product or part prior to receiving the original product or part ("advance exchange"). If advance exchange is not available, then the repaired product or part will be shipped as soon as reasonably possible, which will be no later than thirty (30) days after INTEG receives the original product or part. Repaired or replacement products will be shipped to Customer at INTEG's expense. INTEG shall not be required to install, or be responsible for the costs associated with the installation of, the replaced or repaired product or part.

Products or parts shipped by Customer to INTEG must be sent prepaid and packaged appropriately for safe shipment, and it is recommended that they be insured and sent by a method that provides for tracking of the package. When an advance exchange is provided and Customer fails to return the original product or part to INTEG within thirty (30) days from the date the replacement product or part is shipped to Customer, INTEG will charge Customer the then-current published price of such product or part.

WARRANTIES EXCLUSIVE

IF THIS PRODUCT DOES NOT OPERATE AS WARRANTED ABOVE, CUSTOMER'S SOLE REMEDY FOR BREACH OF THAT WARRANTY SHALL BE REPLACEMENT OR REPAIR OF THE PRODUCT OR PART OR REFUND OF THE PURCHASE PRICE PAID, AT INTEG'S OPTION. TO THE FULL EXTENT ALLOWED BY LAW, THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, TERMS, OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES, TERMS, OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, CORRESPONDENCE WITH DESCRIPTION AND NON-INFRINGEMENT, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. INTEG NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE OR USE OF ITS PRODUCTS.

INTEG SHALL NOT BE LIABLE UNDER THIS WARRANTY IF ITS TESTING AND EXAMINATION DISCLOSE THAT THE ALLEGED DEFECT OR MALFUNCTION IN THE PRODUCT DOES NOT EXIST OR WAS CAUSED BY CUSTOMER'S OR ANY THIRD PERSON'S MISUSE, NEGLECT, IMPROPER INSTALLATION OR TESTING, UNAUTHORIZED ATTEMPTS TO OPEN, REPAIR, OR MODIFY THE PRODUCT, OR ANY OTHER CAUSE BEYOND THE RANGE OF THE INTENDED USE, OR BY ACCIDENT, FIRE, LIGHTNING, POWER CUTS OR OUTAGES, OTHER HAZARDS OR ACTS OF GOD. THIS WARRANTY DOES NOT COVER PHYSICAL DAMAGE TO THE SURFACE OF THE PRODUCT. THIS WARRANTY DOES NOT APPLY WHEN THE MALFUNCTION RESULTS FROM THE USE OF THIS PRODUCT IN CONJUNCTION WITH ACCESSORIES, OTHER PRODUCTS, OR ANCILLARY OR PERIPHERAL EQUIPMENT AND INTEG DETERMINES THAT THERE IS NO FAULT WITH THE PRODUCT ITSELF.

LIMITATION OF LIABILITY

TO THE FULL EXTENT ALLOWED BY LAW, INTEG ALSO EXCLUDES FOR ITSELF AND ITS SUPPLIERS ANY LIABILITY, WHETHER BASED IN CONTRACT OR TORT (INCLUDING NEGLIGENCE), FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES OF ANY KIND, OR FOR LOSS OF REVENUE OR PROFITS, LOSS OF BUSINESS, LOSS OF INFORMATION OR DATA, OR OTHER FINANCIAL LOSS ARISING OUT OF OR IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE, USE, PERFORMANCE, FAILURE OR INTERRUPTION OF THIS PRODUCT, EVEN IF INTEG HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND LIMITS ITS LIABILITY TO REPLACEMENT, REPAIR, OR REFUND OF THE PURCHASE PRICE PAID, AT INTEG'S OPTION. THIS DISCLAIMER OF LIABILITY FOR DAMAGES WILL NOT BE AFFECTED IF ANY REMEDY PROVIDED HEREIN SHALL FAIL OF ITS ESSENTIAL PURPOSE.

DISCLAIMER

Some countries, states, or provinces do not allow the exclusion or limitation of implied warranties or the limitation of incidental or consequential damages for certain products supplied to consumers, or the limitation of liability for personal injury, so the above limitations and exclusions may be limited in their application to you. When the implied warranties are not allowed to be excluded in their entirety, they will be limited to the duration of the applicable written warranty. This warranty gives you specific legal rights, which may vary depending on local law.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the Commonwealth of Pennsylvania, U.S.A., and by the laws of the United States, excluding their conflicts of laws principles.

NAME

help - Help System

ALIASES

HELP, MAN

SYNOPSIS

help [OPTIONS] [TOPIC]

DESCRIPTION

The Help System is designed to make information more readily available to users during Command Line Console sessions. The HELP command issued without parameters lists the available commands. Help information for any of the available commands can then be displayed using the name as the TOPIC.

Additional HELP Topics are available for Registry keys and reference information.

-S

When a topic is not found HELP displays search results displaying topics which contain the TOPIC keyword. By default only a limited number of matches are displayed. This option skips the search for a specific TOPIC, performs the content search, and shows ALL results. Results are listing in order of decreasing relevance.

-I [CATEGORY]

Generates an index including all of the available HELP topics. If a valid CATEGORY is specified the list is limited to a related subset.

-C

List all available categories. Most HELP topics belong to at least one category.

-P

This option pages the Help response 24 lines at a time. The user can page through the information using any keyboard keystroke. This eliminates the need to scroll back for reading. A Ctrl-C disables the paging for the balance of the text. (See note below)

-L

Displays the brief legacy Help text as is available for commands. The option '-?' may be used with most commands to access their short help text.

NOTES

The Topic may contain '*' and '?' wildcards but only matches legacy Help text in that case.

Help output can be lengthy as there can be a lot of information available for display. In addition to the -P option that pages the output for you, you may also 'pipe' the output using the pipe character '|' from the command to MORE . This opens the screen editor with the output in read-only mode. Here you can scroll, page and even search the results. Keep in mind that Ctrl-Q exits this tool.

SEE ALSO

HELP Topics: SUPPORT, MANUAL, MORE

HELP WebUI

The Help System is available through the WebUI.

CONTEXT SENSITIVE HELP

Context sensitive Help is provided when placing the mouse over any configuration setting. The Registry Key related to the setting is displayed in the status bar at the bottom of the WebUI display. Pressing F1 or clicking on the displayed Registry Key enters the Help System displaying information about the key (if available) in a new browser tab.

HELP SYSTEM

The Help System itself can be reached using the '[Help Search]' link located at the bottom right of the WebUI display. You may enter text for the search or leave the search box empty. This opens the Help System under a new browser tab showing search results. If the search is blank this displays an exhaustive list of available Help Topics. Click on any topic for additional information.

The Help System header also provides access to a list of all of the Console commands. This is a subset of topics. There is also a link specifically for Technical Support and the topic provides details on contacting INTEG.

PRINTABLE MANUAL

The Help System can generate a *Users Manual* with content specific to the current JNIOR. This not only includes Help information for the version of JANOS operating system but also any that is available for installed applications. The Users Manual appears in the browser fully paginated with a Table of Contents and Index ready for printing. It is suggested that this manual be saved as a PDF as opposed to hard copy printing. It is a useful reference and helpful in exploring the JNIOR.

SEARCHING

A Search link opens a small dialog requesting a search term to be used in performing a simple scan of Help Topics. The topics correlating to the term are displayed in decreasing relevance along with the collection of words surrounding the located search terms. The entire set of matched topics can be displayed from the command line using the HELP -S search command.

Matching topics are scored and displayed in decreasing score. While the score itself is abstract you can display it. Define a *Help/ShowScore* Registry key setting it to "true". This will include the scores with the results.

Searches, especially when searching for a very common term, can take several seconds to complete.

SEE ALSO

HELP Topics: USERS_MANUAL, HELP

SUPPORT **Technical Assistance**

For technical assistance:

1. Check the Knowledge Base at jnior.com
2. Email: support@integpg.com

Monday-Friday 8AM-4PM EST

3. Enter Chat at integpg.com
4. Call +1 724-933-9350

PRINTABLE MANUAL

A printable manual containing all of the information available here may be generated using the JANOS WebUI. The content is dependent on the current version of JANOS and will uniquely include any Help information supplied by installed application programs.

It is recommended that this be saved as a PDF in preference to printing. Links within the document should then be usable for navigation. It can take a minute to generate this Users Manual.

NOTES

We recommend that you update to the latest version of JANOS to insure that you are not experiencing a known and corrected issue.

To save time you can include a snapshot taken with the Support Tool with your communications.

jnior.com and *integpg.com* are presently the same destination.

SEE ALSO

HELP Topics: HELP, MANUAL

Power Up Getting Started

GETTING UP AND RUNNING

To get started with a JNIOR you will need a power supply or some source of power. In many cases the JNIOR ships in bulk to integrators and power supplies are obtained separately since they depend on the destination country. That often means that you might be handed a JNIOR without a power supply. Any roughly 12 VDC source capable of supplying at least 1 AMP will work.

Power supplies for the JNIOR may be supplied with the 4-position screw terminal connector. More recently the power supplies are equipped with a 2.1MM I.D. 5.5MM O.D center positive barrel connector. A short adapter accepting the barrel connector provides the 4-position connection for the JNIOR. In addition there are four 8-position connectors provided.

If the barrel adapter is not available you can cut the barrel connector off a suitable supply, strip and tin the wires as needed. See PWR for wiring details.

With power applied to the JNIOR the Blue LED will illuminate. The Orange LED illuminates briefly during boot. This orange status LED has many uses and may flash at times to indicate activity.

NOTES

The Series 3 JNIOR used a Green LED to indicate power. The legacy Series 3 units are not recommended for new applications.

SEE ALSO

HELP Topics: KEYBOARD, PWR, POWER_SUPPLY

User Interface Getting Started

COMMUNICATING

In order to configure and program the JNIOR you will need to communicate with it. The JNIOR has no keyboard or display interface. There are ways to interact with the unit both serially and through the network.

NETWORK ACCESS

In order to fully interact with the JNIOR and use its WebUI you must properly configure the unit to operate on the network. JNIORs are now being shipped from the factory with Dynamic Host Configuration Protocol (DHCP) enabled. With a network supporting DHCP the JNIOR will obtain a valid IP address and automatically configure itself properly for the network. You will still need to determine the IP address that it has been assigned.

One unique method uses the orange status LED. If you know the first 3 octets of the IP addressing used by the network you can determine the forth octet and therefore the full IP address assigned to the JNIOR. Connect the JNIOR to the network and power it up. After a couple of minutes disconnect the network connection leaving the unit powered. The status LED will flash the digits of the last octet in Morse Code! See the MORSE_CODE reference for the digit patterns.

You can download the *JNIOR Support Tool* from the Downloads area under Support on the website jnior.com . The Support Tool uses the Beacon Protocol to communicate with JNIORs on the local network segment. The active JNIORs on the network are listed under the Beacon tab. This protocol does not require that the JNIOR have a valid network configuration. A JNIOR even if configured for a foreign network will appear in the list. You can right-click on a JNIOR and select Configure and IP Configuration to establish settings.

Once the IP Address of a JNIOR (properly configured for the network) is known you may enter the following URL in a browser to activate the Dynamic Configuration Pages WebUI.

```
http://[IP Address]
```

The WebUI is distributed as the file */flash/www/config.zip* and the default setting of the Registry Key */WebServer/Path* is */flash/www/config* . This allows the simple use of the IP address (or hostname) in the URL to locate the supplied WebUI.

If the JNIOR has been previously configured to support a custom Website you may bypass that site and reach the WebUI with the following URL.

```
http://[IP Address]/config
```

The JNIOR supports the HTTPS:// secure protocol as well.

FINDING YOUR JNIOR ON THE NETWORK

From a Windows system located on the same network leg you may access the JNIOR using its Hostname. Even after you edit the hostname as might be appropriate for your situation you may use the new name or the unit's Birth Name. By default the JNIOR is shipped with its hostname being a combination of the characters 'jr' followed by the unit's serial number. We refer to this as its birth name.

This will also work from Linux systems when the Wins name resolution has been enabled.

For instance, referring to the label on the rear of a JNIOR we see that its serial number is 615010258. We can enter the following URL:

```
http://jr615010258/
```

I most cases this will open the WebUI for that JNIOR. The name resolution systems vary from network to network and computer to computer. So your experience may vary. If you redefine the hostname the above will still work and if you replace the birth name with your new host name that should work too. Note that there are constraints on the format for a valid host name. The JNIOR may let you define a name not meeting those requirements and therefore won't work in this context.

Typically a device like the JNIOR where you need to go to it with your browser or other network function is termed a 'server'. Servers would normally be assigned a fixed IP Address by those managing the network.

If you need to configure a fixed IP address you may use these techniques to first access the unit and then make the changes using the ipconfig command.

The *Support Tool* also provides access to any JNIOR with an unknown IP address or even a JNIOR with an incorrect network configuration. This tool can assit you in configuring JNIORs for other networks or in working with those that have been brought in from a remote site.

COMMAND LINE INTERFACE (CLI)

The Command Line Interface (CLI) is the basic access point to any operating system. Windows provides a Command Prompt that originated from MS-DOS. Linux based systems rely upon a terminal interface (Ctrl-Alt-T). The JNIOR is no different and JANOS uses a CLI that is modelled closely after both of those. Users familiar with either interface will feel at home.

There are many points of access to the command line. In the absence of the network a serial cable may be used as describe in the next section. Over the netwrok the CLI is available as the Console tab in the WebUI, through a Telnet connection, and now also with the Secure Shell (SSH) protocol.

SECURE SHELL (SSH)

JANOS now supports SSH. This protocol offers a cryptographically secure connection the the JNIOR. It can offer functionality beyond simple terminal access to the CLI and is therefore worth a little more discussion.

Currently the JANOS SSH implementation is limited and may not be functional with older SSH client packages. It should work with most fully updated client packages. The SSH command is available from the Windows 10 command prompt; It is functionald from Linux terminals; And, you can use the popular PuTTY program, among others, for an SSH connection.

The typical command syntax from a Linux terminal looks like:

```
ssh jnior@10.0.0.135
```

This makes an SSH connection using the username 'jnior' (by default an Administrator on any JNIOR). On first access to a JNIOR you will see a message like this:

```
The authenticity of host '10.0.0.239 (10.0.0.239)' can't be established.
ED25519 key fingerprint is SHA256:idqhzbRVeCP+fVldu20xNWE3kfr/AhSEoenYLTrywwo.
Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

If you approve by answering 'yes' the system will store this fingerprint and not confront you again unless this does not remain consistent. After answering in the affirmative it proceeds:

```
Warning: Permanently added '10.0.0.239' (ED25519) to the list of known hosts.
jnior@10.0.0.239's password:
```

Here you enter the unit's password (also 'jnior' if default) and the connection is made.

XTERM SUPPORT

One advantage of the SSH connection is support for dynamic screen dimensions. The screen width and height is conveyed on connection and updated whenever you resize the associated window. In addition the XTERM terminal supports color characters. These are new terminal capabilities for JANOS.

As a result during an SSH connection JANOS will highlight the command prompt in green and render errors in some places in red. Some commands can utilize a greater screen width and will adjust their output accordingly. The EDIT editor when used in an SSH session will expand to utilize the entire screen area both in width and height.

PUBLIC KEY AUTHENTICATION

While you typically authenticate by supplying the valid password for the login account, SSH offers the ability to bind a client computer to the JNIOR using a key pair. In order to do so your computer needs to have such a key pair. This is typically created using the following command:

```
  ssh-keygen [options]
```

This is executed on the client computer and options may not be needed. If the command asks you to overwrite an existing key, it is probably a good idea to leave the original in place and simply abort the command. That is proof that a key has already been generated. It may already be in use with other connections. If you overwrite the key you will need to resubmit the new key for all other uses.

Once you know there is an SSH key pair, you can submit the public part of the key to the JNIOR. If the this is accepted it will serve as authentication abd bypass the need for password entry. The procedure for doing this varies from server to server. The JNIOR provides a built-in command for this purpose.

When connection to other Windows or Linux systems the 'ssh-copy-id' command may be executed on the client comupter. This may perform the necessary steps to submit the key. With JANOS you would execute the 'copy-id' command on the remote JNIOR as follows:

```
  ssh jnior@10.0.0.239 copy-id
  jnior@10.0.0.239's password:
  public key successfully added
```

You will need to authenticate with a valid password. In the background the SSH protocol would have attempted to authenticate using the public key. This built-in command then may add the key to the user's authorized_keys file.

Once the client computers public key has been accepted and recorded you may reconnect using SSH without the password requirement from the system. Behind the scenes your connection is authenticated as you prove that you do have the private part of the key matching the recorded public key.

While this is a convenience and veryu helpful in executing remote commands, there is complicated cryptography in use which cost in computing time. This type of authentication can be slower than having to entry the password.

REMOTE COMMAND EXECUTION

While SSH allows you to establish a secure connection to a JNIOR and then to manage that unit through the Command Line Interface, it can also be used to remotely execute commands. Generally the SSH client will process any additional text on its command line as an individual command to be executed on the remote server. For instance if you are able to connect without need for the password entry the following command will simple close ROUT 1 (relay output 1) on the remote JNIOR and return back to the local prompt.

```
  ssh jnior@10.0.0.135 jrmon -x c1
```

This would execute the JRMON command on the remote JNIOR thereby closing the relay.

It is important to note that this is not an acceptable replacement for an application to toggle the remote relay using, for instance, the JMP Protocol. Due to the overhead in making the secure SSH connection the execution of the above command can take several seconds. An application using the appropriate protocol however can close that relay within milliseconds. Also, the above command provides no feedback that any relay had actually been activated. An application would have immediate confirmation and would have the opportunity to address any error situation.

SERIAL ACCESS

In the absence of a network connection you can reach the Command Line Interface (CLI) or Console through the COM serial port. A USB-to-Serial adapter may be used as PCs these days do not provide serial ports. The communications parameters are 115,200 Baud, 8 Data Bits, 1 Stop Bit and No Parity.

The IPCONFIG command at the command line can be used to determine and alter the IP configuration of the JNIOR. This command may be necessary in establishing proper network addressing if DHCP or the Support Tool cannot be used. For example: The JNIOR may be connected to the network using a cellular modem or other wireless approach not supporting the broadcast required by the Beacon protocol.

The CLI is quite powerful in many ways and not just for configuration although, the network is still required for transferring files either on to, or off of, the device.

NOTES

A network cable can often be used to connect the JNIOR directly to a PC. The Support Tool running on the PC will locate the JNIOR and allow you to configure the unit.

The Telnet application built in to the Support Tool can be used for serial communications. After opening the Telnet tool the *Connect* button at the bottom offers the serial option.

SEE ALSO

HELP Topics: MORSE_CODE, BEACON, NETWORK, COM_SERIAL, IPCONFIG

NETWORKING

A JNIOR must be properly configured to participate reliably on the local network. Network configuration can be quite complex and a great deal of planning often goes into the structuring of commercial networks. While the IT Department or appropriate networking professionals should be consulted when adding devices like the JNIOR to a network, some relatively simple concepts are all that are needed to get the JNIOR up and running.

The JNIOR is a wired network device. While WiFi and Cellular adapters are available to provide the JNIOR with such connectivity, the device is typically connected to a *Network Switch* via a CAT5 cable. Any number of computers, printers and devices connected to a network switch or multiple switches constitutes a *Local Area Network* or LAN. The connected devices can all message one another.

A *Wireless Access Point* provides wireless connectivity and is at some overly simplified level just a big multi-port network switch in the sky. WiFi extends the wired network and all devices both wired and wireless are able to communicate with one another.

A *Wireless Router* often serves on the local network side as a network switch with wireless access. The router has another connection allowing it to be connected to another network which is often referred to as the *Wide Area Network* or WAN.

ETHERNET MAC ADDRESS

Just as when someone wishes to send you a letter they need your postal address or when they send you an email they need your email address, a machine on the LAN can send another a message if it knows its *Media Access Control* or MAC address. This is an address like9c:8d:1a:00:07:f9 and is something that thankfully you never really need to know.

On the wire that MAC address is absolutely necessary to get packets of information from one place to another. Of importance is that every device manufactured should have a unique MAC address permanently programmed. Each JNIOR has a unique address and the prefix 9c:8d:1a is assigned to INTEG. This can be used to identify all of the Series 4 JNIOR products on a network.

IP ADDRESSING

As opposed to the MAC address the address that you do need know to communicate with devices locally and outside is the *Internet Protocol* address or IP Address. This is an address that looks something like 192.168.2.37 which is not all that easy to remember either. Typically the first three numbers (or octets) displayed here are consistent for every device on the LAN. Only the last octet varies.

On the network, and very much in the background, there is a procedure for finding the MAC address for any destination with an IP address. You need not know much more about it.

While a JNIOR may be assigned any IP address it has but one MAC address. Units are labeled with the programmed MAC address and this can also be obtained by using the IPCONFIG command in the Command Line Console.

CLIENT vs. SERVER

When you open your Browser and enter a URL it is typically some text like

```
https://jnior.com
```

In this case you are a *Client* and are attempting to connect to a *Server* located at INTEG. Fortunately you do not need to know the IP Address 209.195.188.92 in order to make the connection.

You will want to use the browser to access the JNIOR. In this case you need to know its IP address because it is a *Server* . The URL would look like:

```
http://192.168.2.37
```

On some networks you may be able to reach the JNIOR using its hostname. The JNIOR also registers its 'Birth Name' which is comprised of its numeric serial number with a 'jr' 2-character prefix. For example these two URLs can both reach the same JNIOR.

```
http://bruce_dev
http://jr615010258
```

By default the hostname is initially the birth name. This can be altered using the HOSTNAME command. The ability to reach a JNIOR using these names is dependent upon the network configuration for name resolution. This may or may not work depending on your network's capabilities.

The serial number for the JNIOR can be located on the rear label.

IP SETTINGS

To properly configure the JNIOR for the network there are 2 critical IP settings and 3 fairly important settings. These are as follows:

1.	IP Address	192.168.2.37
2.	Subnet Mask	255.255.255.0
3.	Gateway Address	192.168.2.1
4.	Primary DNS	8.8.8.8
5.	Secondary DNS	8.8.4.4

If you are uncertain as to the proper settings for your network you may try the Dynamic Host Conbfiguration Protocol (DHCP). Most routers enable this protocol. This helps computers join the network and properly configure. The JNIOR now ships with DHCP enabled.

DHCP can be enabled from the command line with the following command:

```
ipconfig -d
```

In the Support Tool it is a selection. Right-click on the JNIOR in the Beacon tab and select **Configure** and then **IP Configuration** . There is a selection to enable DHCP. After a minute if DHCP is available the JNIOR will acquired a valid network setup.

You can then check the IP configuration through the Support Tool or by using IPCONFIG. This will give you items 2 thru 5 in the above list. DHCP IP addresses themselves are *leased* . While it is likely that the JNIOR will retain the assigned IP address for some time, that address is assigned from a pool (range of addresses) and can change. Since you need the IP address to communicate with the JNIOR you don't need it to be a moving target.

The solution is then to disable DHCP and assign a *fixed* IP address which should be outside of the DHCP range. You will need to get that address from your network administrator. In a pinch you can use the ARP -U command to locate a low-numbered unused address. This ARP command scans the network and reports any addresses that do not actively respond.

You can then disable DHCP again using the Support Tool or with the following command:

```
    ipconfig -r
```

The JNIOR may retain the DHCP configuration. It is important to reassign the IPv4 address outside of the DHCP range either using the Support Tool or command. For example:

```
    ipconfig -a 192.168.2.37
```

SUBNET MASK

It was mentioned that the first 3 numbers or octets of IP addresses on the local network typically all match. The local network must use only a small range of all possible IP addresses as those outside of the range are then used to access hosts and devices all over the world. The local address scheme uses an address range typically reserved for individual local networks.

The *Subnet Mask* defines the portion of the IP address that must match that assigned to the JNIOR for any local network participant. This is a bit mask specifying bit by bit from the left (most-significant bit) the bits that must match between source IP address (the JNIOR) and destination. So with a typical local network a subnet mask of 255.255.255.0 indicates that all of the bits in the first 3 octets must match for local communications. With 8 bits per octet (byte) there are 24 bits from the left that must match. You may also see the IP address specified as for example 192.168.2.37/24 .

When the destination address DOES NOT match in every indicated bit position the destination is assumed to be outside of the local network. The source then attempts to contact the destination using the *Gateway* device. The gateway then potentially providing access to the Wide Area Network and hopefully the host destination.

The Subnet Mask can be set using the Support Tool or using IPCONFG. In these command examples the latter sets both the IP Address and Subnet Mask in one step.

```
    ipconfig -s 255.255.255.0
    ipconfig -a 192.168.2.37/24
```

If you erroneously set the Subnet Mask, communications may fail to reach some members of the local network or some external hosts. This may depend on the operation of the gateway which might optionally assist in properly locating the destination as still being on the local network. Basically, the subnet mask typically is set identically for all members of the local network. More complex network topologies are possible. It is best to consult your network administrator.

GATEWAY

The *Gateway* is a device on the local network that also is a member of another network. The latter being presumably connected to the Wide Area Network and ultimately possibly the Internet. The Gateway then is likely the router for the local network. It serves as a bridge to the outside world.

If a Gateway address is not properly defined the JNIOR will not be able to contact hosts outside of the local network. In a typical automation scenario it may not seem that the JNIOR would have any reason to communication outside of the local network. The JNIOR periodically reaches out to a NTP server in order to synchronize its clock. This occurs about every 4 hours and relies on proper Gateway settings and DNS.

The JNIOR can also be configured to send email notifications. For this to be possible the unit also needs to access the outside world. It is important to properly define the Gateway IP address.

DNS SETTINGS

The Domain Name System is a huge distributed database spread across the Internet. Its basic function is to translate a domain name like those you use in URLs to IP addresses. You use a DNS server to convert the website jnior.com to the INTEG IP address 209.195.188.92 so that behind the scenes your computer can communicate with the company's server and the browser can render the website.

While the JNIOR does not have its own browser it is configured with domain names that it will need to convert to IP addresses from time to time. In particular the JNIOR synchronizes its clock with an external NTP Server. The NTP server is located by first requesting an IP address from a DNS server for the domain:

```
pool.ntp.org
```

There are other NTP services that you can use. This one selects from a large pool of available NTP servers and offers an IP address for one that can best service your location. With a DNS server properly specified the DATE command can reach out and synchronize. For example:

```
bruce_dev /> date -n
Requesting time sync from pool.ntp.org (195.33.242.132)
Clock synchronized by NTP
Wed Jul 28 11:28:51 EDT 2021

bruce_dev />
```

Note here that pool.ntp.org has been resolved to the address 195.33.242.132 and that the JNIOR successfully synchronized its clock.

There are two DNS addresses, a *Primary* and a *Secondary* . A DNS server may get too busy to respond or may be down for service. It is critical to have a backup. We specify a primary and a secondary DNS server address in hopes that at least one of the two is available to help us. The JNIOR may try the primary first and if there is no timely response attempt to use the secondary. It may also just ask both and take the first response and run with it.

The NSLOOKUP command can be used to resolve domains. For example:

```
bruce_dev /> nslookup jnior.com

Issuing DNS request (<0.1s)
   Inet Addr          Domain
  209.195.188.92     jnior.com

bruce_dev />
```

If DNS addresses are not defined or if the DNS Servers cannot be reached the JNIOR clock will likely drift away from the correct time. This may only affect the timestamps that appear in logs. If the application is performing tasks on a schedule those events may not occur on time. Email notifications if configured will not be deliverable. You might use the Google public DNS addresses 8.8.8.8 and 8.8.4.4 although there are many other servers available.

NTP TIME SYNC

The JNIOR clock is set at the factory and is likely to drift many seconds or even minutes by the time the unit is in your hands. While you can set the time and date using the DATE command it is preferred that a NTP server be used for automatic time synchronization.

With proper IP configuration and access to the Internet the JNIOR will obtain the current time immediately after boot and then by default every 4 hours. If the JNIOR is operating in a sandboxed network or otherwise restricted by firewall it is recommended that the **#IpConfig/NTPServer** registry key be defined with a local NTP time source.

Additionally the JNIOR uses the NTP synchronization to calibrate both the hardware and software clocks (JANOS v2.4 and later). This calibration occurs during the first few days of operation assuming access to the NTP server.

SUMMARY

For proper network use the JNIOR needs 1) a unique IP Address valid for the local network; 2) A proper Subnet Mask for the local network; 3) A Gateway IP Address for access to the outside world; And, 4) at least one valid DNS server address. DHCP can be a valuable tool for discovering settings for all but the IP address itself. Finally, the IP Address must be uniquely defined for each device on the network. The JNIOR will query for conflicts during boot. If the IP address assigned to the JNIOR is claimed by another device on the network the JNIOR will not be available. In this case it will report an IP Address of 0.0.0.0 and will remain accessible through the Support Tool for reconfiguration.

SEE ALSO

HELP Topics: IPCONFIG, ARP, NSLOOKUP, DATE

FIRMWARE

The *Firmware* consists of the JANOS operating system and Java Runtime Library. These are programmed at the factory into a Read-Only Memory (ROM) area within the processor itself. This is sufficient to bring the JNIOR to life. Any further configuration for any specific purpose is achieved by loading files, some containing application programs (JAR files), into the File System.

The ROM can contain two separate copies of the operating system. The update process is managed by the JRUPDATE command. INTEG supplies an updated version of JANOS in an update file (UPD extension). The JRUPDATE command takes the UPD file and transfers the new version of the operating system into the second area and signals the availability of the update. On reboot the system, in an absolutely fault tolerant way, swaps the two JANOS images installing the updated version.

The UPD file also contains an updated version of the Java Runtime Library JanosClasses.jar that is accessible in the /etc folder. The JRUPDATE command immediately updates the runtime library image. There is a very slight risk that an updated runtime library might not be compatible with the running version of JANOS. An immediate reboot is recommended to insure that the new version of the operating system, which would be compatible with the runtime, comes on-line. Any incompatibility would simply generate an Exception during application execution. This would only be a temporary condition.

NOTES

The update file (UPD) is generally about 1MB in size. This should be transferred into the /temp temporary folder before executing the JRUPDATE command. The only other area in the file system that can accommodate a file of this size is the /flash folder and its sub-folders. Attempting to place this large file anywhere else in the file system could cause the unit to run out of memory and potentially lose data. This should, however, be a recoverable situation.

If you are running an *Update Project* such as an All-In-One using the Support Tool, this update process is handled for you.

SEE ALSO

HELP Topics: JRUPDATE, FLASH, TEMP

Factory Configuration

FILES

In production a number of files are initially loaded onto the JNIOR and specifically into the /flash file area. The file system in general is stored within a battery-backed Static Random Access Memory (SRAM). There are two exceptions to this. One is the /flash folder and all of its contents. This information is stored within a Flash Memory component. This is not dependent on the battery and therefore considered a bit more permanent. The other exception is the /temp area which is temporary and therefore stored in the larger general-purpose Heap memory. There is also the /etc folder which is read-only and contains the runtime. It is actually in processor ROM.

On a JNIOR you may observe files with the DIR or LS command. The files that you find outside of the /flash folder are actually generated by the JNIOR. These are typically log files. The /flash folder is pre-loaded in production and may contain the following files:

/flash/cksums.bat

This is a batch program that creates a CKSUMS command for use at the command line. This reports checksum and digest calculations for the content of files. This is useful in validating content against the published checksum or digest information calculated from the original files.

This is a good example of how to create a custom command using the PHP-like scripting language that is unique to JANOS.

/flash/ftp.jar

The JNIOR supports a built-in File Transfer Protocol (FTP) server allowing you to upload and download files from the unit using FTP from a PC for instance. The **ftp.jar** application program allows you to use FTP from the command line as a client. Using this command on the JNIOR you can go to remote FTP servers and get or put files. This might be useful in pulling (or pushing) a file from one JNIOR to another.

/flash/JBakup.jar

The JBakup utility extends logging for periods much longer than can be accommodated by the standard .LOG file and its .LOG.BAK backup. This program can be run in the background and on the quarter hour it will detect newly updated .LOG.BAK files and combine their content into a compressed library stored in the /flash/baks folder. Depending on activity levels this could preserve log data for many months.

/flash/jnior.ini

This is generated by the JNIOR once it is up and running. The **jnior.ini** file is a backup for the Registry . In general one should not edit or overwrite this file.

/flash/manifest.json

The MANIFEST -U command creates a reference point for the file system. This essentially is a database of checksum/digest information for all of the files. In production a target version of this file is uploaded and MANIFEST is used to verify the file set. This detects any missing files or any upload errors even if only a single bit is in error. It is employed initially as a quality control function.

/flash/manpages.zip

This contains the extended Help information available with the HELP command. Its content is what generates this book.

/flash/ModbusServer.jar

MODBUS is a protocol that may be used to communicate with the JNIOR. If needed this protocol can be enabled through the WebUI on the Configuration tab Applications page. It can also be started by setting a Registry /Run key.

/flash/SerialControl.jar

Serial Control Plus runs on the JNIOR and allows the user to interact with the JNIOR I/O via the serial port or the Ethernet port using simple ASCII commands. The user can control the relay outputs (on, off, pulse) and receive the status of the digital inputs and relay outputs (on, off) along with counters via the serial port or Ethernet port. The application is enabled using the WebUI on the Configuration tab Applications page.

/flash/SerialEthernet.jar

Serial-to-Ethernet acts as a converter between a Serial device connected to the JNIOR and a remote application communicating with the JNIOR. The connection made using Serial-to-Ethernet is bi-directional allowing information to travel both ways. The application is enabled using the WebUI on the Configuration tab Applications page.

/flash/SlaveService.jar

The Slaving service when running can be configured to cause an input or output on one JNIOR to reflect the input or output on another. This can be used to extend a remote signal through the network. The application is enabled using the WebUI on the Configuration tab Applications page.

/flash/SNMP.jar

The Simple Network Management Protocol (SNMP) can be enabled through the WebUI on the Configuration tab Applications page. SNMP can be used to manage the JNIOR remotely. Variables can be defined which will be monitored or controlled in a manner consistent with other SNMP enabled devices.

/flash/www/config.zip

This contains the entire WebUI (default JNIOR website) which is served directly from this one file. This forms a virtual **/config** folder for the WebServer.

/flash/www/Bundled.zip

This contains the configuration pages for the Slaving application and as well as that needed by the other applications that may be activated on the JNIOR.

To find out more about these applications and others available for the JNIOR visit the INTEG website or contact Technical Support for an overview.

SEE ALSO

HELP Topics: DIR, CKSUMS, REGISTRY, MANIFEST

Factory Configuration

FACTORY RESET

A JNIOR may be reset to factory configuration. This involves clearing the unit which is an operation referred to as *Sanitizing* . Once this is done an All-In-One update project must be run using the Support Tool in order to restore the factory set of files.

SANITIZING

This procedure clears the JNIOR completely of any prior configuration placing the unit in a fresh and blank condition. This performs the following actions:

1. Shuts down running applications.

2. Reformats the Flash memory erasing all content.

3. Resets the Registry removing all content.
   This retains key IpConfig settings so connection with the unit is not interrupted. This also retains the Timezone.

4. Erases User Database resetting to default credentials.
   This retains clock configuration, the POR count, and the runtime tally.

5. Performs a reboot.

This reset does not revert the operating system to that originally supplied. If a particular version is required the proper All-In-One must be used containing the desired UPD for the version. We recommend that you use the latest All-In-One in this process.

The command to perform this operation must be run from the Command Line and is as follows:

```
REBOOT -ERASEALL
```

This *Sanitization* sufficiently removes all user related information as may be of security concern. If the JNIOR is employed in a secure Secret or Top Secret environment it must be sanitized with this procedure before being removed.

RESTORING FILES

The latest *All-In-One* Update Project may be run using the Support Tool to finally update the JANOS operating system and restore the factory installed files. Both the Support Tool and the update projects may be obtained from the website at jnior.com .

Note that in the absence of the Support Tool you can transfer the files listed in the Initial_Files section to the unit from another JNIOR or backup file.

NOTES

Do not copy the **/flash/jnior.ini** file. If you intend to copy Registry settings to the unit the Registry import/ingest command REG -I should be used. The **jnior.ini** file is automatically generated and should not be edited or overwritten.

SEE ALSO

HELP Topics: REBOOT, REG

Overview **Security**

OVERVIEW

The JNIOR can be used with confidence on the open Internet provided that certain security precautions are taken and consistently observed. The product configuration as shipped is not appropriate for use in the uncontrolled environment. There are default accounts with default login credentials which would set you up for disaster. There are protocols, for example MODBUS, that do not support login (without customization) and therefore cannot be used freely. With care however, the product can exist securely in a chaotic world like the Internet.

Even in a controlled environment such as an air-gapped or sandboxed network you would still want to control access to the JNIOR. Another trusted person with access to the network might in a moment of curiosity accidentally activate the JNIOR or alter configuration. Depending on what might be wired to the product, randomly closing a relay could damage the connected equipment or at a minimum disrupt the normal operation of things. A small accidental configuration change might later be difficult to detect and remedy. Both cases would be things to avoid. Proper security would limit that risk.

DEFAULT ACCOUNTS

The JNIOR ships with four (4) default user accounts two of which have full Administrator permissions. Leaving just one of these active in an uncontrolled situation would create a security risk.

Eliminate Unneeded User Accounts

A previously used JNIOR might have several user accounts. A new JNIOR has just 4. Those being:

1.	jnior	Administrator
2.	admin	Administrator
3.	user	Control
4.	guest	View Only

The users are configurable by administers through the Command Line Interface (CLI) or Console. The USERS command will display the available accounts. Typically in a single user situation the 'jnior' account would be the primary. Log into the 'jnior' account and then *disable* the other accounts with using the following USERMOD commands:

```
        usermod +d admin
        usermod +d user
        usermod +d guest
```

Similarly you may disable any other accounts that may also exist on the unit from any prior use. These commands add the Disabled flag to the accounts but do not remove the users. This would allow you to later restore the users if necessary.

You may also remove unnecessary user accounts using the USERDEL command. This command allows you to remove more than one user. It does not confirm removal so do use this cautiously. You cannot remove the currently active user (see WHOAMI). Only an Administrator can make these user changes. So you can never remove all of the administrator accounts. There is always going to be one. The following command removes the extra accounts:

```
        userdel admin user guest
```

Note that SAFEMODE temporarily reinstates the 'jnior' account with the default password. This is important should usernames and/or passwords be lost or forgotten.

Change Default Passwords

Passwords are your main protection against unwanted access. Without knowledge of the password an attacker can do little more than try to disrupt the operation of your device through some kind of Denial of Service (DoS) attack. Using the default passwords is convenient and while you might not feel that anyone would take advantage of that it is always going to be a risk.

The default user accounts each have a default password consisting of the username itself. It is highly recommended that you alter these default passwords before putting the JNIOR into service. For each of the remaining user accounts you would use the PASSWD command to change the password. This command can be used by an Administrator to both change the password for the current user and that for any of the other accounts.

To alter the current account simply enter the command:

```
        passwd
```

You will be prompted for the current password which you must properly provide. You will then be asked for a new password and then to reenter the password. Both must match for the command to succeed.

To change the password for any of the other accounts you must supply the username as follows:

```
passwd admin
```

In this case you will not need to enter the current password. You will be asked for a new password and then to reenter it. Both must match for the command to be successful.

Passwords on the JNIOR can be as few as 4 characters and as many as 19. These may contain any of the printable characters. Account passwords are never displayed by the JNIOR. These are stored in a secure internal memory area.

NOTES

The command HELP U will display the syntax for each in the collection of user commands.

SEE ALSO

HELP Topics: HELP, USERS, USERMOD, USERDEL, USERADD, WHOAMI, SAFEMODE, PASSWD FACTORY_RESET

Connectivity   Security

CONNECTIVITY

Networking provides significant advantages and at the same time adds risk. Multiple connections to the JNIOR may be easily created all over a single network wire. Those may be ongoing connections such as you might need between the JNIOR and the equipment it controls. They may also be brief and random connections as you might expect when someone issues a command or checks status now and again. You cannot be certain that every communication over the network is what you intend. This is a huge issue with the personal computer where the network is generally constantly active communicating with remote systems and frankly actively doing things that no one can explain.

The JNIOR provides services such as the File Transfer Protocol (FTP), Telnet, SSH, Hypertext Transfer protocols serving web pages (WebUI), and others. These are generally only those services that you would need to properly program and maintain your automation device. You can use the NETSTAT command to see which *ports* have been opened and are available to receive connections.

Limit Connectivity

By default the JNIOR will open a standard set of protocols. Each of those will by default require a username and password. Those login credentials are your protection against unwanted access. Therefore we highly recommend that you do not keep the default passwords as discussed in the previous section.

Also it is important to note that not all protocols have login capabilities. MODBUS remains a popular protocol but it does not support login without some custom extension. It is therefore a huge security vulnerability. We recommend that it be avoided. The Series 3 JNIOR activated the non-secure MODBUS by default. The Series 4 offers MODBUS as an application that you must specifically activate. Hopefully doing so while fully aware of the risk.

In most cases the login requirement may be disabled for a protocol. This is done through a Registry setting. Again, this is not recommended as you are creating a serious security vulnerability. Clearly disabling login is an aid in development. But once you have your automation set up and performing most neglect to go back and eliminate this risk. It is therefore very important to first conquer the login hurdle before proceeding to implement any automation.

Not all protocols provided are required to manage your JNIOR. In fact you can successfully perform all required actions through the WebUI web interface using your browser. You might even force that to be done securely. You logically then can disable all of the other protocols leaving only HTTP on Port 80 and HTTPS on Port 443. Perhaps only the latter if you require a secure trusted connection.

Note that the Support Tool utilizes, and therefore requires, the Telnet and FTP protocols. You will need to leave those active if you plan to use that tool.

Given that the WebUI offers services such as drag and drop file transfer, file downloading, command line console access and status, you can significantly harden your installation by limiting accessibility. A single rule allowing the HTTP port 80 (also the HTTPS port 443) can be added to a firewall or proxy providing limited remote access to the device. Similarly a single port forwarding rule might be added to the advanced configuration of a router.

Summary

Remain cognizant of the services open on your JNIOR. Insure that each requires a secure login. Do not use the default passwords. There is no need to create highly cryptic passwords but do avoid those obvious ones that can be easily guessed.

SEE ALSO
HELP Topics: NETSTAT

Encryption **Security**

SECURE COMMUNICATIONS

Access to the JNIOR is controlled by login credentials involving a username and secret password. This assumes that you have not disabled login for any of the services and do not use those protocols that do not support login. It is not likely that you would allow someone to watch over your shoulder as you enter these credentials and log into your JNIOR even if they were trusted. But without some care others may be able to easily and remotely observe your login compromising the security of the product. Your username and password may be communicated from you to the JNIOR in a plain text form.

Even if no one can monitor network traffic on your closed network the JNIOR itself performs network capturing. The NETSTAT command can be used to generate a network capture file that can be downloaded and analyzed offline. Your plain text user credentials may be evident in this capture file. You can eliminate the risk by insuring that all communications are secure and encrypted using both SSL/TLS and Secure Shell (SSH).

Use Secure Access

By default the JNIOR has SSL enabled. You do need to elect to use the encrypted protocols. That means accessing the JNIOR WebUI using the HTTPS:// URL as opposed to the previously common HTTP:// protocol. In using the secure protocol you eliminate the ability for a remote observer to see your login credentials and to know anything about what you are doing.

Browsers can utilize the AUTH DIGEST procedure for transferring login credentials even over the plain text HTTP protocol. This does encrypt your login credentials specifically and provides some peace of mind. This can still be thwarted by a particularly malicious actor and it is not a sound alternative to the more secure HTTPS connection.

FTP

Beyond the browser interface other protocols are routinely used in managing the JNIOR. One would be the File Transfer Protocol (FTP) used to transfer files onto and off of the JNIOR. The WebUI provides you with the ability to move files to and from the JNIOR under the **Folders** tab. This securely uses the JANOS Management Protocol (JMP) and not FTP. If you generally would rely on the WebUI for file management it is recommended that you disable FTP with the following command.

```
        reg FTP/Server = disabled
```

The FTP server can also be disabled under the Configuration tab on the FTP page by unchecking **Server Enabled** . In either case you must then reboot the unit to change the server status. Note that you can use the NETSTAT command to see what services are running. After disabling FTP you can confirm that it is no longer listening.

> NOTE
>
> The Support Tool currently relies on FTP for file transfer. If you rely on the Support Tool you should not disable the FTP Server.

The FTP Server does have a secure mode using the STARTTLS command. The remote FTP client must be configured to use STARTLS for transfers. In this case once an FTP connection is made the STARTTLS FTP command is issued to convert the connection to an encrypted channel before the credentials and anything else is transferred. This is a configuration setting for whatever FTP client you plan use.

TELNET

The Telnet protocol is used for making Command Line Interface (CLI) connections. Unfortunately Telnet clients (terminal programs) typically do not support SSL/TLS encryption. Users prefer to utilize Secure Shell (SSH) when a secure connection is needed. The JNIOR does support a STARTLS capability similar to that used by FTP. To utilize this feature you would need to obtain the client terminal program from INTEG as the feature is not generally supported.

You can disable Telnet just as you can FTP using the WebUI or by setting the appropriate Registry key. Again the Support Tool does currently rely on Telnet and the command connection for many of its procedures.

Secure Shell (SSH)

Starting with JANOS v2.5 the JNIOR supports the Secure Shell (SSH) protocol. SSH uses cyrptography to authenticate and secure a connection to the JNIOR over which you may access the Command Line Interface (CLI) similar to using Telnet or the WebUI Console tab. In addition to a terminal connection the SSH protocol may be used to execute individual commands on a remote JNIOR.

As with other protocols, SSH may be disabled through the Registry.

JMP PROTOCOL

The WebUI uses the JNIOR Management Protocol (JMP) through the Websocket facility supported by the same ports used by HTTP or HTTPS. If you have achieved a secure connection in accessing the WebUI the background JMP connection will also be secure. The JMP protocol requires a login. It has been integrated with the WebUI sharing the single entry of credentials.

The JMP Protocol is available on Port 9220. It also supports the STARTLS capability and client programs designed to communicate using the JMP protocol can take advantage of an encrypted connection.

JNIOR PROTOCOL

The JNIOR Protocol is a legacy binary protocol still in use today. It has limited capability and can also be elevated to an encrypted connection. It is available on Port 9200. This can be disabled as well if it is not required in your application.

SEE ALSO

HELP Topics: NETSTAT

Defenses **Security**

CYBER DEFENSES

The open Internet connection is a hostile place. Some activity is legitimate and a lot is not. An automation device such as the JNIOR should be in a well-protected network environment such as behind a firewall, router or other proxy. Even in that case care must be taken when opening ports for external communications as you might with a port forwarding rule or firewall exception. And still you run the risk that some other computer on the internal network becomes infected and serves as a bridge to the local network for an external malicious actor.

Granted that there are applications of the JNIOR that are intended for operation over Internet. If, for instance, you need to access the JNIOR through your cell phone or other remote computer, connections from the outside world need to be possible. And if you can reach your JNIOR, others can and from anyplace in the world and with any intention. In fact if a JNIOR is newly connected to the Internet with an unpublished and never before used IP address it will come under attack within minutes. Luckily you have defenses that can be deployed to thwart these attempts.

Depending on your point of view there are some legitimate unsolicited activities that may reach your JNIOR. For instance, search engines such as Google eventually find out about the active IP address and begin crawling web pages. They may just encounter the webUI login and proceed no further. Your application might offer a more public web site and that will get scanned. Today various Artificial Intelligence (AI) platforms search the Internet as part of their ongoing training. These things may or may not be of concern to you.

An the dark side, infected systems throughout the Internet (and there are 100s of thousands) work diligently to spread. These computer worms search for machines hoping to load a copy of themselves and to start that independently on that same task. These are some of the first attacks that you would see with a newly connected JNIOR. This would come in the form of a Telnet connection and attempts to login using a library of standard (default) usernames and passwords. Sadly they are successful all too often as we are not as diligent and we need to be in removing default passwords. The default 'admin' account active in a factory default JNIOR is at risk here. Those login credentials are very common.

Fortunately, even if a bot successfully logs into your JNIOR it will likely be unsuccessful. These malicious programs are looking for common computers and expect either a Microsoft Windows environment or some form of Linux installation. They will attempt to execute commands at the command line for those systems. The intent as previously stated would be to save a copy of themselves and to set that running. While JANOS mimics a number of MSDOS and Linux commands, the JNIOR is different enough to not fall prey.

Perhaps there will be a day when a bot specifically searches for a JNIOR and knows what to do with it. Your first and foremost defense is to eliminate the default passwords and to remove unused accounts. You might also limit the availability of unused protocols. Both are actions previously discussed here. And there is even more that you can do to harden your JNIOR and to repel the attacks and to perhaps even frustrate them.

SEE ALSO

HELP Topics: SECURITY, CONNECTIVITY, PLAIN_TEXT

Greylisting **Security**

GREYLISTING

A technique widely employed by email servers is called *Greylisting*. This has been used with great success to eliminate a large percentage of spam email. The fact is that criminal email systems tasked with the delivery of millions upon millions of unwanted emails work to deliver them as efficiently and as quickly as possible. In that effort there is no time to retry any delivery. Those systems just simply move on to the next target when any difficulty is encountered. So our legitimate email servers initially refuse email from an unknown source. The source is temporarily relegated to a "greylist". If the email delivery is retried, and done with standard timing, the email is accepted and the source approved for further exchanges. This technique is very effective.

Uniquely JANOS takes the Greylisting technique to a new level. While JNIOR does not receive emails it does receive connection requests. In order for any remote system to make a connection to the JNIOR it first sends a request. This comes in the form of a Transmission Control Protocol (TCP) packet with the SYN flag set. Normally JANOS is programmed to acknowledge the SYN packet with a SYN ACK and to proceed to form the connection with the remote client.

Now, just as with email delivery, the malicious bot program also does not bother retrying should it have difficulty connecting. If you enable the Greylisting on the JNIOR, that first SYN packet is ignored. The client is added to a greylist. A well-behaved client system will retry the connection. The Internet is a lossy network after all. But the bot gets no response and thinks maybe that there is no computer at that IP address and so it moves on and does not retry, or retries but way too aggressively. If we do receive a valid retry and the client is in the greylist the connection is allowed. This feature can be enabled by setting the IpConfig/Greylisting Registry key to "enabled".

Greylisting has proven to reduce malicious connections by over 98% in our testing with JNIORs directly connected to the Internet. In reality this does not completely eliminate the risk and other steps are recommended in an overall defense strategy but it is very effective. It is also unique as we are not aware at the time of this writing of any other system employing the technique in this fashion. We highly recommend enabling Greylisting on any JNIOR accepting connections from the Internet. This does not impact your normal legitimate use of the product in any way. It is not enabled by default.

Note that packets initially rejected by Greylisting are considered to be network noise. These may be filtered from the NETSTAT sniffer display.

SEE ALSO

HELP Topics: NETSTAT

Visibility **Security**

VISIBILITY

Logically one would think that a JNIOR connected to the Internet would be safe as no one would know that it is there. However there are 100s of thousands of systems out there searching random IP addresses for responses. In fact we see several packets arriving from various sources every minute. Each of those attempting to make connections on every possible TCP/IP port. You are not safe even if you set custom ports for accessing your JNIOR.

In fact, knowledge of the presence of computers on the Internet is a valuable asset. As a result systems search for computers or devices using various techniques but only to identify that the IP address is possibly available to be explored more thoroughly. We see connections made and then immediately dropped without exploitation. We suspect that the IP address is then added to a list and that list later sold to the highest bidder. The list is then fed to some malicious program that spends time not searching for prey but in working to own it.

For a long time PING was the preferred method to confirm that a computer resided at an IP address. The security industry has been recommending that you disable PING for this reason. You can disable it on JNIOR by setting IpConfig/PingReply to "disabled".

As a result the searches use a different approach and attempt connections to random ports at a target IP address hoping to get some response. One response might be the acceptance of the connection request but more typically they might receive a "Port Unreachable" ICMP message. JANOS does not provide the ICMP response for this security reason but it does by default handle PING requests.

We recommend that PING be disabled on any JNIOR connected to the Internet. This works in combination with Greylisting to mask the presence of your automation from the bad actors. Both are valid means of defense against unwanted cyber activity.

Blacklisting **Security**

BLACKLISTING

Even with the use of all of the techniques listed so far (strong passwords, limited connectivity, greylisting, etc.) malicious activity can disrupt your JNIOR. This then falls under the category of Denial of Service (DoS). A remote bad actor repeatedly making connection with the JNIOR and trying to guess at usernames and password consumes processing resources. While the JNIOR is a very capable device those resources are still limited. If connectivity is tied up in these situations your legitimate connection request may not be successful preventing you from using your automation. Cryptography is computationally expensive and that means that while JANOS is busy calculating encryption other tasks have to wait. The system slows. While this is acceptable when you need a secure connection, it is another matter when bad actors repeatedly waste processing cycles and impact performance.

One solution is to limit access to the JNIOR using the IpConfig/Allow Registry entry. This can be used to restrict access to the JNIOR to only your IP address or range of IP addresses preventing others from seeing the product. If the JNIOR application is to more generally provide a service and others should have access to it, then this approach is too limiting.

The alternative is *Blacklisting*. A text file may be created containing a list of IP addresses (one per line) to be blocked. The Blacklist is enabled by defining the file in the setting of the IpConfig/Blacklist Registry key. When a valid file specification appears in this key JANOS ingests the file and filters all incoming packets. Any packet from the blacklisted IP address is outright ignored. These packets are considered then to be Network Noise and can be filtered from the NETSTAT sniffer output.

The blacklist file may be edited at any time. The change will be detected and take effect within seconds. The list may contain a couple of thousand IP addresses before network performance is impacted. Blacklists can be obtained from various sources that contain 10s of thousands of IP addresses known to be generating malicious communications. These lists contain far too many addresses and will impact network performance. A very large list can render the JNIOR network connection unusable requiring some undoing from the command line through the serial COM port.

Note that the NETSTAT -Bn command is available to export your blacklist sorted by IP address, block count or last time blocked (depending on 'n'). Those statistics are exported with the list. And since the blacklist only takes one IP address per line the exported output could be edited and established directly as a new list. Any text other than the IP address at the beginning of the line is ignored as comment.

Procedure

The procedure would be to watch the network activity of the JNIOR using the NETSTAT -SDN command. This is best done after enabling Greylisting where the -N option will hide the noise. If you notice a specific IP address making repeated unnecessary connections you can add its IP address to the blacklist. The built-in EDIT editor is a useful tool for this.

You can also periodically review the **access.log** file for IP addresses responsible for failed login attempts using obvious lists of user credentials. Those IP addresses can be added to the blacklist. This log also lists SSH DoS attempts. Those IP addresses are good candidates for the blacklist as well.

Similarly you can review the **web.log** for HTTP requests snooping the JNIOR for files that are obviously targets on computers. Often corrupt forms of URL are tried in an attempt to access restricted parts of some computer. Those IP addresses are worth blocking.

If the JNIOR has been running for some time you can export the blacklist sorted by timestamp. Typically a number of addresses at the bottom of this list have not returned in some time and may be safely removed to prune the list. The following command pipes the list to the editor where it can be shortened and saved to the current blacklist file.

```
    netstat -b3 | edit
```

Finally, this blocking of malicious activity can be automated. We have experimented with a **Blacklister.jar** application that watches for new entries in log files, analyzes them for malicious triggers and appends the IP addresses to a blacklist. If you are interested you can contact INTEG Support for more information.

SUMMARY

JNIOR can be made relatively unaffected by ongoing malicious network activity. We have proven the ability to resist all unsolicited contact to the point that if it is left alone the JNIOR remains silent without issuing a packet in response to background public traffic for hours on end. All of that while remaining reachable by legitimate means from anywhere on the globe.

In fact in remaining silent for hours we had uncovered an issue with Internet Service Providers upstream equipment in default configurations for residential service used still to support business customers. The typical Digital Subscriber Line Access Multiplexer (DSLAM) is configured with a 60 minute timeout after which it assumes that the customer connection is not longer active. It ceases to route packets to our configured fixed external IP address. To prevent this the JNIOR resolves the gateway MAC address ever half hour even though it has been cached. This query is sufficient to keep the DSLAM aware of our presence and on task.

With the procedures detailed in this section the JNIOR can be used with confidence while directly connected to the hostile world of the Internet. And while an external IP address is infrequently acquired for a device such as the JNIOR on its own, external traffic is often allowed to reach the product through routers, proxies and firewalls. INTEG will continue to work to secure the JNIOR but to achieve reliable safe undisturbed operation you need to do your part as well.

DESCRIPTION

Once you have successfully logged into the Command Console you will be prompted at the *command line* for a command. A *command* consists of a command name followed by any number of parameters and options each separated by a space. Commands may be entered in either upper or lower case. The specific syntax varies from command to command and the HELP command can be, well, helpful.

Under JANOS, options are prefixed by the dash '-' character and are each specified by a single character. For example the command LS -L uses the 'L' option to provide a long (verbose) format when listing files (the purpose of the LS command). There are only a couple of exceptions to the single character option rule. The -? option solicits a brief explanation of the syntax, options and aliases for most commands. The HELP System offers much more detail.

Options may be grouped after the dash prefix or each provided separately with their own dash prefix. Generally options may appear in any order and even before or after parameters such as file names. If an option is defining an optional parameter that parameter MUST follow the option group specifying the option. You can experiment to get a feel for the flexibility here.

While you are at the mercy of the terminal client used to access the command console you can fully edit the line as you enter it. The backspace and delete keys are available. As these two keys function slightly differently between Windows and Linux based systems JANOS will attempt to figure out the proper usage for you.

You can use RIGHT and LEFT cursor movement to move throughout the line and either insert or overwrite characters. The Insert key (Ins) will toggle between insert and over-strike modes. The End key will reposition you after the last character in the line. Similarly the HOME key will move you to the beginning of the line. The escape key (Esc) can be used to erase any previous content on the line should you wish to start over.

Commands are executed using the ENTER key. Note that you do not need to be at the end of a line to execute it.

COMMAND HISTORY

As commands are entered they are recorded in the command history. This history is specific to the user account and remains persistent from one command session to another. Up to 200 commands are recorded. You view and search this list using the HIST command.

You may scroll through the recent command history using the UP and DOWN cursor movement. In this fashion you may locate a previous command and, if necessary, edit it before re-executing it.

The TAB feature can assist with locating a previously entered command. You can start typing a command then use TAB to scroll through previous line entries sharing the initial characters that you have entered. You may edit and execute any appropriate line. Note that the TAB auto-fill feature changes mode once you have typed beyond the command name.

FOREIGN CHARACTER SUPPORT (UTF-8)

The JNIOR supports foreign character sets through Unicode and UTF-8 encoding. UTF-8 is a variable-length character encoding standard that permits characters to be represented by integers in a range large enough to support Unicode. As such a single character may be encoded in as many as 4 bytes.

We continue to enhance your ability to specify Unicode not only from the command line but also within application programs and scripting.

JANOS uniquely offers the CTRL-U Unicode accent toggle during command and text entry. This simply allows you to enter a *base character* such as the letter 'e' and then to use Ctrl-U repeatedly afterwards to cycle through the known forms of accenting the may be applied to that base character. With this shortcut you may quickly utilize accenting as would be appropriate for your locale.

Beginning with JANOS v2.5 the system should be fully compatible with the presence of UTF-8 characters in all file and folder names.

SEE ALSO

HELP Topics: HIST, HELP, HISTORY

AUTO-COMPLETION **User Commands**

DESCRIPTION

The TAB keystroke on the Command Line has a particular utility. The function is context-sensitive depending on the position in the command and on the command itself.

File Completion

When entering a command that may require a FILESPEC you may start typing the file specification and hit the TAB key. The file specification will be auto-completed with an existing matching file or folder. You may repeat the TAB keystroke and the system will toggle through all matching names. This allows you to locate a file or folder with minimal typing.

Note that repeated TAB usage cycles through the found matches returning to your starting point. The same list is repeated if you continue. So if you accidentally pass your desired match you and work your way back around to it.

Registry Completion

When entering a REGISTRY or HELP command (including aliases) the auto-complete set is enhanced to include existing and system Registry keys. This can reduce the amount of typing but also help remind you of the proper key to use.

With the REGISTRY command if you use TAB immediately after the equals '=' sign the line will be pre-filled with the current value of the Registry entry if any. An existing Registry Key can be quickly accessed and brought up for editing using the TAB feature.

Command Completion

When using the TAB key at the beginning of the command line in starting to type a command it will toggle through all of the valid matching commands. This is further augmented by any matching commands from the existing command history. This can be very helpful in quickly recalling a recent command entry.

NOTES

When in doubt hit TAB. This is THE Series 4 JNIOR feature that makes the Series 3 JNIOR even more painful to use.

SEE ALSO

HELP Topics: REG, PROMPT

ADVANCED **User Commands**

DESCRIPTION

Beginning with JANOS v2.4 multiple commands may be executed from a single command line. While this may seem like a trivial convenience the ability to 'pipe' the output of one command into another can be very useful. These enhancements are intended to make the JANOS command line consistent with terminal and command line features in other operating systems.

Previously there had only been the ability to save the output of any command into a file. For example the following would format a JSON file and save the result in a text file for later viewing/printing.

```
cat -j manifest.json > manifest.txt
```

With the recent command extensions the CAT command has been expanded to process any number of files in order. In this example you can create a single log file stretching back to include even the backup log content.

```
cat jniorsys.log.bak jniorsys.log > syslog.log
```

And with earlier versions of JANOS the only other command suffix of note was the ampersand '&' which instructs that the command be executed in the background. This would start the command in another command process and return you immediately to the command prompt.

With JANOS v2.5 we introduce wildcards in the CAT command. The example above that combines the backup BAK and current LOG files can be abbreviated now as follows. Notice here that we pipe the result to the MORE command which opens the editor in read-only mode. You can then scroll, page and search the combined syslog log file content.

```
        cat jniorsys.log* | more
```

Files matching the wildcard specification are concatenated in last modification date order. If that is not appropriate then you will need to specify those files separately in the order required.

MULTIPLE COMMAND EXECUTION

The semicolon ';' character can be used to separate two or more individual commands entered on the same command line. The utility in this varies but often we do execute a couple of commands in sequence and it might be simpler for us to enter them now and not have to wait for the first command to complete before getting to type the next. This also adds the combined commands to our command history letting us repeat the combination easily.

JANOS now supports conditional command execution using the '&&' (logical AND) and '||' (logical OR) syntaxes. These are used to separate individual commands as you would with the semicolon ';'.

The *conditional* aspect comes from the implied logical function. For an AND operation to be TRUE both operands must be TRUE. In the command line context a successful command is considered to be TRUE while a failed command is FALSE. So with two commands coupled with the '&&' separator if the first command fails (FALSE) the whole line is then going to be FALSE and there is NO NEED to execute the second command. JANOS won't bother.

Similarly using the OR operation. With two commands coupled with the '||' separator if the first command is successful (TRUE) there is NO NEED to execute the second. No matter what happens with the second command the command line will be TRUE. So JANOS will not execute the second command.

Again, the utility of these features is greatly dependent on your creativity. There are situations where this can be very useful. They have been implemented for the most part to support compatibility with other terminal and command line implementations in an effort to support users/programmers who have grown accustomed to such things.

PIPING

The vertical bar '|' character is used to indicate the desire to 'pipe' the output of one command into another. Many of the commands that process the content of a file now detect and can use as a source the data being passed from a previous command. The usefulness in this depends greatly on what you need at the time.

For example you might want to know how many lines there are in the logs. Here we will use the GREP command whose -C option reports the number of matched lines. On the command line we execute the following command:

```
        bruce_dev /> cat jniorboot.log.bak jniorboot.log | grep -c
         1285 lines matched
```

Here the CAT command combines the full extent of boot logs and we then asks the GREP command to count the lines. To find out how many individual reboots are contained in the logs we merely take advantage of the GREP search string.

```
        bruce_dev /> cat jniorboot.log* | grep -c POR
         37 lines matched
```

> TIP
>
> The CAT command extension that allows use of the wildcard specification, combines all matching files in order of modification date from oldest to latest. In this case combining LOG files exactly as in the previous example.

We have the logs from the past 37 boot events. Here is another example command designed to list the last 2 times the clock has been synchronized.

```
        cat jniorsys.log* | grep NTP | tail 2
```

This is an advanced command which harvests the IP addresses of pool.ntp.org NTP servers reported in the jniorsys.log file pinging each to get a feeling for their response times.

```
egrep sync.+(\\d+\\.\\d+\\.\\d+\\.\\d+) jniorsys.log -f "@ping -qc 1 $1" | exec
```

This uses EGREP to locate the IP address and format a PING command for each. The PING command is to issue one and only one PING for the IP address. The piped output then appears like a batch file containing a list of PING commands and EXEC goes ahead and executes the batch. Here are some results from this:

```
        Reply from 207.244.103.95 (22ms)
        Reply from 162.159.200.123 (21ms)
        Reply from 44.190.5.123 (71ms)
        Reply from 65.19.142.137 (73ms)
        Reply from 142.202.190.19 (68ms)
        Reply from 66.151.147.38 (78ms)
```

It is important to note that we are not passing data from one command to be used as keyboard input to the next. JANOS does not support the ability to source keyboard input from a file. For example using '< file' after a command.

SEE ALSO

HELP Topics: CAT, GREP, TAIL, EGREP, PING, EXEC, REGEX

DESCRIPTION

The Command Line prompt contains both the Hostname assigned to the JNIOR and the current working directory. Depending on the selection of hostname and use of CD to change the working directory the prompt can become quite lengthy and crowd the command line.

The **Del** Delete Key when used at the beginning of a blank command line toggles the inclusion of the hostname in the prompt. This may help to shorten the prompt.

SEE ALSO

HELP Topics: HOSTNAME, CHDIR, TAB

CHDIR/CD **User Commands**

NAME

chdir - Change Working Directory

SYNOPSIS

```
chdir DIRECTORY
```

ALIASES

CHDIR, CD

DESCRIPTION

Use this command to change the current working directory. Initially the working directory is the File System root. The current directory (or folder) is displayed in the prompt.

SEE ALSO

HELP Topics: MKDIR, MD

HISTORY/HIST **User Commands**

NAME

history - Command Line History Utility

ALIASES

HISTORY, HIST

SYNOPSIS

```
hist [INDEX]
hist [SEARCH]
```

DESCRIPTION

The Command Console maintains the history of entered commands. This is generally accessed using the UP and DOWN cursor arrows. A previous command may be recalled, optionally edited, and potentially reissued.

The command history has been greatly enhanced as many more commands are retained and now are carried from console session to console session. These histories are unique to the user for obvious security reasons.

In the absence of INDEX or SEARCH parameters the HISTORY command displays an enumerated list of past entries. Beginning with JANOS v2.4 there are up to 200 previous command line entries recorded. Their listing is now presented from oldest to latest making the new -P option useful in reviewing only the most recent usage.

INDEX

The numeric INDEX from the history list can be entered to recall the related entry to the command line for optional editing and reissue.

SEARCH

A SEARCH string may be used to display prior entries containing a match. These will be enumerated but if there is only one matching entry it will be brought to the command line for immediate use. The SEARCH string may contain Regular Expression (REGEX) syntax.

-P

Displays the last page of the history list (approximately 23 lines).

NOTES

The HISTORY listing may be piped to a subsequent command such as GREP for more sophisticated searches. Or, piped to TAIL for better control of the list to be presented. You may pipe the output to MORE and explore the data in the screen editor.

The command line TAB auto-complete has been further enhanced to include lines from the command history. When TAB is used near the beginning of the command line, lines from the history starting with any characters typed to that point are offered. You may recall a previous CAT command, for example, by merely pressing 'c' followed by TAB.

SEE ALSO

HELP Topics: REGEX, PROMPT

BYE/EXIT/QUIT User Commands

NAME

exit - closes the console session.

ALIASES

BYE, EXIT, QUIT

DESCRIPTION

A Console Session is a separate process running on the JNIOR. A session can be terminated by closing a connection to the JNIOR. This command can be used to explicitly close the session.

DATE User Commands

NAME

date - displays and adjusts the system time and date.

SYNOPSIS

```
date [OPTIONS] [NEWDATE] [TIMEZONE]
date -n [NTP_SERVER]
```

DESCRIPTION

The DATE command without parameters simply displays the current time, date and timezone.

-T

Displays the current set of available timezones.

-G

Displays the current time in UTC.

-N [NTP_SERVER]

Requests the current time from the NTP server and updates the clock if a response is received. If NTP_SERVER is specified it is used in the request and sets the NTP server to be used in all subsequent requests.

-S

Disables the use of Daylight Saving Time (DST).

-D

Enables the use of DST.

-M

Includes milliseconds in the displayed time.

-H

The system maintains a hardware clock when power is removed. This is queried during boot. This option reports the time according to the hardware. It also reports any difference between this time and the running (software based) system clock.

-V

Verbose output. When the time and date are displayed this goes into great detail. It describes any active DST rule and the DST status.

NEWDATE

This manually set the new time and date. The format is as follows:

```
MMDDYYYYHHMMSS
MM   - 2 digit month (01-12)
DD   - 2 digit day (01-31)
YYYY - 4 digit year (2021)
HH   - 2 digit hour (00-23)
MM   - 2 digit minute (00-59)
SS   - 2 digit second (00-59)
```

The entire string is not required. The unspecified portion is assumed to be 00. You can optionally append "am" or "pm" however time can best be set in 24-hour format.

TIMEZONE

Sets the timezone if specified. This is either the standard or DST abbreviation for the timezone.

NOTES

The system clock is updated from an available NTP server upon boot and approximately every 4 hours thereafter assuming that the JNIOR has access to the Internet.

A local NTP server may be also defined using the IpConfig/NTPServer Registry key. The update period may be controlled through the IpConfig/NTPUpdate Registry entry. Beginning with JANOS v2.4 the latter key does not require a reboot.

Also beginning with JANOS v2.4 both the hardware and software clocks handled by the operating system are auto-calibrated with each NTP update. This will improve the clock accuracy between updates. If the JNIOR is to operate in in an off-line situation you might allow the unit to run for a couple of days with Internet connection so as to achieve a reasonable calibration before being isolated.

IPCONFIG User Commands

NAME

ipconfig - IP Network Utility

SYNOPSIS

```
ipconfig [OPTIONS]
```

DESCRIPTION

This command is used to configure network settings. If issued without options the current settings are displayed.

The product is shipped with Dynamic Host Configuration Protocol (DHCP) enabled which will allow the JNIOR to properly configure itself for most networks. In most applications the JNIOR should be assigned a fixed IP address.

-A IPADDR

```
Assign the IP Address IPADDR. The accepted formats are:
    NNN.NNN.NNN.NNN     Defining IP address only.
    NNN.NNN.NNN.NNN/BB  Defining IP address and BB netmask.
    where:
        NNN is 0-255
        BB  is typically 24 (number of 1's in netmask)
```

-M NETMASK

Assigns the subnet mask NETMASK. Often 255.255.255.0 is used. This mask (as with IP addresses) specifies 4 bytes. In this example their values are 0xFF, 0xFF, 0xFF and 0x00 as 0xFF hex is 255 decimal. In a 32-bit system like the JNIOR this is recorded as a word 0xFFFFFF00 with the bytes assembled in order. Each byte is 8 bits which are either 0 or 1. The byte 0xFF in binary is 11111111 where 0x00 is just 00000000. Note there are 24 1's left-justified in the submask word and therefore we might use the /24 to specify the IPADDR and the NETMASK simultaneously as described above.

-G IPADDR
Define the Gateway IP Address. This is required to reach external servers as may be needed for DNS name resolution, Network Time Protocol (NTP) for clock updates, and sending email notifications.

-P IPADDR
Define Primary DNS IP Address.

-S IPADDR
Define Secondary DNS IP Address.

-D
Enable DHCP configuration (default).

-R
Release DHCP leased IP address and disable DHCP.

-T MILLIS
Set DNS timeout to MILLIS milliseconds (default 5000).

-H HOST
Sets the mailhost. HOST can reference a Domain or Ip Address.

-F EMAIL
Defines the Sender's (FROM) email address. This will be validated by the Mail Server and must be the user's valid registered email address.

-U USERNAME
Defines the username for the email account used for sending email. Note that in setting the username a password will be automatically requested, encrypted and stored securely.

-X
Remove/Delete user credentials entered with the -U option. Necessary to insure that both the Username and the securely stored password are cleared from the unit.

-L SYSLOG
Defines a SYSLOG server for external logging. SYSLOG may reference a Domain or IP address.

-N DOMAIN
Defines the local Domain. By default this is jnior.local and it is generally arbitrary.

NOTES

The NTP time server address is set by the DATE command. The default is pool.ntp.org.

The ARP -S command performs a local IP scan and can be used to verify availability of IP addresses.

The PING -V command can be used to verify communications with the configured gateways and servers.

SEE ALSO

HELP Topics: ARP, DATE, NSLOOKUP, SENDMAIL, LOGGER, PING

HOSTNAME **User Commands**

NAME

hostname - Sets system hostname.

SYNOPSIS

```
hostname NEWNAME
```

DESCRIPTION

By default the system Hostname is the unit's Serial Number with a "JR" prefix. The Hostname is displayed as part of the command line prompt. The HOSTNAME command sets a new Hostname to NEWNAME.

Hostnames should be short and descriptive. The Hostname can be used in a URL to reference a unit whose IP address might not be known. In this case only characters compatible with a fully qualified domain name (FQDN) should be used. The Hostname is included in the unit's TLS Certificate to assist in establishing secure connections.

The Hostname is also used in NetBIOS Name Resolution. In this case the name should be no more than 15 characters and avoid punctuation. This limitation may be required before the Hostname will work in a URL.

SEE ALSO

HELP Topics: IpConfig/HostName

NAME

reg - Configuration Utility

ALIASES

REGISTRY, REG

SYNOPSIS

```
reg [KEY] [= VALUE]
reg [KEY]
reg [OPTIONS] [SEARCH]
reg [OPTIONS]
```

DESCRIPTION

Configuration settings are maintained using a database of Name-Value pairs. This is referred to as the Registry. Registry Keys can be created for just about any purpose. There is a set of built-in Registry Keys that have specific roles in the configuration of the JNIOR.

Querying a Registry Key or Keys
reg KEY

The command REG KEY displays the current VALUE of the key if any has been assigned. The KEY parameter may use the '*' and '?' wildcards. Therefore the command REG * dumps all assigned Registry Keys.

Setting a Registry Key
reg KEY = VALUE

The REG KEY = VALUE command sets the Registry Key to the VALUE. Registry entries contain string values even when numeric settings are required. If VALUE contains a space it must be enclosed in double-quotes. When entering a KEY striking the TAB key immediately after the equals '=' will pre-fill the line with the existing VALUE. This may be useful when an entry simply needs to be edited.

Deleting a Registry KEY
reg KEY =

Assigning a blank VALUE to a Registry Key removes it from the system. The operating system or an application may then choose to use a default VALUE for the setting.

Options

-D KEY

The KEY parameter may specify a single KEY or use wildcard characters such as '*' and '?' to select a group of keys. Each deletion must be confirmed.

-A

This option overrides the deletion confirmation. This is the same as confirming a deletion with [A]ll and all operations will complete without prompting.

-E

The SEARCH parameter contains Regular Expression (REGEX) syntax.

-M

Displays the last modification timestamp for each Key. This is in the form [YYMMDDHHMM] and can be useful in determining when a setting may have been made.

-X

When listing Keys using a wildcard this option will include unassigned known system keys also matching the SEARCH. The command REG -X * not only displays all assigned keys but also those system keys that are defaulted.

-B

Displays keys formatted as another command. This output may be redirected to a BAT batch file and later executed to restore settings.

-F FILE

Exports keys matching SEARCH to the specified file in INI format. If SEARCH is omitted the entire Registry is exported with the exception of the IpConfig section. This allows the file to be moved to another JNIOR and when ingested not damage that unit's network configuration.

-I FILE

Import (or ingest) the FILE. This file must be in INI format. If the FILE is a JAR file then any included AppInfo.INI file is ingested. This is the same as Registering the application. Note that this creates the keys defined in FILE but does not remove those that are not.

-U FILE

Uninstall the FILE. This file must be in INI format. All keys referenced in the INI file are removed (deleted) from the Registry. If a JAR file is specified then the keys referenced by the included AppInfo.INI file are removed. This is equivalent to de-registering the application. Use the option VERY carefully.

-S

Generate Registry Snapshot. The saves the entire Registry to a file located in the /flash/registry folder. The file name is in the format jnior_YYYYMMDDHHMM.ini and this contains all entries including the IpConfig section. This creates a backup save point for the Registry.

NOTES

Registry Keys are not case-sensitive although when they are defined character case is retained to improve readability.

The TAB key has a specific utility on the Command Line. It is of particular use in working with the Registry.

The /flash/jnior.ini file should not be edited or overwritten. This is a backup for the Registry and is not referenced unless the Registry has been damaged. Use -I to import Registry content and -F to export content for updating other JNIORs.

Registry changes are logged to the jniorsys.log file.

SEE ALSO

HELP Topics: TAB, BATCH, INI

FILES User Commands

The JANOS File System was modeled after Linux in order to maintain some familiarity for some users. Also the Linux file permissions are handled more logically than in other operating systems.

OWNERSHIP

Each file or directory has an Owner. This is the user account that created the file or directory or 'root' if the system did so. The USERS command lists the current users. The CHOWN command can alter the assigned ownership as well as the Group.

GROUPS

A file or directory may be assigned to a Group. A Group is a subset of the user accounts that can be given specific access permissions for the file or directory. The GROUPS command lists he current Groups. The CHGRP command can alter the Group assignment. The 'root' Group includes all users and is the default.

PERMISSIONS

File and directory permissions are displayed as a 10-character string in the format:

```
drwxrwxrwx
```

'd'   Is present for directories.
'r'   Indicates that 'read' permission is granted.
'w'   Indicates that 'write' permission is granted.
'x'   Is set for executable files.
'-'   Is displayed otherwise.

After the first character that describes the entry type there are 3 'rwx' sets corresponding to permissions respectively for the Owner, Group and then everyone else. The CHMOD command is used to alter file and folder permissions.

NOTES

An Administrator has access to all files and directories regardless of the defined permissions. Permission settings are then generally not required unless the product is to be accessed by other types of users.

SEE ALSO

HELP Topics: LS, USERS, GROUPS, CHOWN, CHGRP, CHMOD

DIR/LS/FIND User Commands

NAME

dir - File Directory List Utility

ALIASES

DIR, LS, FIND

SYNOPSIS

dir [OPTIONS] [FILESPEC]

DESCRIPTION

Lists files stored in the File System. FILESPEC may define a specific file or contain '*' and '?' wildcards.

-L, -V

Long or Verbose mode lists file details such as permissions, size and last modification date.

-A

Lists ALL files including Hidden files. Hidden files and folders have names beginning with a period '.' .

-F

Lists only Files. Folders or Directorys are not listed. This is the default for the FIND alias.

-D

Lists only Directories or Folders. Files are not listed.

-S, -R

Recurses sub-directories or sub-folders listing content in each. This is the default for the FIND alias.

-W

Lists files in columnar format. Not valid with verbose listings.

-X

Includes the '.' file entry (current folder) when used with a recursive (-S or -R) verbose (-V) listing.

FORMAT

The long format (option -L) is interpreted by other systems and protocols such as File Transfer Protocol (FTP). It is therefore somewhat cryptic and may look foreign to some. A header is not provided as it might be misinterpreted in processing. The output appears as follows:

```
-rw-r--r--   1 root      root         387 May 27 08:45 jniorsys.log
```

-rw-r--r--

The initial column displays the Permissions for the file or directory. It comprises of 10 characters in the format 'drwxrwxrwx'.

1

The digit '1' is always listed. JANOS does not support multiple hard-links.

root

Next the file Owner is listed using the account username or 'root' if the file or directory was created by the system. The USERS command lists the current users.

root

The Group to which the file has been assigned. The GROUPS command lists the currently defined Groups. The 'root' group includes all users and is always available.

387

The file size in bytes. If the listing is a directory (first char in the permissions is a 'd') then this is the count of entries in the folder.

May 27 08:45

The date of the last file or directory modification. The format may change to include the year when the entry is sufficiently old.

jniorsys.log

Finally the file or directory name is listed.

NOTES

The FIND alias aids in locating files throughout the file system. The resulting search is performed recursively from the root or the path provided. The results are limited to files. Wildcards are automatically inserted before and after the filename to create a lazy match on similar files.

SEE ALSO

HELP Topics: PERMISSIONS, USERS, GROUPS

RM/DEL User Commands

NAME

rm - Remove File(s)

ALIASES

RM, DEL

SYNOPSIS

```
rm [-A] FILESPEC [FILESPEC]...
del [-A] FILESPEC [FILESPEC]...
```

DESCRIPTION

Deletes the specified file or files. The parameter FILE may contain the '*' and '?' wildcard characters.

If wildcards are used the command will prompt to confirm matching files for deletion. The user may reply 'Y' or 'N' to this prompt. A response of 'A' will apply the 'Y' reply to this and remaining prompts.

-A
    Overrides confirmation prompts performing the requested deletions.

COPY/CP **User Commands**

NAME

copy - Copies files

ALIASES

COPY, CP

SYNOPSIS

```
copy SOURCE DESTINATION
```

DESCRIPTION

Copies one or more files specified by SOURCE to DESTINATION.

SOURCE may specify files using the wildcards '*' and '?'.

If SOURCE specifies a single file then DESTINATION can define both a new location and name for the file.

If SOURCE specifies one or more files and DESTINATION is a folder then the files are copied into the destination folder.

If SOURCE specifies a folder then all file content is copied to the specified DESTINATION folder. The . wildcard is assumed.

-O
    Overwrite all. If the destination file already exists it will be overwritten without confirmation.

-S, -R
    Includes subfolders in wildcard copies. Note that the folder structure is maintained and destination folders will be created if needed.

SEE ALSO

HELP Topics: MOVE

MOVE/MV User Commands

NAME

move - Move files.

ALIASES

MOVE, MV

SYNOPSIS

```
move SOURCE DESTINATION
```

DESCRIPTION

Moves one or more files specified by SOURCE to DESTINATION. Once a successful copy is completed the SOURCE file(s) are removed. The files are moved to a new location.

SOURCE may specify files using the wildcards '*' and '?'.

If SOURCE specifies a single file then DESTINATION can define both a new location and name for the file.

If SOURCE specifies one or more files and DESTINATION is a folder then the files are moved into the destination folder.

If SOURCE specifies a folder then all file content is moved to the specified DESTINATION folder. The . wildcard is assumed.

-O

Overwrite all. If the destination file already exists it will be overwritten without confirmation.

-S, -R

Includes subfolders in wildcard actions. Note that the folder structure is maintained and destination folders will be created if needed. The existing folders from which files are moved are not removed. These will remain even if empty. These can be removed then using the RMDIR command.

SEE ALSO

HELP Topics: COPY, RENAME, RMDIR

RENAME/REN User Commands

NAME

rename - Rename file

ALIASES

RENAME, REN

SYNOPSIS

```
ren FILE NEWNAME
```

DESCRIPTION

This command renames the source FILE to NEWNAME. The FILE must exist and the NEWFILE cannot already be present. This command cannot be used to move a file. The MOVE command however can rename a file in the process of moving it.

SEE ALSO

HELP Topics: MOVE

MKDIR/MD **User Commands**

NAME

mkdir - Create Folder/Directory

ALIASES

MKDIR, MD

SYNOPSIS

```
md FOLDER
```

DESCRIPTION

Creates the specified FOLDER.

SEE ALSO

HELP Topics: RMDIR, LS, DIR

RMDIR/RD User Commands

NAME

rmdir - Remove Folder/Directory

ALIASES

RMDIR, RD

SYNOPSIS

rd [OPTION] FOLDER

DESCRIPTION

Removes the specified FOLDER. The folder/directory must be empty. The -S option can be used to remove a folder along with any existing content.

-S

Recursion removes the folder/directory along with any files and sub-folders it may contain.

SEE ALSO

HELP Topics: MKDIR, LS, DIR

ARC/JAR/ZIP User Commands

NAME

arc - manages content within a compressed library file.

ALIASES

ARC, JAR, ZIP

SYNOPSIS

arc [OPTIONS] archive [FILES]

DESCRIPTION

ARC is a compression and file packaging utility. Files are stored in single library usually with the .ZIP or .JAR extension. This is used to compress files reducing storage space and to package multiple files in one library that can be managed as a single entity.

-E

Extract - Extracts uncompressed FILES to their relative path locations. To override the destination path use the -P option.

-A

Add - Compresses and adds FILES to an archive preserving their relative paths. To override the stored paths use the -P option.

-U

Update - Compresses and updates FILES in the archive when the new files have been more recently modified.

-F

Freshen - Scans the archive comparing the last modification dates with any matching external files. If an external file has been modified more recently it will replace the copy in the archive.

-M

Move - Same as -A adding FILES to the archive. Once the archive has been successfully modified the added external files are removed. The FILES are moved into the archive.

-D

Delete - Remove FILES from the archive.

-L

List - Display archive content. Use the -V verbose option for greater detail.

-S

Recurses folders when wildcard file specifications are used.

-P pathspec

Overrides the destination path associated with a file. When extracting this is affects the destination of the file(s). When adding this defines the relative path stored for the file(s).

-V

Verbose output. Increases detail.

-O

Overwirte when extracting. If an external copy of the file would be overwritten the action is confirmed. The -O option bypasses the confirmation and overwrites as requested.

-T

Test the archive. This decompresses archive content and confirms that each file can be successfully extracted. This uses stored CRC information.

NOTES

JAR and ZIP archives are equivalently formatted archive files. The JAR file is so named as it generally contains an application program for the JNIOR written in Java.

In some cases a ZIP/JAR library forms a *virtual folder* with the name of the library (without the extension) located at that point in the file system. That allows the JANOS Java Virtual Machine, Webserver and Help system to access files directly out of archives. Programs and websites each require multiple files in order to function properly and an archive file allows those to be transferred and managed easily as a group.

With JANOS 2.4 the CAT command can retrieve and display text content directly from a virtual folder formed by an archive file. This can give you easy access to the extended log files backed up by the optional JBakup utility.

SEE ALSO

HELP Topics: JVM, WEBSERVER, CAT, JBAKUP

NAME

chmod - Modify Permissions

SYNOPSIS

```
chmod [OPTIONS] MODE FILESPEC
```

DESCRIPTION

This command alters the permissions for FILESPEC. Wildcards may be used to alter a set of files or directories. There are two optional syntax for MODE that define how permissions are altered. This is similar to the Linux usage.

Numeric Syntax

The numeric representation contains 3 digits each specifying the permissions for the owner, group and others in that order. Each is a bitwise mapping of 'rwx' where: r is 4 (bit 2), w is 2 (bit 1) and x is 1 (bit 0). For example:

```
    ---  0      r--  4      r-x  5      rw-  6      rwx  7
```

And therefore:

```
    777     -rwxrwxrwx
    644     -rw-r--r--
```

Symbolic Syntax

```
[ugoa][-+=][rwx][, ...]
```

The symbolic approach can be used to conditionally alter permissions. Here MODE is a command separated list of actions defined with a mnemonic. Where:

```
    u   User or Owner
    g   Group
    o   Others
    a   All (Owner, Group and Others)

    -   Remove permissions
    +   Add permissions
    =   Set permissions

    r   Read permission
    w   Write permission
    x   Execute permission
```

EXAMPLES

To set test.bat permissions to -rwxr-xr-x use either syntax:

```
chmod 755 test.bat
chmod u=rwx,go=rx test.bat
chmod a=rx,u+w test.bat
```

To add execute permissions on test.bat for all users. This does not alter any previously defined read or write permissions.

```
chmod a+x test.bat
```

OPTIONS

-S
: When wildcards are used this applies the change recursively through sub-directories.

-D
: Alter permissions on a directory. This option is required when changing permissions on one or more directories. This is necessary to signal the intent in wildcard and recursive actions.

-V
: Provides additional detail when changes occur.

SEE ALSO

HELP Topics: PERMISSIONS, LS

CHOWN User Commands

NAME

chown - Change Ownership

SYNOPSIS

```
chown [OPTIONS] USERNAME FILESPEC
chown [OPTIONS] USERNAME:GROUP FILESPEC
```

DESCRIPTION

This command alters the Ownership of FILESPEC. Wildcards may be used to alter a set of files or directories. This sets the new owner to USERNAME.

If GROUP is supplied the command will change both the Ownership and the Group assignment.

-S
: When wildcards are used this applies the change recursively through sub-directories.

-D
: Alter Ownership of a directory. This option is required when changing the ownership on one or more directories. This is necessary to signal the intent in wildcard and recursive actions.

-V
: Provides additional detail when changes occur.

SEE ALSO

HELP Topics: USERS, GROUPS, CHGRP, FILES

NAME

cat - displays file content.

ALIASES

CAT, TYPE, HEAD, TAIL

SYNOPSIS

```
cat [OPTIONS]... FILESPEC [FILESPEC]...
type [OPTIONS]... FILESPEC [FILESPEC]...
head NUM [OPTIONS]... FILESPEC [FILESPEC]...
tail NUM [OPTIONS]... FILESPEC [FILESPEC]...
```

DESCRIPTION

Displays the content of FILESPEC to the standard output.

-D

The file content is dumped in standard hex debug format.

-H NUM

Displays at most NUM lines from the Head of the output.

-T NUM

Displays the last NUM lines or Tail of the output. Note that Tail is applied before Head and therefore the two may be used to display a range of lines within the output stream.

-R

Reverse the order of displayed lines. The Tail becomes the Head.

-J

Attempts to display a JSON file in a more readable form.

-P

Displays the last page (23 lines) of the file.

-M

Monitors file content for new data. You may display a LOG file for instance using the -M option. The last several lines of the file will be displayed and the command will display new lines as they are appended to the file. Any keystroke will break you out of this mode. This may be used to watch for an event to occur. You may monitor the jniorsys.log file and wait for the associated log entry to appear.

Commands and options are not case-sensitive. Options may appear anywhere on the command line and in any order. Options may be combined following the dash '-' or separately specified.

EXAMPLES

```
cat jniorsys.log -p
```

Displays the most recent page of SYSLOG entries.

```
type -j manifest.json
```

Formats and displays the MANIFEST command reference point database.

```
    cat jniorsys.log.bak jniorsys.log -t 10
        Displays the last 10 lines of the system log even if the log has
        recently aged to the BAK file.
```

NOTES

This command will accept piped data if any from a prior command and append to that each specified file. A file specification is not required if piped data is available.

New with JANOS v2.4 the file specification may contain wildcards. The matching files are concatenated from oldest to latest modification date. For instance the third example above, combining the LOG files, could be executed as follows:

```
    cat jniorsys.log* -t 10
```

The PS and NETSTAT commands providing system status have also been extended to include a -M real time monitoring feature. Like the -M option of the CAT command those commands will display newly added lines to one or more LOG files as notifications in addition to process or network status. Those files can be optionally defined in activating the command. This feature may be used to visually correlate system activity with logged events.

Also new is the ability allowing the CAT command to utilize virtual folders created by ZIP/JAR library files. This unique feature has been utilized by the JANOS Web Server to serve entire websites with all of the files required from a single compressed library file as if presented in a folder of the same name.

For example if you are using the JBakup application to preserve LOG files for an extended period, the BAK files for logs are combined and stored within a ZIP file in the /flash/baks folder. The following CAT command would access that backup and display the oldest 10 lines of the jniorsys log.

```
    cat /flash/baks/jniorsys.log/jniorsys.log.bak -h 10
```

Here the file /flash/baks/jniorsys.log.zip created by JBakup generates a virtual folder. The CAT command can then look inside that to access the jniorsys.log.bak file it contains. This is a very powerful tool allowing you to search the extended logs by piping to a additional GREP command.

Assuming that JBakup has processed the current BAK file into the archive, which it does on the quarter hour, the following command would list every recorded NTP time synchronization.

```
    cat /flash/baks/jniorsys.log/jniorsys.log.bak jniorsys.log | grep NTP
```

This feature does require that you specify the absolute file path for the virtual folder. Relative paths and wildcards are not allowed.

SEE ALSO

HELP Topics: MANIFEST, JSON, ASCII, JBAKUP, GREP

NAME

grep - File Search Utility

ALIASES

GREP, EGREP

SYNOPSIS

```
grep [OPTIONS] SEARCH FILE
egrep [OPTIONS] REGEX FILE
```

DESCRIPTION

This command searches a text FILE for matches to a specified SEARCH string. Each line containing a match is displayed. GREP searches for an exact match to the string. Case-dependent and case-independent searches are possible. Regular Expressions (REGEX) are used with EGREP or when optionally selected.

-E

Use Regular Expressions (REGEX) for searches. This is the default with the command alias EGREP.

-C

Counts the number of lines with matches. Only the resulting count is reported.

-N

Displays the line number in the FILE for each matching line.

-H

Displays the FILE specification and line number for each matching line.

-I

Performs a case-independent search.

-M

This displays each matching line and subsequently underlines the matched text with a series of dashes '---'. When this option is used with REGEX the captured Groups as may be specified in the Regular Expression using parentheses ( ) are displayed.

-F FORMAT

Output formatting using REGEX results. The FORMAT specifies an output string that is generated for each match. The group specifiers $1, $2, $3, etc. are replaced by the first, second, third, and so on group matches.

NOTES

The output formatting option -F can be used to format a readable string or even a command that might be subsequently executed. For example the following extracts NTP server IP addresses from the syslog and generates PING commands to test NTP server validity (and response time).

```
  egrep sync.+(\d+\.\d+\.\d+\.\d+) jniorsys.log -f "@ping -qc 1 $1" | exec
```

This results in PING command responses like these:

```
    Reply from 129.146.193.200 (66ms)
    Reply from 45.79.111.167 (69ms)
    Reply from 162.159.200.123 (21ms)
    Reply from 208.76.2.12 (79ms)
    No reply from 65.100.46.164
    Reply from 45.33.65.68 (28ms)
```

The REGEX group matches an IP Address from the jniorsys.log file which is included in a series of formatted PING commands. The result is piped to an EXEC command that runs the piped list as if it were a batch file.

Note that beginning with JANOS v2.4 both the Stratum and RTT (response time) are included in the system log when NTP time synchronization occurs.

SEE ALSO

HELP Topics: BATCH, PING, REGEX

NAME

edit - Text Editor

ALIASES

EDIT, ED, MORE

SYNOPSIS

```
edit [-R] FILE
```

DESCRIPTION

The EDIT Editor is a simple text editor relying on VT-100 compatible terminal clients. Advanced features are available for those terminals providing XTERM (X Windows System) emulation. It is compatible with the JNIOR WebUI Console tab.

EDIT opens the specified text file and displays the first page of lines. If XTERM emulation is available the editor will fill the window knowing the screen dimensions. There are several editing functions provided. It is important to know that **Ctrl-Q exits** the editing and at that point the option to save any modifications is offered. You can also optionally save the file with a new name performing the Save-As.

-R

The FILE may be opened in Read-Only mode by specifying the -R option. You may want to do this if do not intend to alter the file and want to be extra certain that you do not. The MORE alias assumes the -R option.

As an alternative to a file, content for editing may also be 'piped' into the command using the pipe character '|'. For instance:

```
cat jniorsys.log* | MORE
```

The MORE alias opens the editor in a read-only mode. In any case you can then view a lengthy command output in the editor where you can scroll, page and even search the text.

Editing Key Reference

Ctrl-Q

Exit the editor. Optionally save, rename or cancel at that point.

Ctrl-S

Allows you to save your work without leaving the editor. A confirmation will appear at the bottom of the screen. Note that you can only save to the original file. If you want to save the file under a new name then you must Ctrl-Q and exit. You may edit the destination file at that point.

F5

Refreshes the screen. This may be useful if you resize your window and need the editor to utilize the new area.

Ctrl-F

Enables the Search/Find mode. The help text at the bottom of the screen is replaced with the Find prompt. Enter the desired search string. Note that REGEX is used and the search is case-independent. Hit ENTER to execute the search.

If a match exists the next occurrence of it will be highlighted in the text and the cursor will be located at the start of the match. The match is highlighted but not selected. The F3 key may be used to move from one match to the next. The search will wrap back around to the beginning of the file. There is status in the bottom boundary line.

Note that with the REGEX search string you may need to escape certain characters special to the syntax with the '\' backward slash. For example to search for a string containing an open parentheses such as "func(" you will need to use "func\(".

F3

Moves to the next match if there is an active search in progress.

Ctrl-Z

Undo.

Ctrl-Y

Redo.

Ctrl-U

Toggles the accent applied to the character to the left of the cursor. To enter an accented character type the *base character* and use Ctrl-U repeatedly if necessary until the desired accent is applied.

Ctrl-A

Drop the Anchor. The cursor keys can then be used to highlight or select text for subsequent editing. This is similar to holding the Shift key when editing on the computer but since VT-100 does not support Shift key status reporting we have to 'drop an anchor' and then drag it by moving the cursor.

With XTERM emulation you may left-click the mouse while holding the Shift key. This moves the cursor to that location and also drops the anchor for selection. You cannot drag the selection with the mouse from that point.

Ctrl-C

Copy the selected text to the clipboard.

Ctrl-X

Copy the selected text to the clipboard and remove it from the file.

Ctrl-K

This cuts the current line in its entirety and places it in the clipboard. The line is removed from the file. Each consecutive Ctrl-K cuts one line from the text and uniquely **appends** the line to the clipboard. Ctrl-K must be used one right after another if a block of lines is to be cut and made available for later pasting as a whole.

Ctrl-V

Paste any text from the clipboard to the current cursor location in the file.

Ins

The Insert key toggles between insert or overstrike on key entry.

PgUp

The Page Up key displays the previous page of text until the beginning of the file is reached.

PgDn

The Page Down key displays the next page of text until the end of the file is reached.

Home

Moves the cursor to the beginning of the current line. If you are at the beginning of a line it moves you to the beginning of the current page. If you are at the beginning of a page the Home key moves you to the beginning of the file.

Ctrl-Home

With XTERM emulation this keystroke moves you immediately to the beginning of the file.

End

Moves the cursor to the end of the current line. If you are at the end of a line it moves you to the end of the last line in the displayed page. If you are at the end of the last line of the page the End key moves you to the end of the file.

Ctrl-End

With XTERM emulation this keystroke moves you immediately to the end of the file.

Alt-UpArrow

Moves to the spot of a previous edit if any. This walks backwards through the Undo list and can be very useful in moving to the areas that you are working on. At the earliest edit it will circle back to the latest. This does not modify the data.

Alt-DownArrow

Moves to the spot of the next edit if any. This walks forward through the Undo list. This is also circular and if you just made an edit this will take you back to the first changes that were made. This does not modify the data.

Ctrl-G

This can be used to move to a specific line number. When used it will request a line number at the bottom of the screen and move there if the line exists. There will be no change if the line number is invalid.

Del

Deletes the character at the cursor or deletes any selected text.

Bksp

Backspace deletes the character before the cursor or any selected text.

Tab

The TAB key moves the non-blank text following the cursor position to the next tab stop location. Spaces are inserted as needed. The TAB used in the indentation area of a line basically increases the indentation by another tab stop. Note that if there is a selection (see dropping the anchor) and multiple lines are selected the TAP key will increase indent for the selected line. This allows you to indent a block of code for example.

Shift-Tab

With XTERM emulation the Shift-Tab key combination is available. Like TAB this moves the non-blank text following the cursor to the left and to the previous tab stop if possible. If used in the indentation area this effectively reduces the indent. This will move a block of selected lines to the left.

MOUSE

The editor is able to utilize special escape sequences that are available if you are connecting to the command console using a terminal program that offers XTERM (X Windows System) emulation. This includes certain mouse functions. Not all mouse function is available to the editor. The terminal program reserves some mouse events to support its own function.

Left Single Click

Clicking the left button moves the edit cursor to the location of the mouse pointer. Clicks outside of the text area are ignored. If the Shift key is held when you click and there is no active selection the anchor is dropped.

If a selection is active you can manipulate the selected area with subsequent left clicks. You may also do so using the cursor movement keys. You can disable the selection with the ESC key or toggle it with Ctrl-A.

Left Double Click

Double clicking the left mouse button moves the edit cursor to the text under the mouse pointer. The word under the pointer composed of alphanumeric characters (a-z A-Z and 0-9). is selected (anchor dropped). You may alter the selection or edit it normally from that point.

Left Triple Click

Triple clicking the left mouse button moves the edit cursor to the text under the mouse pointer and selects characters bounded by spaces/blanks. This will select the block of non-blank characters. You may alter the selection or edit it normally from that point.

Left Quadruple Click

Clicking the left mouse button four times moves the edit cursor to the line under the mouse pointer and selects the entire line. You may alter the selection or edit the line normally from that point.

Scrolling

You can scroll the screen using the mouse wheel. The edit cursor remains visible and is moved as necessary to stay in sight. If there is an active selection, the area will be deselected (anchor lifted) when it moves out of sight.

What is Not Supported

You cannot drag anything with the mouse. This includes enlarging the selected area. You may be used to doing this in other editors. This has not been implemented to this point.

The right mouse button is ignored. It may have some function with your terminal program and that will be unaffected. Similarly any center button or wheel click event will be ignored. The wheel provides scrolling only.

CLIPBOARD

The editor maintains a clipboard. Selected text copied (Ctrl-C) or cut (Ctrl-X) is saved in the clipboard. Entire lines may be copied to the clipboard using Ctrl-K. This feature will actually append cut lines allowing you to cut several and then insert them back in another place in the original order. Normally new content overwrites anything previously help in the clipboard.

Upon exiting the editor the content of the clipboard is saved to the **/temp/clipboard.txt** file. If this file exists when you enter the editor it will preload the clipboard. You may use this to copy text from one file and insert into another even though you must exit the editor for the first and reopen it for the second file.

The clipboard file is simple text and content can be used externally as such. You may also copy text into the clipboard.txt (creating it if needed) making it available in the editor if that helps you.

TAB USAGE

The editor converts tabs to spaces. The default tab stop is 4 which means that with the leftmost column being 0 the tab key will advance to columns 4, 8, 12, etc. by inserting the appropriate number of spaces. A file that initially contains TAB characters will be converted upon loading. When the file is saved it will no longer contain tabs.

The tab stop may be altered in the range from 2 to 8 inclusive. This may be temporarily achieved for the current console session by setting the TABS environment variable before starting the editor. For example:

```
set TABS=2
```

This will establish tab stops at columns 2, 4, 6, etc. and may be necessary when loading a file with tabs and getting it formatted correctly after the space conversion.

A more permanent redefinition of the tab stop can be achieved through the Registry. For example:

```
reg Edit/Tabs = 2
```

In this case the new tab stops will be used on that JNIOR whenever the editor is invoked.

If the source file does not contain leading tabs the editor may analyze the indentation used and suggest an alternate tab stop if it would vary from the default. Files save by the editor will not contain tabs nor trailing spaces. Trailing spaces are trimmed when the file is saved.

The editor does perform a C-oriented form of smart indent based off of the left column of the prior line considering the use of the curly brace '{'.

NOTES

Mouse usage may vary depending on the client terminal software in use. This editor is designed as a command line keyboard driven utility.

SENDMAIL **User Commands**

NAME

sendmail - Command Line Email Utility

SYNOPSIS

```
sendmail [OPTIONS] RECIPIENTS [SUBJECT]
```

DESCRIPTION

This command facilitates the creation of an email from the command line. The email will be sent if the Mail Server/Host is defined, a user email address is specified and proper user credentials have been entered through the IPCONFIG command.

One or more RECIPIENTS must be specified. Multiple recipients are separated by a semicolon ';'. A SUBJECT line may be specified.

The command will then accept entry of one or more lines of the message. The message entry is terminated by a single line containing the period '.' character.

-C ADDRS

Specifies one or more email address to be CC'd. Multiple recipients are separated by a semicolon ';'.

-B ADDRS

Specified one or more email address to be BCC'd. Multiple recipients are separated by a semicolon ';'.

-I FILE

Specifies a text file that is to be appended to the message. If used in combination with the -S option the email will contain only the message in FILE.

-A FILES

Specifies one or more attachments to be included with the email. Multiple attachments are separated by a semicolon ';'.

-S

Skip message entry. The email will either be blank or contain text specified by the -I option.

QUEUE MANAGEMENT

When an email cannot be posted it will be queued and retried. The following options provide some management over queued email messages.

-Q

Lists all queued (not yet sent) email messages.

-F

Forces an immediate retry of queued messages. You may have corrected the issue preventing delivery and wish to immediately retry.

-R

Reset the queue. This removes all queued messages. Since it is unlikely that a queue would contain multiple messages a simple reset is provided. Individual messages cannot be removed/retried.

NOTES

The JNIOR may be configured to send emails on particular events such as at boot. When configured to send at boot the default includes LOG files which can be useful in determining the reason for the reboot.

SEE ALSO

HELP Topics: IPCONFIG

LOGGER **User Commands**

NAME

logger - Log Entry Utility

SYNOPSIS

```
logger [OPTIONS] MSGTEXT
```

DESCRIPTION

Makes a log entry using the MSGTEXT. By default this logs to /jniorsys.log and to the SYSLOG Server if configured. This command is useful in batch and script files when the action should be logged. The log entry by default has a [logger] prefix tag.

-F FILE

Redirects the log entry to FILE.

-T TAG

Log the entry with a [TAG] prefix. Overrides [logger] default.

-I

Includes the Process ID (PID) with the entry.

-R

Directs the log entry to the external SYSLOG Server only.

-P LEVEL

Sets the severity level reported to the external SYSLOG server.

0 - Emergency
1 - Alert
2 - Critical
3 - Error
4 - Warning
5 - Notice
6 - Info (Default)
7 - Debug

SEE ALSO

HELP Topics: BATCH, SCRIPTING

TELNET **User Commands**

NAME

telnet

SYNOPSIS

```
telnet DESTINATION
```

DESCRIPTION

There are different ways to access the command line console. One way is by using a terminal or telnet client. For the PC there are tools such a PuTTY or even the Telnet client built in to the JNIOR Support Tool. Once you are working at the command line (beginning with JANOS v2.4) you can quickly access other JNIORs on the same subnet using the TELNET command.

This may be helpful should you perhaps wish to check a setting on another unit so that the same setting could be made on the current one. You might also use this Telnet client command to manage other JNIORs for instance if you only have external access to this one. The FTP client can also be used to transfer files between peers.

DESTINATION

> You must specify a destination that is running a Telnet server. The JNIOR by default is a suitable target. You can reference another JNIOR by IP Address or by its Hostname. The target's Hostname is resolved using the internal peers list.
>
> Telnet will also allow access to other servers. You can specify such a destination again using the IP Address or by its domain name.

NOTES

While connected to the remote Telnet server the session will in every way act as if you had connected directly. The EXIT command can be used to terminate the session and return to the command prompt on the original unit.

The Ctrl-Z keystroke can also be used to terminate the Telnet session.

SEE ALSO

HELP Topics: FTP, HOSTNAME, EXIT

TOUCH **User Commands**

NAME

touch

SYNOPSIS

```
touch FILE
```

DESCRIPTION

This command sets the last modification timestamp of FILE to the current time. This makes the file appear to be new. The content is not altered.

If FILE does not exist a 0 length file is created.

SEE ALSO

HELP Topics: LS, DIR

JAVA **User Commands**

NAME

java - Execute Java Application

SYNOPSIS

```
[java] FILESPEC [&]
```

DESCRIPTION

This executes the Java program. FILESPEC typically defines a JAR file generated externally by a standard Java compiler such as Netbeans. The program must be expressly built using the JanosClasses.jar runtime library.

The optional ampersand '&' must lie at the end of the line and when present causes the program to execute in the background as a new process.

The JAVA command itself is optional. When a command line is processed and a built-in command has not been specified the system looks for a Java program. If FILESPEC does not specify a folder the system will search for the program, FILESPEC also does not need to include the .JAR extension as it will be assumed.

Java programs are typically stored in the /flash folder. The system searches the /flash folder first. If the program is not found the search will continue in the root and then the current working directory before finally indicating that the program cannot be found.

NOTES

Applications are started on boot using Run keys in the Registry.

```
Run/<NAME> = <COMMAND>
```

The NAME is arbitrary and usually the program name is used. The value of the key is handled as a COMMAND as if were entered from the command line. Programs started with Run keys execute in the background each with their own instance of the JVM.

SEE ALSO

HELP Topics: PROGRAMMING, THD, PS

NAME

run - Execute Script
exec - Executes commands in batch mode

SYNOPSIS

run SCRIPT PARAMETERS
exec BATCH

DESCRIPTION

JANOS uses a PHP-like language for scripting. In batch file execution, scripts may be used to render batch file commands which are then executed. This is analogous to using PHP to render an HTML document which is then served to a browser. The RUN command executes the script the results of which are simply sent to the display. In this case the SCRIPT is essentially a program.

The SCRIPT file typically has a PRG file extension. If an extension is omitted then .PRG is assumed. The system searches for the SCRIPT file as it would a Java program. Scripts may be placed in the /flash folder and easily executed without path or extension using RUN.

Script files accept PARAMETERS as do batch files and Java applications.

The EXEC form of the command simply executes the supplied BATCH file. This is equivalent to entry of the filename at the command line except that the BAT file extension is not required.

NOTES

The RUN command can be used to render a batch program allowing you to examine the resulting commands without executing them. Once you are satisfied that the script generates the correct command set you can execute the batch file normally.

A SCRIPT could be written to output information using the ECHO command allowing it to be used without the RUN command in batch mode.

Scripts are compiled and therefore run fairly efficiently. The resulting compiled script is cached for the duration of the command session.

The RUN/EXEC command will process a piped command set.

EXAMPLES

Let's take the following script easily created in the /flash/hello.bat file using the ED editor. Here we display the script and use GREP to enumerate the lines for us.

```
bruce_dev /> cat /flash/hello.bat | grep -n
    1: <?
    2:     print('@echo "Yo! Hows it goin?"');
    3: ?>

bruce_dev />
```

Here we use the script PRINT command to output a single command line utilizing ECHO to offer the hello salutation. The '@' in the created command line instructs the batch processing to not echo the command itself. We just want to see the greeting.

The script can be simply executed by name.

```
bruce_dev /> hello
Yo! Hows it goin?

bruce_dev />
```

We can use RUN to validate the script output without executing it as follows. This shows you what the script produces without invoking the batch processor to execute the line.

```
bruce_dev /> run hello.bat
echo "Yo! Hows it goin?"

bruce_dev />
```

Although we execute this script by simply entering its name on the command line we could more explicitly cause it to execute using the EXEC command.

```
bruce_dev /> exec /flash/hello.bat
Yo! Hows it goin?

bruce_dev />
```

Now we can see the difference between RUN and EXEC. Here we use RUN to render the command and then hand that to the batch processor for the same now familiar result.

```
bruce_dev /> run hello.bat | exec
Yo! Hows it goin?

bruce_dev />
```

Just a word about the script. In the program above, line 3 is unnecessary as the end of file is a suitable termination for a script. Also, in this case the script performs such a simplistic action that the scripting is really itself unnecessary. You might imagine, however, that you may want to create a more complicated procedure like that in the CKSUMS script.

SEE ALSO

HELP Topics: BATCH, SCRIPTING, PHP, CKSUMS

SETENV/SET User Commands

NAME

set

ALIASES

SETENV, SET

SYNOPSIS

```
set
set VARIABLE
set VARIABLE = VALUE
```

DESCRIPTION

Each process has its own Environment. This command displays the variables that may be defined in the current Environment.

If VARIABLE is specified its value will be displayed. If VALUE is given then the variable will be replaced.

NOTES

Environment variables are case-sensitive and are inherited from a parent process.

An Env/ Registry Key may be used to pre-initialize a variable in the Environment. This would insure that it is always defined.

SEE ALSO

HELP Topics: ENVIRONMENT

REM User Command

SYNOPSIS

```
rem TEXT
```

DESCRIPTION

On the command line and in batch files the REM command has no effect. The content of the line is ignored and can serve as a comment.

ECHO User Commands

NAME

echo - Display a message

SYNOPSIS

echo MESSAGE

DESCRIPTION

The echo command displays MESSAGE to the console. The MESSAGE can be redirected to a file as can the output of any command.

The entire remaining command line is echoed. Leading and trailing spaces are trimmed and multiple spaces within the message are shortened to a single space. If white space is to be preserved in formatting the string may be enclosed in double quotation marks. Those will be removed. Escaping of non-printable characters is supported.

SEE ALSO

HELP Topics: SCRIPT, CKSUMS

PS User Commands

NAME

ps - Process List

SYNOPSIS

ps [OPTIONS]

DESCRIPTION

Lists currently active processes along with the Process ID (PID). Processes are listing in order of decreasing demand on the CPU (%). This command also displays the current uptime.

-V

Provides additional process information.

runtime	- Total runtime accumulated
%	- percentage of CPU usage
mem	- Amount of memory in use (KB)
msg	- Number of inter-process messages pending (should be 0)
hnd	- Number of handles allocated
stk	- Maximum stack usage (percent)
frm	- Count of Stack frames (Applications)
pram	- available internal processor RAM

-M [LOGFILES]

The PS command displays the process activity at a moment in time. As this activity can at times be very dynamic, two successive PS commands might display dramatically different results. Processes my be added. Others may terminate. Still others normally dormant might get busy. The -M option monitors the process status dynamically updating the display every couple of seconds. Any keystroke will exit from this mode.

An optional log file such as **jniorsys.log** or list of log files may be provided. These files are monitored for newly appended lines which are then displayed as notifications. This offers a convenient means for correlating changes in process activity to logged events.

NOTES

Developers want to insure that an application does not monopolize CPU resources. An application abnormally accumulating runtime may benefit from the use of process sleep() and yield() functions where appropriate.

Stack usage above 50% should be watched carefully. Use of recursive routines in programs can drive stack usage up. A program will assert and stop should it use up the available stack space.

Handles are required for various I/O activities and should be released if no longer required. These are a limited resource as well.

Inter-process messaging is essential in creating functionality like custom protocols. The application program creates a message pump/queue in order to send and receive such messages. It is imperative that the queue be serviced promptly. A building msg count signals a messaging issue which certainly will impact system performance.

The Idle Process should typically involve 90% or more of the CPU time. Other tasks may at times have work to do and require 100% of the CPU for certain possible extended periods of time. This is normal. The CPU however should return to the Idle state at some point. If this does not occur it may indicate that some process is not performing efficiently and may require modification.

SEE ALSO

HELP Topics: THD, KILL

THD   User Command

NAME

thd - Display JVM Thread Status

SYNOPSIS

thd [OPTIONS]

OPTIONS

-V

Verbose -- If the associated application is compiled to include DEBUG information the classes where a line number may be available are displayed from the thread's stack trace. This provides information as to what part of the program is being executed.

-E

Shows changes in process time. When the THD command is executed without the -E option the process times are recorded for use here. The -E option then uses those saved times to display the elapsed process time. This can be used to check thread activity.

-X

Extended -- This provides detailed stack trace information.

DESCRIPTION

Applications are written in Java and each executes with its own instance of a Java Virtual Machine (JVM). The THD command displays the status of each active JVM.

Each process is listed along with the accumulated process time, memory usage, PID and stack as would be displayed by the PS command. In addition the amount of memory associated with active Java Objects and classes is shown.

Each Thread in the program is enumerated along with the associated amount of runtime accumulated by the thread. The status of the thread is indicated. For instance SLEEP is shown if a thread has executed a sleep().

If an application sets a system Watchdog the status of the watchdog is displayed along with the remaining time on its timer.

SEE ALSO

HELP Topics: PS, KILL, JAVA

KILL User Commands

NAME

kill - Terminate Process

SYNOPSIS

```
kill PID
kill PROCNAME
kill -A
```

OPTIONS

-A

Terminates all active Java applications.

DESCRIPTION

This command allows you to terminate a process that is running in the background. The PID parameter is the ID of the process as shown by the PS command. You may also identify a process by its PROCNAME or description displayed by the PS command.

NOTES

The system attempts to shutdown the process by setting an interrupt flag as would occur when using Ctrl-C to interrupt a foreground program. If the process has not shutdown on its own after 15 seconds it is terminated forcibly.

SEE ALSO

HELP Topics: PS, THD

NV User Commands

NAME

nv

DESCRIPTION

This lists any application created non-volatile memory blocks sometimes referred to as "immutable blocks". These blocks provide a form of fast variable storage that retain content through a reboot/restart.

NAME

gc - Garbage Collection

SYNOPSIS

gc [OPTIONS]

DESCRIPTION

JNIOR applications are Java programs and Java programs continually create objects using memory. When objects fall out of scope (are no longer used) they must be cleaned up. This process is called Garbage Collection (GC).

The GC activity under JANOS has minimal impact on program performance. The GC command is available for status.

-R

Resets statistics.

-D

Disable GC. This option is available to assist in diagnostics and performance evaluations. GC will automatically restart when memory reaches a critical level.

DIAGNOSTICS

Memory management is a vital part of system and application development. It is possible to cause a *Memory Leak* when memory is allocated and not released. This is a situation when memory slowly becomes unavailable until performance is impacted.

There are a couple of options to the GC command that provide memory allocation detail that can assist in detecting a memory leak and tracking down the cause.

-M

Lists the Top 10 memory allocation sources (hex address) by decreasing memory usage. When repeating the GC -M command if there is a source with continuously increasing usage (and block count) then a leak is the suggested cause.

-B

Lists the Top 10 memory allocation sources by decreasing block counts. A memory leak involving very small blocks may not stand out against applications with higher memory usage. Here we can watch the block count.

-L

List all memory allocation by decreasing usage.

NOTES

Memory leaks within the operating system need to be corrected. If you suspect a leak you should report it to INTEG. While OS leaks have occurred, most have been eradicated.

JNIOR Applications are written in Java and scripts in PHP both of which are managed languages. Memory management is not the job of the programmer in those cases. However, Arrays, Vectors and Hashtables can continuously collect entries that potentially may never be removed. This is essentially a memory leak that will lead to performance issues. These situations become evident in the GC diagnostics.

Not all JNIOR applications are developed and maintained by INTEG. Many customers handle their own application programs. These diagnostic tools are being provided to assist them.

The hexadecimal addresses relate to locations within the operating system. if you suspect a leak and need more information contact Technical Support.

EXTERN **User Commands**

NAME

extern - External Module Utility

SYNOPSIS

extern [OPTION]

DESCRIPTION

Displays the status (present or not preset) and the ID string assigned by the factory.

-R

Removes devices that are no longer present.

NOTES

Module order affects the extension of the internal I/O. For instance the Model 410 has 8 relay outputs 1 - 8. Adding an external 4ROUT module then adds relays 9-12. Adding another module adds relays 13-16 for a maximum of 16. The order in which the modules are added determines the relationship to the relay numbers.

To insure the proper order:

1. Disconnect all external modules.
2. Execute the EXTERN -R command
3. Connect the first module (for relays 9-12 for instance).
4. Execute EXTERN confirm that the module has been recognized.
5. Connect the second module.

The order would then be correct and properly remembered.

Do not attempt to manipulate the TypeHH_N Registry keys. These are dynamically updated by the system.

NAME

iolog - I/O Log Utility

SYNOPSIS

```
iolog [OPTIONS]
```

DESCRIPTION

The IOLOG command provides access to digital and communications logs that are available for digital inputs, relay outputs, the AUX serial port and the JNIOR Sensor Port (expansion bus).

The command entered without OPTIONS generates the /jniorio.log file containing detailed entries for each digital transition of an input or relay.

-T

Indicates digital transitions. The standard /jniorio.log uses 0's and 1's indicating the state of the input or output. An entry is made when a state changes. This option uses an 'L' to indicate and state changes 1->0 and an 'H' for the change 0->1.

-A

This option specifies the AUX port. This generates the /auxio.log file detailing communications activity over the AUX port.

-S

This option specifies the Sensor Port. This generates the /sensorio.log file detailing communications with external modules.

-E

Uses an expanded format for serial transmissions separating the transmitted (Tx) from received (Rx) data. This will be easier to read when working with a remote device that echos data or when using RS-485 2- wire communications.

-O

Redirects output to the console. This displays the log to the console and the associated file is not generated.

-R

Resets the logs. All previous activity either digital or serial is erased.

NOTES

Serial logs are in hexadecimal. Data transmitted by the JNIOR is shown as HH along with the character representation. Data received by the JNIOR is surrounded by dashes as -HH- to distinguish the direction of the communication. The NETSTAT command provides a network capture capability that is also useful in diagnostics.

SEE ALSO

HELP Topics: NETSTAT, JRMON, ASCII

NAME

jrmon - JNIOR I/O Utility

SYNOPSIS

jrmon [OPTIONS]

DESCRIPTION

This command provides command line access to the I/O features of the JNIOR. It is a useful diagnostic tool as well.

When executed without OPTIONS the command displays the current state of digital inputs and relay outputs including those assigned to external 4ROUT modules. A 'twirly' (a character sequence / - \ | emulating rotation) spins to indicate active monitoring. Any keyboard keystroke exits the command.

WARNING: THE FOLLOWING COMMANDS AFFECT RELAY STATES AND THEREBY ANY EQUIPMENT WIRED TO THOSE RELAYS. DO NOT ATTEMPT THESE ACTIONS UNLESS YOU ARE CERTAIN THAT THE RESULT WILL NOT DAMAGE EQUIPMENT OR OTHERWISE CAUSE UNWANTED EVENTS TO OCCUR.

ACTIONS

Single character commands are accepted at the JRMON prompt in interactive mode. A sequence is executed with the ENTER keystroke. These can also be executed from the command line using the JRMON -X command.

[C]lose NNN

Causes 1 or more relays to Close (be activated, LED illuminates). For example 'c35' closes Relay Outputs 3 and 5 simultaneously.

[O]pen NNN

Causes 1 or more relays to Open (be deactivated, LED extinguishes). For example 'o35' opens Relay Outputs 3 and 5 reversing the above example.

[P]ulse

A relay may be pulsed for a very specific time defines in milliseconds. This action must be combines with a Close or Open. For instance the command 'cp2' pulses Relay Output 2. This can pulse an output ON for a moment and then back OFF. I can also pulse the output OFF and then back ON.

Pulses have a duration. The default pulse duration is 100 milliseconds. The '=' equals sign can be used to specify the pulse duration. The command 'c1p = 2000' pulses Relay Output 1 foe 2 seconds. This does not alter the default and therefore the command 'c1p' pulses the same output for just 0.1 seconds (100 milliseconds). However, the command 'p = 2000' alters the default to 2000 milliseconds.

NNN

Relay outputs and Digital Inputs are identified by single individual numeric digits. You can enter 1 or more digits. Relay Outputs 1-8 are designated with numerals '1' thru '8'. Relay Outputs 9-12 are considered to be a second bank of 8 and are referenced by preceding the digit with the '+'sign. The command 'c1+12' closes Relay Outputs 1, 2, and 9. An '*' asterisk specifies ALL. You can open all relays with the command 'o*'.

[R]eset NNN

Digital Inputs may be latched. Depending on configuration these may reuire manual intervention to be reset or unlatched. The command 'r2' resets any active latching on Digital Input 2.

[L]ist

The 'l' lowercase 'L' command lists the values of the input counters.

[S]et NNN

This sets the counter or counters for the specified Digital Inputs. You can set a counter to a specific value if a correction is needed or clear the counters to 0 zero. The command 's1=1241' set the counter to Digital Input 1 to 1,241 while the command 's*=0' resets all counts to 0 zero.

[U]sage

The 'u' command displays the value of Usage (Metering) timers. These may be viewed and can only be reset by application.

[Q]uit

The 'q' command exits JRMON terminating the interactive session.

COMMAND LINE SYNTAX

-C

Enters Control Mode. In this mode commands may be issued to Close, Open or Pulse individual relays or even all of the relays. For example:

```
q           - exit the program
c1          - close Relay Output 1
o1          - open Relay Output 1
c3p=2000    - close Relay Output 3 for 2 seconds (pulse)
c25         - close Relay Outputs 2 and 5 simultaneously
o          - open all Relay Outputs
```

Relay Outputs 1-8 are defined by a single character. The plus '+' sign is used to reach relays 9-16 with digit characters 1-8.

```
c+1         - close Relay Output 9
c5+2        - close Relay Outputs 5 and 10
```

The default pulse is 100 milliseconds. This can be altered for the current command instance.

```
p=5000      - set 5 second pulsing
c1p         - close Relay Output 1 for 5 seconds
c2          - close Relay Output 2
o2p         - open Relay Output 2 for 5 seconds.
```

Digital inputs can be configured for Latching. Once latched the input need to be reset somehow and possible by an application.

```
r2          - reset latched Digital Input 2
```

Input transitions are tallied by Counters. These can be displayed and even preset by the following actions.

```
l           - list counters (lowercase L)
s1=1024     - set DIN1 counter to 1024
s*=0        - reset all counters
```

Usage meters tally time for inputs and outputs. While those cannot be set here you can view them.

```
u           - view all usage meters
```

-X CMD

Execute control command CMD immediately and return. This performs the request and does not enter the monitoring mode. The following immediately opens all relays.

```
jrmon -x o
```

-D

Diagnostics Mode. This is the same as the -C Control Mode with the addition of a T action. This runs a complex pattern of relay outputs just to showoff the relays. It is interesting but would be really really bad if anything were actually wired to the JNIOR.

-M

System Monitor mode. This mode is not related to I/O but allows you monitor system load in real-time. The system load is determined by measuring the overhead time involved in process swaps away from the monitoring process. System heap status is also shown. Any keyboard input exits the command.

SEE ALSO

HELP Topics: IOLOG

MODE   User Commands

NAME

mode - Adjust system mode.

SYNOPSIS

mode [OPTION]

DESCRIPTION

The MODE command is provided for modifying the mode of the COM RS-232 port. The COM port provides access to the Command Line Console and also provides diagnostic dialog during boot. If the port is to be used in an application the default diagnostic and command line operation can be disabled. The application may do so through programming. The MODE command can be used to restore default operation.

-S
Option silences the COM port dialog and disables command line access.

-V
Restores COM port boot dialog and command line access.

-A
Temporarily allows Command Line access through the AUX port.

NOTES

The COM port setting is stored in the **COMSerial/BootDialog** Registry key. The AUX port command line capability once activated is available only until power is removed.

USERS **User Command**

NAME

users - List User Accounts

DESCRIPTION

The USERS command lists the current set of defined users. The output includes the Username, UserID and Account Permissions. Accounts either have 'Administrator' permissions, 'Control' capabilities, or are 'Guest' accounts.

Admistrators can perform all actions, execute everything and make any and all configuration changes. Users with Control capabilities can control the state of outputs and have access to a limited set of commands. Guests basically can only monitor the status of the JNIOR I/O.

In addition to permissions a user account may be 'Disabled'. This allows an account to be rendered inactive without removing it. This would allow the account to later be reactivated.

Accounts also have passwords. These cannot be displayed.

NOTES

By default the JNIOR ships with 4 accounts defined. The USERS command shows:

```
  admin       3  Administrator
  guest       0  Disabled
  jnior       1  Administrator
  user        2  Control
```

The default passwords are set to be the same as the user names.

When you install a JNIOR you might decide whether as Administrator you are going to use the 'jnior:jnior' account or the 'admin:admin' account and use the USERMOD command to disable the other accounts. Then use the PASSWD command to set a unique password for the administrator.

SEE ALSO

HELP Topics: DEFAULT_ACCOUNTS, USERADD, USERDEL, USERMOD, GROUPS, SAFEMODE

PASSWD   User Commands

NAME

passwd - Change User Password

SYNOPSIS

```
passwd [USERNAME]
```

DESCRIPTION

Sets the password for the USERNAME account. The USERNAME parameter can only be specified by an Administrator. When USERNAME is not specified this sets a new password for the current account.

You are asked to first enter the current password to authenticate and then the new password. You will need to succesfully reenter the new password before the command will make the change.

NOTES

Passwords may contain any characters however they must be at least 4 characters in length and no more than 19 characters.

If you have forgotten your Administrator account (jnior) password you will need to use SAFEMODE to regain access to the unit. This procedure requires physical access to the JNIOR.

SEE ALSO

HELP Topics: SAFEMODE

USERMOD   User Commands

NAME

usermod - Modify User Permission

SYNOPSIS

```
usermod USER ACTION
```

DESCRIPTION

This command is user to set or unset the Administrator, Control or Disabled flags associated with the USER account. Onlys a single flag may be modified by ACTION with each command use. The USERS command can be used to confirm the changes. The actions are as follows:

+A	Add Administrator permissions
-A	Remove Administrator permissions
+C	Add Control capabilities
-C	Remove Control capabilities
+D	Disable an account
-D	Activate an account

NOTES

Administrators by definition can perform all of the Control actions and the Control flag need not be set for administrators.

An account without Administrator permissions and Control capabilities is considered a Guest account. These have limited access and can only monitor things.

Any account can be temporarily Disabled and later activated.

SEE ALSO

HELP Topics: DEFAULT_ACCOUNTS, USERS

USERADD User Commands

NAME

useradd - Add New User

SYNOPSIS

```
useradd [OPTIONS] USERNAME
```

DESCRIPTION

This command adds the USERNAME user. USERNAME cannot already exist. If OPTIONS are not specified the user is created as a Guest. With the creation of the user you are asked for a password and must successfully reenter the password.

-D

Creates USERNAME as a Disabled account. A password must still be set.

-C

Creates USERNAME with Control capabilities.

-A

Creates USERNAME as an Administrator.

NOTES

Use the USERS command to confirm the account creation. Login as the user and confirm the password as well as the intended permissions.

SEE ALSO

HELP Topics: DEFAULT_ACCOUNTS, USER, USERMOD, USERDEL

USERDEL **User Commands**

NAME

userdel - Delete User

SYNOPSIS

userdel USERS

DESCRIPTION

This command removes one or more users from the system. There are no options or confirmations. Multiple users may be removed simply by listing them separated by spaces.

NOTES

You cannot remove the current user. Since you must be an Administrator to remove users you can never remove all of the Administrator accounts. That would obviously be a bad thing.

SEE ALSO

HELP Topics: DEFAULT_ACCOUNTS, USERS, USERADD

GROUPS **User Commands**

NAME

groups - List Groups

DESCRIPTION

A Group can have one or more members. Each member is a user account. The GROUPS command lists the available Groups, the Group ID and the members.

SEE ALSO

HELP Topics: GROUPADD, GROUPDEL, CHGRP, FILES

GROUPADD **User Commands**

NAME

groupadd

SYNOPSIS

groupadd GROUP USERLIST

DESCRIPTION

This command adds each member from USERLIST to the GROUP. If the GROUP does not exist it is created. The USERLIST can contain one or more account names separated by spaces.

SEE ALSO

HELP Topics: GROUPS, GROUPDEL, CHGRP, FILES

GROUPDEL User Commands

NAME

groupdel

SYNOPSIS

```
groupdel GROUP USERLIST
```

DESCRIPTION

If the USERLIST is omitted the command will remove the entire GROUP. If the GROUP has members a confirmation of the deletion is required. Otherwise the command removes each member of the USERLIST from the GROUP. The USERLIST may specify one or more account names separated by spaces.

SEE ALSO

HELP Topics: GROUPS, GROUPADD, CHGRP, FILES

CHGRP User Commands

NAME

chgrp

SYNOPSIS

```
chgrp [OPTIONS] GROUP FILESPEC
```

DESCRIPTION

This command alters the Group assignment for FILESPEC. Wildcards may be used to alter a set of files or directories.

-S

When wildcards are used this applies the change recursively through sub-directories.

-D

Alter Group assignment on a directory. This option is required when changing the Group assigned to one or more directories. This is necessary to signal the intent in wildcard and recursive actions.

-V

Provides additional detail when changes occur.

SEE ALSO

HELP Topics: GROUPS, GROUPADD, GROUPDEL, FILES

WHOAMI User Commands

NAME

whoami - Display current user

DESCRIPTION

Displays the current username, userID and role.

NETSTAT **User Commands**

NAME

netstat - Network Status Utility

SYNOPSIS

netstat [OPTIONS]

DESCRIPTION

This displays the status of the LAN connection and lists all of the active network connections as well as any of the services accepting connections.

-U

Displays any services accepting connectionless UDP packets.

-A

Displays network statistics such as packet and error tallies.

-M [LOGFILES]

Dynamically displays network activity. The display mode is exited by any keyboard entry.

An optional log file such as **jniorsys.log** or list of log files may be provided. Newly appended lines to these files will be displayed as notifications while monitoring. This offers a convenient means for correlating changes in network status with logged events.

-C [FILTER]

Generates the /temp/network.pcapng capture file which contains recent network traffic. This may be downloaded and opened with Wireshark https://wireshark.org . An optional FILTER may be used to limit the content.

-F [FILTER]

JANOS always buffers recent network traffic for capturing. This option can set a FILTER to limit the traffic collected. Since only a limited space is available for buffering, a filter can be used to retain packets of interest for a much longer period of time. The filtering is removed if FILTER is omitted.

-R

Resets the network buffer removing prior buffered traffic.

-T

Displays TLS statistics regarding the negotiation of various security suites.

-S [FILTER]

The -C option generates a PCAPNG file that can be remotely opened in Wireshark. The -S option enables a real-time network scanner/sniffer where packets are displayed as they occur. Any keystroke will terminate the scanning. A FILTER can be specified to limit the packets listed to only those of interest.

-P [FILTER]
This displays packets from the current capture buffer. A FILTER may be defined to limit the list to only packets of interest. If this option is used in combination with -S, once packets are displayed from the capture buffer the scanner will proceed to display new packets as they occur.

-D
Enables the hexadecimal dump of packet payload when used with either the -S and/or -P options. This displays only the data and not the associated headers (such as MAC, IP and TCP/UDP headers).

-V
The Verbose setting will display additional information during sniffer operation. This causes some additional low-level packets to be displayed. Packet payload dumps are typically abbreviated. In verbose mode the entire payload is displayed.

-N
Filter *Noise* from the sniffer display. Packets that are received by the JNIOR that are not processed are considered to be noise. These might be from some external application attempting to access a port on the JNIOR that is not defined. The sniffer identifies these packets with a '-' character to the left of the packet details. This is quite prevalent when connected to a wide-area network or the Internet directly. The -N option hides the display of this traffic.

-B -B1 -B2 -B3
Outputs the internal Blacklist if one is in use in sorted order. The output is sorted by IP address (-B or -B1), by blocking count (-B2) or by last encounter date (-B3).

NOTES

When connecting to the JNIOR command line through a network connection, packets associated with that connection are not displayed by the sniffer. Those are presumably not what you are interested in. The packets involved in those communications are still in the buffer. The detailed display of ongoing network traffic itself generates considerable traffic through your viewing connection. The capture buffer can overrun. This may result in a "malformed packet" or other error breaking you out of the sniffer mode.

A solution to this is to filter your console communications from the capture using the NETSTAT -F filter. You may need to logically include your connection in the filter expression if a filter is already in use. In most cases you may simply avoid using the -V verbose setting; Only use the -D payload dump option as may be needed for debugging; And, perhaps view the previous capture data using -P only if that would be helpful. You can also optionally enlarge the capture buffer with the IpConfig/CaptureBuffer registry setting.

The IpConfig/Greylisting advanced option is available. This reduces unwanted connections from bots and malicious actors. The concept, in use routinely in SPAM email detection, ignores connection requests on the initial attempt. The connection is accepted only if the client then properly retries. Malicious systems tend to not retry. Note that the initially ignored SYN packet is considered to be *Noise*. It will not be displayed when the -N option is used.

Another approach available for use in protecting the JNIOR on an open network is *Blacklisting*. A text file containing one IP address per line may be defined using the IpConfig/Blacklist registry key. The remainder of the line in the file is ignored and may contain notes or comments. JANOS ingests the blacklist and prevents access by any client therein defined. Blacklisted packets are displayed in the sniffer using an asterisk '*' to the far left of the packet details. These packets are considered to be noise and are not displayed when the -N option is used. An application may be created to analyze information from the access.log file which can automatically add IP addresses to the blacklist file. JANOS monitors the file and will immediately update the internal blacklist with any new addresses. For a locked-down implementation consider carefully using the IpConfig/Allow registry entry to limit access.

NETWORK SCANNER

New with JANOS v2.4 is that ability from the command line to view ongoing network communications in real-time. As more and more JNIOR applications involve the interaction with remote network equipment it becomes important in testing to get immediate feedback as to proper operation. The NETSTAT -S network scanner displays network traffic as it happens.

As network packets are received and transmitted JANOS records them for later analysis. This has always been available for export and analysis by Wireshark through the NETSTAT -C option. The amount of network data available at any one time is limited by the size of the capture buffer established by the setting of the IpConfig/CaptureBuffer Registry key. By default this is a modest 512KB and can be expanded to 8MB. Depending on the frequency of network communication and the amount of data exchanged the network history in terms of time can be quite small and on the order of only several minutes.

FILTERING

A capture filter can be used to limit the traffic being recorded. A FILTER can be set using the NETSTAT -F command. This filter then permits only certain communications to be recorded in the capture buffer. When analyzing the interactions with one particular remote device this can greatly increase the amount of time covered and the amount of interaction available for review.

NOTE

> When using the scanner to look for specific interactions make sure that these are not filtered. The NETSTAT -F command without a filter specification removes any existing filter. These are Registry changes that are logged in the jniorsys.log file if you need to determine a prior setting.

The FILTER specified with the NETSTAT -C, -P and -S options is a restriction imposed on the data being *retrieved* from the capture buffer. That is to say after what might already be filtered by the -F filter. If you are looking for a specific communication it must not be first filtered on reception and then not filtered upon display.

When running the scanner, network communications related to the current connection are automatically filtered. For instance, if you are accessing the command line console using Telnet those packets will not be displayed as you are likely looking for other traffic. This is a secondary filter in addition to (and does not alter) any FILTER that you define regarding display. This traffic will however be captured in the buffer unless filtered by the incoming -F filter. (See IpConfig/Filter).

REAL-TIME

The NETSTAT -P command will display the (optionally) selected packets from the capture buffer. That would start from the oldest available right up to the present moment. At the completion of display you are returned to the command prompt.

To view *real-time* traffic use the NETSTAT -S command (with optional filter). This will immediately display new packets (matching your filter) as they occur. This will continue for as long as the command is active. Any keystroke will interrupt the command and return you to the prompt.

If you are interested in traffic past and present you will need to use both options in one command. For instance NETSTAT -PS or NETSTAT -SP. Notice that if you issue the NETSTAT -P and then after returning to the prompt you give the NETSTAT -S command there is a chance that you would skip packets occurring between the two command executions.

DISPLAY FORMAT

The network scanner displays packets in a similar fashion as Wireshark. With each packet a timestamp is displayed followed by the source IP address, source port number, the destination IP address and destination port number. The timestamp does not display the date given that a capture extending over days is unlikely. The following is a brief moment in time and happens to show only broadcast traffic. The -V option includes underlying packets for ARP, ICMP and so on, which are normally not listed.

```
Packets for current session not displayed
 Timestamp     Src_IPaddr     srcprt  Dst_IPaddr     dstprt typ
12:01:56.728  10.0.0.20       17500  255.255.255.255 17500  UDP
12:01:56.730  10.0.0.20       17500  255.255.255.255 17500  UDP
12:01:56.730  10.0.0.20       17500  10.0.0.255      17500  UDP
12:01:57.470  10.0.0.27       17500  10.0.0.255      17500  UDP
12:01:58.462  10.0.0.17       60504  10.0.0.255       1947  UDP
12:02:01.252  10.0.0.20       54131  255.255.255.255  1947  UDP
12:02:02.541  10.0.0.5          137  10.0.0.255        137  UDP
12:02:04.180  10:78:d2:75:14:06      Integpro_00:07:f9      ARP
12:02:04.180  Integpro_00:07:f9      10:78:d2:75:14:06      ARP
12:02:05.258  10.0.0.20       54131  10.0.0.255       1947  UDP
```

The right side of each line may define the protocol and provide some additional details.

```
               typ  proto      detail
               UDP             (144 bytes)
               UDP             (144 bytes)
               UDP             (144 bytes)
               UDP             (154 bytes)
```

```
                       UDP             (40 bytes)
                       UDP             (40 bytes)
                       UDP    NBNS     (50 bytes)
                       ARP            Who has 10.0.0.102? Tell 10.0.0.20
                       ARP            10.0.0.102 is at 9c:8d:1a:00:07:f9
                       UDP             (40 bytes)
```

If additional analysis is needed then an export using NETSTAT -C and subsequent viewing in Wireshark is recommended.

PAYLOAD

The NETSTAT -D option used with either the -S, -P or -SP scanning, displays in hexadecimal and ASCII the data contained in the payload portion of the communications.

Here we use the DATE -N command to update the clock using NTP and then look at the network exchange. Notice that NTP uses port 123 and we can use 'NTP' in the filter definition since it is a standard port for that.

```
bruce_dev /> netstat -pd NTP
LAN connection active (100 Mbps)
 Packets for current session not displayed
  Timestamp     Src_IPaddr     srcprt  Dst_IPaddr     dstprt typ  proto      detail
 12:20:33.562  10.0.0.102      53270  50.205.57.38      123  UDP    NTP      (48 bytes)
      0000  0b000000 00000000 00000000 00000000 00000000   ....................
      0014  00000000 e818b7d1 8fdf3b64 00000000 00000000   ....h.7Q._;d........
      0028  00000000 00000000                              ........
 12:20:33.601  50.205.57.38      123  10.0.0.102      53270  UDP    NTP      (48 bytes)
      0000  0c0106e7 00000000 00000000 47505300 e818b7d1   ...g........GPS.h.7Q
      0014  00000000 00000000 00000000 e818b7d1 94731021   ............h.7Q.s.!
      0028  e818b7d1 94735fe5                              h.7Q.s_e

bruce_dev />
```

Here we see the binary exchange with the network time server. None of the packet payload involves characters that make sense. The ASCII is displayed however since in some cases text is clearly exchanged (in serial commands with some devices for instance) and translation from the hexadecimal ASCII is a chore.

If you use NETSTAT -C to export this and then open the capture file in Wireshark a complete parsing of this exchange is available.

NETWORK NOISE

Depending on network structure and proximity to the open Internet packets may be received that cannot be processed by the JNIOR. These may be attempting to open connections to ports that are not supported by the JNIOR. Such packets are considered to be network *Noise*.

The NETSTAT sniffer will indicate noise by placing a '-' character at the beginning of the line to the left of the timestamp. The NETSTAT -N option may be used to omit noise from the scanner display.

The IpConfig/Greylisting feature may be enabled to filter bot and malicious traffic attempting to make connections. These sources on average do not conform the standards and thus can be detected. When enabled this feature marks any initial connection attempt (SYN) packet as network noise. While connections are allowed when subsequently properly retried, this rejects as much as 90% of annoying Internet traffic.

A *Blacklisting* capability exists for use in extreme cases. A file containing a list of IP addresses to be blocked can be supplied using the IpConfig/Blacklist registry key. Packets received from blacklisted clients are ignored and the scanner also considers those to be network noise. These are indicated by an asterisk '*' at the left margin.

For additional security it is recommended that you disable replies to PING requests. This is achieved by setting the IpConfig/PingRply registry key. When these replies are disabled PING packets are considered to be network noise.

SEE ALSO

HELP Topics: FILTER, ASCII, PING

CERTMGR **User Commands**

NAME

certmgr - TLS/SSL Certificate Management

SYNOPSIS

certmgr OPTIONS

DESCRIPTION

JNIOR network connections support TLS v1.02 security. This insures that information passed over the connection is encrypted and unreadable. Most importantly this protects usernames and passwords which are normally required to gain access to the JNIOR.

A Certificate is required during TLS negotiation. This not only verifies the identity of the JNIOR but also passes public key information. The CERTMGR command performs a number of functions related to keys and certificates.

By default the JNIOR generates a unique and secret key pair. It then creates a self-signed certificate for use in negotiating a TLS connection.

Beginning with JANOS v2.5.1 each JNIOR certificate authenticating the unit's IP address, hostname and birthname is signed by the INTEG Root Certificate Authority. The resulting *certificate chain* is then supplied during secure connection negotiations. Since INTEG is not represented in the Trusted Root Certificate store the browser will continue to present the security warning.

You can now obtain the INTEG root certificate using the CERTMGR -E2 command below. If you manually add this to your Trusted Root Certificate Store from that point forward any JNIOR running JANOS v2.5.1 or later will be trusted.

```
A secure connection will be successfully created without warnings.

-V
    Verifies the current active keys and the associated certificate.

-C [FILE]
    Regenerates the self-signed certificate. If FILE is specified an
    externally generated certificate is installed. This must be in PEM
    format.

-A FILE
    Adds an intermediate certificate. The FILE must be in PEM format.

-S FILE
    Validates the digital signature on the certificate in FILE.

-K FILE
    Installs an RSA key pair from the FILE. The key file can be encrypted
    and the command will prompt for the password.

-D [FILE]
    Dumps the current certificate or if FILE is specified the certificate
    within the file. This formats the ASN.1 content in a somewhat
    readable form.

-E FILE
    Exports the current certificate to the FILE in PEM format.

-E2 FILE
    Exports the INTEG Root Certificate that attests to the validity of
    this unit's identity.  Note that the resulting file can be added to your
    computer's trusted certificate store allowing your browser to trust any
    JNIOR running JANOS v2.5.1 or later. This avoids warning messages.

-P FILE
    This exports the current Public Key to FILE. The Private Key is secret
    and cannot be exported.

-B
    Performs the certificate export in binary format. This option is used
    in conjunction with the -E export option.

-G [BITS]
    Generates a new RSA Key Pair. This requests that a new key pair be
    generated and this is performed as a background process. By default
    a 1,024 bit key pair is generated. The optional BITS parameter can
    define a different bit length. Note that only a limited range of key
    sizes are possible.

-X FILE
    This generates a Certificate Signing Request (CSR) from the installed
    RSA Key Pair. A CSR can be provided to a suitable Certificate
    Authority (CA) for signature. The resulting signed certificate can
    then be installed with the -C FILE option. The JNIOR would then be
    trusted by browsers.
```

-R
Restore default credentials. The JNIOR is shipped with a temporary 1,024 bit RSA key pair. Once up an running the JNIOR will generate a 1,024 bit key pair as a background task. This option resets the key pair and repeats that process.

NOTES

When IP addressing or the hostname is changed the JNIOR will automatically generate a new certificate. This certificate will then automatically be authenticated and signed by the INTEG Root Certificate Authority. This root certificate can be added to your computer's trusted root certificate store thereby creating trusted secure connections with any JNIOR.

PING User Commands

NAME

ping

SYNOPSIS

```
ping [OPTIONS] [ADDRESS]
ping [OPTIONS] [HOST]
```

DESCRIPTION

PING is used to test the ability to communicate with a specific HOST over the IP network (Internet). A small packet is transmitted to a destination which, if it is configured to do so, will reply. The round trip time is displayed. A HOST may be specified by IP ADDRESS or Domain Name.

-C COUNT
By default PING will make 4 communication attempts. This number may be specified by COUNT.

-I MILLIS
By Default PING sends a communication every 1 second. This interval may be specified by MILLIS in milliseconds (1 sec = 1000 milliseconds).

-T TTL
The Time To Live (TTL) specifies "how far" a packet is allowed to travel. This is in hops and by the standards each router handling the packet counts as a step. By default TTL is 128. Using a limited TTL allows you to probe only the local network neighborhood.

-W MILLIS
After a packet is transmitted the JNIOR waits for a response. By default if there is not response in 5 seconds the target is declared unreachable. This timeout period can be specified in milliseconds.

-V
This option validates the JNIOR network configuration. This PINGs all of the configured addresses for the Gateway, DNS servers, Mail Server, NTP Server, and SYSLOG Server. This also checks access to

the INTEG website at www.integpg.com which is just a simple way to confirm access to the Internet.

-F

The Flood option can be used to test communications reliability. This continually PINGs the target. A "twirly" is displayed (a sequence of characters / - \ | mimicking rotation). If a response is lost the twirly is replaced with a period '.' and the test continues. This provides a feeling for reliability as periods appear or do not appear during the test. A Ctrl-C key combination terminates the activity and reports statistics.

-Q

Quiet mode removes status text from the command output. Only PING results will be reported.

NOTES

The standard implementation of a network stack supports ICMP (Internet Control Message Protocol) which includes the PING service. Sites wishing to limit their visibility may disable PING responses.

SEE ALSO

HELP Topics: IPCONFIG

ARP User Commands

NAME

arp - Address Resolution Protocol

SYNOPSIS

arp [OPTIONS] [IPADDR]

DESCRIPTION

Communications over the local network use the fixed MAC addressing assigned by device manufacturers. The Address Resolution Protocol (ARP) helps us find the MAC address associated with the IP addresses that we give to local devices and computers. The ARP command displays the cached mappings.

If IPADDR is specified the command displays the mapping for the IP address if known. Otherwise the entire database of active devices is displayed.

-A IPADDR

Issues an ARP request for IPADDR if not present in the cache.

-D IPADDR

Removes IPADDR from the cache. This forces the JNIOR to issue a new request when next attempting to contact the remote device.

-S

Scans the entire subnet displaying the IP addresses used by any computers or devices on the network. In addition to the IP address the listing shows the MAC address and other identification information. If the remote device is referenced in the JNIOR's network configuration its role is also indicated.

-U

Scans the entire subnet displaying inactive IP addresses unused by computers or devices on the network.

The ARP -U command is useful in locating unused IP addresses.

SEE ALSO

HELP Topics: IPCONFIG

NSLOOKUP **User Commands**

NAME

nslookup - DNS Cache Utility

SYNOPSIS

nslookup [OPTIONS] [DOMAIN]

DESCRIPTION

When the JNIOR accesses a domain is must resolve the text into an IP address. An external DNS server provides the service and the results are caches for a period of time. This command displays the content of the cached database.

If DOMAIN is provided the system attempt to resolve the domain.

-D

Deletes the specified domain from cache.

NOTES

Domain addresses remain in the cache for 5 minutes.

SEE ALSO

HELP Topics: IPCONFIG

NBTSTAT User Commands

NAME

nbtstat - NetBIOS Name Resolution Status

DESCRIPTION

Some systems can use NetBIOS Name Resolution to resolve Hostnames into IP addresses. The JNIOR supports this and it allows you to specify the JNIOR by its Hostname in the browser. The NBTSTAT command reports the registered NetBIOS naming for the unit.

NOTES

Hostnames longer than 19 characters or that use forms of punctuation may not be compatible with this form of name resolution.

By default all JNIORs are reachable using their "Birth Name". That being the unit's serial number with a "JR" prefix.

SEE ALSO

HELP Topics: HOSTNAME

REBOOT User Commands

NAME

reboot - Restart the JNIOR

SYNOPSIS

```
reboot [OPTIONS]
```

DESCRIPTION

This command reboots/restarts the JNIOR. This is required for an operating system (JANOS) update. The command terminates all processes in a controlled fashion bringing the system to a halt before restarting.

-F

Skips the confirmation prompt.

-A

Resets heap and system memory.

SEE ALSO

HELP Topics: JRUPDATE

STATS User Commands

NAME

stats - System status

SYNOPSIS

```
stats [OPTIONS]
```

DESCRIPTION

Displays various system information such as specific JANOS version and build. The Model, Serial Number and POR (Power On Reset) count are displayed as well as the current system uptime (time since boot).

JANOS maintains record of the longest uptime achieved and an accumulation of time the product has been up and running. These are provided. A status for the various memory areas within the JNIOR is also displayed.

-A

This option resets the Attenion Status to 'All Clear'.

SEE ALSO

HELP Topics: JRFLASH

MANIFEST User Commands

NAME

manifest - File System Verification Utility

SYNOPSIS

```
manifest [OPTIONS] [FILESPEC]
```

DESCRIPTION

This command lists files and the output differs from the LS or DIR command in that a Message Digest which reflects the file content is calculated from each byte in the file and displayed. The default message digest is MD5. While the digest may be useful in comparing with an externally published value the benefit in the MANIFEST command is its ability to compare against a Reference Point (RefPoint).

The FILESPEC parameter is typically not used. By default MANIFEST scans the entire file system but can be directed to evaluate a single file or set of files.

The -U option (see below) generates the RefPoint which retains information about each and every file on the JNIOR. This is stored in the /manifest.json file and in a second backup copy of this JSON database located in /flash. When MANIFEST is subsequently run it compares the current status of a file against the RefPoint. Differences are reported and this can go a long way in helping the user understand what is changing on the JNIOR.

The following are indications MANIFEST provides when differences are detected.

```
[New]           - File did not exist before. It is new.
[Modified]      - File has changed.
[Missing]       - File existed before and is no longer found.
[Corrupt]       - File content has changed but the timestamp has not.
```

The following are displayed when updating the RefPoint.

[Added]	- File is new and added.
[Updated]	- File has changed and updated.
[Removed]	- File no longer exists and has been removed.

Options:

-U
Update the RefPoint. The JSON database is overwritten.

-L
Only list differences.

-C
Report CRC32 instead of MD5.

-H
Report SHA1 instead of MD5.

-S, -R
Recurse sub-directories when the FILESPEC parameter is provided. FILESPEC can include the wildcards '*' and '?'.

-A
Include Hidden files and folders.

-F REFPOINT
This option instructs the MANIFEST command to use a custom reference point REFPOINT. Here you can specify another database location for this specific execution of the command. The default RefPoint will not be disturbed. You can use different RefPoint databases for different purposes.

NOTES

Typical usage is to issue the MANIFEST -UL command at a point when you are confident in the status of the JNIOR. At a later time you can use the MANIFEST -L command to compare against the RefPoint. You will then know if any files have been lost or corrupted. Presumably those that are modified can be explained. Logs typically quickly become modified. You would also find out if any new files have appeared. Once satisfied you would update the RefPoint with another MANIFEST -UL.

SEE ALSO

HELP Topics: LS, DIR, JSON

NAME

jrupdate - JNIOR Update Utility

SYNOPSIS

```
jrupdate [OPTIONS] UPDFILE
jrupdate [OPTIONS] ZIPFILE
jrupdate [OPTIONS] URL
```

DESCRIPTION

The JNIOR firmware can be updated using the JRUPDATE command. This is used to update the operating system (JANOS). It is highly recommended that the latest version of JANOS be used. In many cases it is a prerequisite for continuing technical support.

-U

Prepare to update from the file UPDFILE. Typically a UPD file is obtained from INTEG and loaded into the /temp folder. This option readies the firmware for update upon reboot. The JanosClasses runtime is immediately updated.

-P

When used in combination with the -U option this causes the system to proceed with the reboot after preparing the UPDFILE.

-F

Skips the update confirmation and proceeds with the update.

-C

Cancels a prepared update. The firmware will not be updated upon reboot. Note that the JanosClasses runtime has been updated in the preparation and this may or may not cause issues pending the eventual firmware update.

-R

At the completion of a firmware update the prior version of the operating system remains stored. This option will revert the firmware to the original upon reboot. Note that the JanosClasses runtime is unaffected and may or may not cause issues with the older firmware. The -R option can be repeated to toggle between JANOS versions. There generally has been little or no need for this reversion option.

-I

Run installer. If a ZIPFILE is specified that contains a setup.bat batch file, it is executed to complete the steps involved in the installation.

-G

Downloads a files from the supplied URL into the /temp folder before proceeding with other options. This may load a UPD file or other installation file.

NOTES

Typically updates are performed using the Support Tool and a supplied Update Project. Manually the firmware is updated by copying the UPD file to the /temp folder and executing the following command.

```
jrupdate -fup /temp/longfilename.upd
```

The TAB feature of the command line is useful in constructing this command in that you need not type the lengthy UPD file name.

Product firmware update procedures typically warn against removing power during the procedure. JANOS performs a fault tolerant firmware exchange procedure that is unaffected by the loss of power. This also completes fairly quickly and won't keep you on the edge of your seat waiting.

SEE ALSO

HELP Topics: TAB

PHOME User Commands

NAME

phome - Phone Home Utility

SYNOPSIS

```
phome [ACTIVATION KEY] [OPTIONS]
```

DESCRIPTION

Beginning with JANOS v2.4 the JNIOR will support the *INTEG Phone Home* remote support service. This is an opt-in function that MUST be activated by the customer.

The command will initiate a *check-in* which will simply register the JNIOR with the INTEG servers. An ACTIVATION KEY must be entered by the customer before any remote access can occur.

ACTIVATION KEY

If the subject JNIOR has Internet access, a temporary activation key may be obtained from INTEG Technical Support. Once activated INTEG (and only INTEG) will be able to securely access the JNIOR remotely. This may be very useful in debugging difficult issues or in supporting applications developed by INTEG for you. The activation key is valid typically for only a few hours.

-D

Deactivates an existing activation.

NOTES

The JNIOR uses unicast Port 2900 for check-in. You may need to set firewall software to allow this port if you wish to take advantage of this service. Additional permissions may be required before the remote connection will be possible.

By default INTEG cannot access your JNIOR without activation.

Additional services may be available through future licensing.

SEE ALSO

HELP Topics: support

JRFLASH **User Commands**

NAME

jrflash - Flash File System (FFS) Utility

SYNOPSIS

```
jrflash [OPTIONS]
```

DESCRIPTION

Part of the JNIOR File System is retained in Flash Memory. This is the content of the /flash folder. This command displays the size of the Flash and the amount of remaining space.

-C

Displays statistics including the status of any cached data. The writes_per_minute statistic may be used as an indication as to how heavily the Flash is used. Flash components do have a finite life.

-F

Formats the FFS. You will need to confirm the action. All data will be lost. It is recommended that data be copied from the Flash first if possible. It can then be restored.

-R

Perform reclamation pass. Flash memory areas can be written once and then must be reclaimed before being used again. The FFS utilizes all of the available memory before reclaiming. The process is transparent and happens in the background. This option allows you to manually reclaim memory. This can greatly improve Flash performance in terms of the average write time.

Registry Configuration

OVERVIEW

The JNIOR Automation Network Operating System (JANOS) and its applications can be configured to suit your needs. Configuration involves choices, and those settings may be stored in a variety of ways. JANOS relies on its Registry system for all operating system configuration. The Registry can also be easily used by applications and web pages for the storage of custom configuration settings. The Registry may also be used to store and share data dynamically.

The JANOS Registry is non-volatile. Its content remains in place even when power is removed. Information is stored as a set of name-value pairs. Each entry is referenced by a unique Registry Key or name. Each entry contains information formatted as a character string representing its value. The content is available to JANOS directly, to external applications and web pages through protocols, and to local application programs through the JanosClasses.jar runtime library.

JANOS maintains a backup copy of the Registry in the /flash/jnior.ini file. When content in the Registry is changed this INI file will later be updated to reflect the changes. This backup file is automatically generated and should not be overwritten or modified. JANOS performs this backup every several minutes as needed. The /flash/jnior.ini file may be read and saved as a representation of Registry content. This INI file will reflect changes only after the backup occurs. The backup is automatically performed on reboot.

A copy of the /flash/jnior.ini file may be edited and saved under a different filename. This then may be ingested using the REG -I command as means a performing bulk configuration.

All actions are logged to the jniorsys.log file providing an audit trail for configuration management.

SEE ALSO

HELP Topics: REG

Access Configuration

USING THE REGISTRY

Configuration is likely best performed using the Dynamic Configuration Pages (WebUI). Once the JNIOR is connected to the network the browser can be used to open the WebUI with the unit's IP address. The JNIOR is configured by default to open the WebUI. An administrator login is required to access the Registry.

The 'Configuration' tab of the WebUI provides an organized form-oriented means for adjusting the various configuration settings. In this section you are provided with over a dozen different categories. These settings affect both how the JNIOR operates and how the WebUI displays information. Not all of the valid and useful Registry Keys are presented within this section but only the most common and appropriate settings for each category. Certain advanced settings will need to be made manually by a different means. The unit's Network configuration, for instance, may be easily adjusted here.

The WebUI also provides a 'Registry' tab. This section shows the raw content of the Registry Keys in a form similar to a file explorer. Only those keys with values are shown. You can add, remove or edit any Registry Key using this tab. Here you are required to know specifically what key or keys you want to change. This is most appropriate for advanced administrators. This provides a graphical user interface for Registry Key management.

The Console tab in the WebUI provides access to the JANOS Command Line Console. This is the same command line facility that can be accessed using a Terminal or Telnet application to open the standard Telnet port (port 23) over the network. Even in the absence of a network connection you may open the console by making a serial connection to the COM port located to the right of the Ethernet/LAN connection on the JNIOR.

If you are working with a Windows based PC you may download and install the INTEG Support Tool. The installer is available from our website at jnior.com . Once the Support Tool is opened the Beacon tab will display all of the JNIORs located on the current network segment. If you right-click any JNIOR the resulting context menu will provide access to the unit's WebUI, a Telnet application, and many other useful functions. The Support Tool also provides a Registry Editor tab through which you can add, remove and edit content as needed for the selected JNIOR.

SEE ALSO

HELP Topics: WEBUI, REG

$BootTime   Registry Key

NAME

$BootTime

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns a string representing the time according to the JNIOR clock at the completion of the latest power-up boot sequence.

$Model   Registry Key

NAME

$Model

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns the product Model number. For example:“410”.

$SerialNumber   Registry Key

NAME

$SerialNumber

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns the product serial numberas a String. For example: “612080001”.

$Version   Registry Key

NAME

$Version

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns the current Versionstring for the product release. For example: “v2.4”

$LastNtpSuccess   Registry Key

NAME

$LastNtpSuccess

DEFAULT

Updated by the system.

DESCRIPTION

This returns the last time the system clock was successfully updated from the network using the NTP protocol.

SEE ALSO

HELP Topics: DATE

$BuildTag   Registry Key

NAME

$BuildTag

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns a tag uniquely defining the current OS build. These tags will increase with each new build and can be numerically compared.

$HdwStrapping   Registry Key

NAME

$HdwStrapping

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns a tag uniquely defining the hardware configuration of the circuit board in this unit. This varies by model and reflects the resources available to the operating system.

Device   Registry Key

NAME

Device/Desc

DEFAULT

None

DESCRIPTION

This key provides a textual descriptionfor this JNIOR. This might be displayed by the WebUI or applications as identification. JANOS will include this description as part of the default email signature if it is defined.

Device   Registry Key

NAME

Device/Timezone

DEFAULT

UTC - Coordinated Universal Time

DESCRIPTION

Specifies the local Timezone to be used in displaying date and time. The set of available Timezones may be viewed using the DATE -T command. This setting can be easily made using the DATE command followed by the appropriate Timezone abbreviation. For example DATE EST.

SEE ALSO

HELP Topics: DATE

Device/ResetAction Registry Key

NAME

Device/ResetAction

DEFAULT

reboot -f

DESCRIPTION

Specifies the action to be taken when the RESET switch is triggered. The JNIOR provides access to a 2-pin connector for an external Reset Switch. When a reset switch is momentarily activated (pins connected together) the command line command detailed by this Registry key is executed. By default this forces a reboot using the REBOOT -F command and performing a well-behaved controlled restart. Any command may be executed and it need not result in a restart. Note that this reset switch is also used to enter SAFE MODE when it is held through a reboot.

IpConfig/DHCP Registry Key

NAME

IpConfig/DHCP

DEFAULT

enabled

DESCRIPTION

When enabled the JNIOR will lease an IP address from a DHCP server if available on the network. This insures that the JNIOR is compatible with the network.

NOTES

ipconfig -d

Enables DHCP using the IPCONFIG command. Sets this key to enabled.

ipconfig -r

Disables DHCP and releases any leased IP address. Sets this key to disabled.

SEE ALSO

HELP Topics: IPCONFIG

IpConfig/IPAddress Registry Key

NAME

IpConfig/IPAddress

DEFAULT

10.0.0.201 (if DHCP not enabled)

DESCRIPTION

This defines a fixed network IP Addressto be used with this JNIOR. The address may be defined using this Registry key or by using the IPCONFIG command. The Registry change takes effect on reboot. Use IPCONFIG to make immediate changes.

The JNIOR queries for IP address conflicts when establishing its address. If another device responds to the IP address defined here, the unit will log the issue and temporarily adopt an IP address of 0.0.0.0.

SEE ALSO

HELP Topics: IPCONFIG, DHCP

IpConfig/SubnetMask Registry Key

NAME

IpConfig/SubnetMask

DEFAULT

255.255.255.0

DESCRIPTION

This defines the network Subnet Maskto be used with this JNIOR. The mask may be defined through changes to this Registry key or by using the IPCONFIG command. Changes take effect on reboot. Use IPCONFIG to make immediate changes.

SEE ALSO

HELP Topics: IPCONFIG, IPADDRESS

IpConfig/GatewayIP Registry Key

NAME

IpConfig/GatewayIP

DEFAULT

0.0.0.0

DESCRIPTION

This defines the network Gateway IP Address. This address is only required if JNIOR is to communicate outside its home network. This would be the case if JNIOR is to synchronize its clock with an external time server as is the default. Changes take effect on reboot. Use IPCONFIG to make immediate changes. This key is ignored when DHCP is enabled.

SEE ALSO

HELP Topics: IPCONFIG

IpConfig/PrimaryDNS **Registry Key**

NAME

IpConfig/PrimaryDNS

DEFAULT

0.0.0.0

DESCRIPTION

This defines the Primary DNSAddress used for name resolution on the network. This would be required if JNIOR is to synchronize its clock with an external time server as DNS is used to resolve “pool.ntp.org” into the appropriate IP Address for communication. Changes take effect on reboot. Use IPCONFIG to make immediate changes. This key is ignored when DHCP is enabled.

SEE ALSO

HELP Topics: IPCONFIG

IpConfig/SecondaryDNS **Registry Key**

NAME

IpConfig/SecondaryDNS

DEFAULT

0.0.0.0

DESCRIPTION

This defines the Secondary DNSAddress used for name resolution on the network should the Primary DNS not be available. Changes take effect on reboot. Use IPCONFIG to make immediate changes. This key is ignored when DHCP is enabled.

SEE ALSO

HELP Topics: IPCONFIG

IpConfig/HostName **Registry Key**

NAME

IpConfig/HostName

DEFAULT

The default is the 9-digit serial number with a "jr" prefix in the form "jrNNNNNNNNN". This is known as the unit's "Birth Name".

DESCRIPTION

This defines a Hostnamefor the device. This name appears in many places. It will be listed as identification in the Beacon tab of the Support Tool.

It is used as the command line console prompt. The name may be used in a URL to access the JNIOR if it is on the local network. It is noted in the default signature when emails are sent.

JANOS allows the Hostname to be defined as just about anything. However, it is recommended that it not exceed 15 characters in length and use only alphanumeric characters. You can use underscore '_' and dash '-' if necessary. These limitations allow the Hostname to be properly used to access the unit over the network using NetBios.

The default Hostname will always be available for network access in addition to any alternative defined by this key. A short name is also best for the command line prompt.

NOTES

This can be easily set using the HOSTNAME command.

SEE ALSO

HELP Topics: HOSTNAME

IpConfig/Domain **Registry Key**

NAME

IpConfig/Domain

DEFAULT

jnior.local

DESCRIPTION

Defines the Domain Nameassociated with the local network. In general you can usually leave this as the default. It is supplied with email transfers. You may need to use a valid domain in order to satisfy requirements for passing spam filters.

IpConfig/MailHost **Registry Key**

NAME

IpConfig/MailHost

DESCRIPTION

This specifies the address of the SMTP Mail Serverthat accepts email for the defined email account. This must be specified if JNIOR is going to send email messages. Changes take effect on reboot. Use IPCONFIG to make immediate changes.

SEE ALSO

HELP Topics: IPCONFIG, SENDMAIL

IpConfig/Username **Registry Key**

NAME

IpConfig/Username

DESCRIPTION

Specifies the Usernamerequired for SMTP Authentication. This may or may not include the domain as this depends on the requirements of the particular server. SMTP Authentication is used ONLY when a MailHost is defined and when both the Username and Password keys are valid.

The Username must be entered through the WebUI or by the IPCONFIG command. Upon entering or re-entering the Username a Password will be requested and confirmed. The password must be encrypted by the system before it is saved. This cannot be done manually.

SEE ALSO

HELP Topics: IPCONFIG, SENDMAIL

IpConfig/Password **Registry Key**

NAME

IpConfig/Password

DESCRIPTION

This cannot be successfully updated manually.

This key specifies the Passwordrequired for SMTP Authentication. The password is encrypted in the Registry and is not displayed by the JNIOR. The login credentials must be entered using the WebUI or IPCONFIG command by first entering or reentering the Username. Each JNIOR has its own unique encryption key and therefore passwords cannot be copied through INI file transfer. SMTP Authentication is used ONLY when a MailHost is defined and when both the Username and Password keys are valid.

SEE ALSO

HELP Topics: IPCONFIG, SENDMAIL

IpConfig/EmailAddress **Registry Key**

NAME

IpConfig/EmailAddress

DESCRIPTION

Specifies the email address used as the FROM address in sending email. This email address should be valid and the one associated with the email account having the defined Username and Password. This address appears as the sender in most communications. It is also placed in SSL certificates to refer to the device Owner.

SEE ALSO

HELP Topics: IPCONFIG, SENDMAIL

IpConfig/DNSTimeout Registry Key

NAME

IpConfig/DNSTimeout

DEFAULT

5000 milliseconds (5 seconds)

DESCRIPTION

This defines the timeout in milliseconds to be used in waiting for a response from configured DNS servers.

SEE ALSO

HELP Topics: IPCONFIG

IpConfig/NTPServer Registry Key

NAME

IpConfig/NTPServer

DEFAULT

pool.ntp.org

DESCRIPTION

JNIOR can synchronize with a network time serversupporting Network Time Protocol (NTP). To utilize this capability JNIOR must be properly configured for a network with access to an NTP server. The NTPServer key defines the server using either a domain name or an IP address. An optional parameter may be used to define an alternate port. The format is as follows:

```
IpConfig/NTPServer = ServerAddress [, ServerPort]
```

Another typical server address is 'time.nist.gov' and you may define a local NTP server.The standard NTP port number is 123. You may optionally specify a custom port number following the ServerAddress separated by a comma.

Only one servercan be specified. If that server is not available then the synchronization will be bypassed. Note that the clock is maintained by a battery during periods without power. Synchronization is not required but useful periodically as the clock will drift in accuracy over long periods. Typical computer hardware clocks (PCs for instance) typically drift by several seconds per day. NTP synchronization is critical in maintaining accurate time.

NOTES

Time synchronization occurs during boot. Synchronization is attempted every four hours by default to maintain clock alignment. JNIOR may also be commanded to synchronize using the DATE -N command in the Command Console.

Proper network configuration including Gateway and DNS Server is required unless a local NTP server is used.

The default 'pool.ntp.org' domain supplies an NTP server from a large pool of servers. It is highly likely that a different server will be selected for each synchronization. If the supplied server does not respond the synchronization will be retried a few times. Beginning with JANOS v2.4 the retry will occur 5 or so minutes later giving time for the DNS entry to expire and thereby fetching a new NTP server that might be ready to assist you.

SEE ALSO

HELP Topics: DATE, IPCONFIG

IpConfig/NTPUpdate Registry Key

NAME

IpConfig/NTPUpdate

DEFAULT

240 (minutes)

DESCRIPTION

JNIOR attempts to synchronize with a network time serverevery 4 hours (240 minutes) by default. The update period may be adjusted through this Registry key. This defines the period in minutes and can be set for any amount of time 5 minutes or longer. To disable NTP synchronization you can set this key to 0. This configuration setting takes effect on boot.

With JANOS v2.4 or later changes to this key take effect immediately. An NTP synchronization will occur and the next will be scheduled based upon the newly defined period.

SEE ALSO

HELP Topics: DATE, IPCONFIG

IpConfig/MTU Registry Key

NAME

IpConfig/MTU

DEFAULT

1500 (bytes)

DESCRIPTION

This Registry key defines the maximum size of packets transmitted over the Ethernet port. The Maximum Segment Size (MSS) is defined as MTU - 40 (40 bytes less than the MTU setting) and no packet will be transmitted with a payload exceeding this size. Regardless of the MTU setting JNIOR will properly receive packets of any size up to the standard network MTU of 1500. The product ignores Jumbo packets upon their arrival.

Valid MTU settings are 400 to 1500 inclusive. A change in MTU setting applies to all Ethernet connections and takes effect upon reboot.

NOTES

MTU issues are generally a thing of the past. It is unlikely that you will need to change this setting.

IpConfig/TTL **Registry Key**

NAME

IpConfig/TTL

DEFAULT

128 (hops)

DESCRIPTION

The IpConfig/TTL Registry key defines the lifespan of a network packet. The time-to-live value is a kind of upper bound on the time that an IP datagram can exist in the Internet system. The value is reduced with the passage through a router (a hop). If it reaches 0 the packet is discarded.

The TTL setting can be considered to limit the maximum radius (in terms of hops) of the network within reach of the JNIOR. The default setting should allow packets to reach the far end of the globe. A low setting would limit access to the unit as only those in the local vicinity could communicate with it. In this respect the TTL setting can be used to improve device security.

A very low setting of 1 or 2 would constrain the JNIOR to the immediate network. One must consider the need to reach Doman Name Servers (DNS) and Network Time Servers (NTP). There may also be the requirement for email transfers wherein the JNIOR needs to reach out to a SMTP Server. To help determine the minimum setting you may be able to use your PC's TRACERT command to detect the hop count involved in reaching those destinations. The JNIOR does not support a route tracing function.

IpConfig/SyslogServer **Registry Key**

NAME

IpConfig/SyslogServer

DEFAULT

None

DESCRIPTION

This defines the address of a Syslog Serverthat accepts System Log messages. This may be optionally specified to remotely log system status messages. This is typically the information found in the jniorsys.log file. Changes take effect immediately. The format for the IpConfig/SyslogServer key is as follows:

```
IpConfig/SyslogServer = ServerAddress [, ServerPort]
```

By default the ServerAddress is not set and no SYSLOG transmissions occur. You can set the ServerAddress through the IPCONFIG -L command syntax. The standard Syslog port number is 514. You may optionally specify a custom port number following the ServerAddress separated by a comma. This must be accomplished through the WebUI or by setting the Registry key directly. If you set the SYSLOG server address using the IPCONFIG command the default port will be used.

Typically SYSLOG postings reflect the jniorsys.log entries. You may post manually to the system log file using the LOGGER command or directly to the SYSLOG server with the LOGGER -R syntax. Applications may also optionally post directly to the syslog server.

JANOS will allow you to configure a broadcast address (255.255.255.255). This may be helpful if you want to support multiple SYSLOG destinations or monitor postings to an existing SYSLOG server.

SEE ALSO

HELP Topics: LOGGER

IpConfig/Keepalive/Time Registry Key

NAME

IpConfig/Keepalive/Time

DEFAULT

300 (seconds)

DESCRIPTION

This is the timeout in seconds before JANOS will probe a connection. By default it is set to 5 minutes (300 seconds). A connection will be probed if there has not been packet traffic from the peer in the configured time period.

IpConfig/Keepalive/Interval Registry Key

NAME

IpConfig/Keepalive/Interval

DEFAULT

30 (seconds)

DESCRIPTION

If there is no response from a probe JANOS will retry after the configured interval. By default this is 30 seconds.

IpConfig/Keepalive/Retry Registry Key

NAME

IpConfig/Keepalive/Retry

DEFAULT

8

DESCRIPTION

Specifies the number of keep alive retries attempted. By default JANOS will retry the probe 8 times before closing the connection.

IpConfig/Socket/ConnectTimeout Registry Key

NAME

IpConfig/Socket/ConnectTimeout

DEFAULT

5000 (milliseconds)

DESCRIPTION

By default socket connections initiated by an application will time out after 5 seconds and generate an IOException. This define the time in milliseconds.

IpConfig/CaptureBuffer Registry Key

NAME

IpConfig/CaptureBuffer

DEFAULT

512 (KB)

DESCRIPTION

The JNIOR by default allocates 512KB of memory for network capture. If network traffic needs to be analyzed, the NETSTAT FC command is used to generate a PCAPNG capturefile which can be downloaded and opened with the Wireshark network protocol analyzer https://www.wireshark.org . This means that there is always recent network history available for capture. The default 512KB can represent minutes or even hours of network operation depending on the amount of network use. Only packets involving the JNIOR are captured. This packet buffer can be increased using this Registry key and can be set for any number KB between 512 and 8192 (8MB Maximum).

This Registry key setting takes effect only on reboot.

NOTES

the capture buffer is volatile and records network activity while the unit remains powered. The content survives a reboot but is reset when power is removed. The NETSTAT -R command will also reset the capture buffer.

If the network capture is not covering a long enough period of time, we recommend first using a capture filter to limit the content to pertinent activity before increasing the buffer. An extremely large PCAPNG file can be difficult to upload and process. Similarly the NETSTAT -C command can include a capture filter moving only those packets of interest to the capture file.

SEE ALSO

HELP Topics: FILTERING, NETSTAT

IpConfig/Promiscuous Registry Key

NAME

IpConfig/Promiscuous

DEFAULT

disabled

DESCRIPTION

By default the network capture collects packets that specifically reference either the JNIOR's MAC address or IP address either as the source or destination. This then excludes general broadcasts and any other unrelated network traffic that the unit may see.

If you need to see all of the network traffic set this Registry key to "enabled". This will enable PromiscuousMode and the capture of all network traffic that reaches the JNIOR. Note that changes in this setting do not require a reboot and take effect immediately.

Network switches and routers generally optimize network traffic and present devices with the subset of communications that are specifically addressed for that destination. In Promiscuous Mode you will generally receive additional broadcast packets and packets addressed to other possibly non-existing devices which the switch or router has yet to locate and filter.

NOTES

The network hub has been obsoleted by the network switch as traffic and bandwidth optimization is a good thing. However the older technology in the hub may be desirable if you need to analyze communications between two other devices. The hub forwards all network traffic to all interconnected devices. The JNIOR in Promiscuous Mode can then capture packet traffic between the other devices. This may be very useful in debugging larger multi-device systems. If you own a hub you should hang onto it as it can be a useful debugging tool when used as a temporary network switch replacement.

SEE ALSO

HELP Topics: FILTERING, NETSTAT

IpConfig/CaptureFilter Registry Key

NAME

IpConfig/CaptureFilter

DEFAULT

None

DESCRIPTION

The network traffic can be filtered prior to the capture buffer. This can extend the period over which traffic can be collected by limiting the content to only those connections or communications of interest. The syntax used to define a capture filter utilizes logical operations such as NOT, AND, OR and XOR. The filter can include references to MAC addresses, IP addresses (IPv4), and TCP/IP or UDP port numbers. Matters of operation precedence can be handled through the use of parenthesis groups. By default the network capture is not filtered.

The NETSTAT -F command should be used to set the incoming filter. This command first verifies the filter syntax and if no errors are found it then sets the Registry key. This is the preferred method in that it includes the syntax check.

The filter setting takes effect immediately and does not require a reboot. An incoming capture filter is non-volatile and will remain in use. To remove the filter you must either remove the Registry key or issue the NETSTAT -F command without further arguments.

NOTES

In a similar fashion packets can be selected from the network capture buffer in creating the PCAPNG file /temp/network.pcapng . The filter syntax is the same. You can therefore use the NETSTAT -C command to prototype and test a packet filter before using it to define the incoming filter.

SEE ALSO

HELP Topics: FILTERING, NETSTAT

IpConfig/ShowPass Registry Key

NAME

IpConfig/ShowPass

DEFAULT

disabled

DESCRIPTION

Failed Console login attempts, which are failed Telnet login attempts, are logged to the access.log file. This port is a favored target for those seeking malicious access to a device. The log entry shows the remote IP address attempting entry along with the username. When this Registry key is enabled the password tried is also displayed. It is not recommended that this feature be used at length since a typographic error by a legitimate user might reveal the user's password by logging it. This is useful in determining the source of the activity. Bots repeatedly use a sequence of common passwords from a dictionary. A bad actor familiar with the JNIOR would try default passwords. You may wish to know if someone is specifically trying to attack your JNIOR.

IpConfig/LLMNR **Registry Key**

NAME

IpConfig/LLMNR

DEFAULT

disabled

DESCRIPTION

You can access the JNIOR using the unit's Hostname. The process required to convert the text name into the IP address needed to locate the JNIOR on the network is called Name Resolution . A computer might utilize a local DNS server or attempt a NetBIOS name query to do this. An alternative is Link-Local Multicast Name Resolution (LLMNR). This has not been adopted as an IETF standard. The JNIOR is capable of performing LLMNR and the feature can be enabled by this Registry key.

LLMNR is disabled by default as some systems currently consider it unsafe. When attempting to resolve a name it may be possible for a malicious system to offer an incorrect IP address and thereby intercept communications. At that point a login might be requested and your credentials stolen.

SEE ALSO

HELP Topics: NBTSTAT, HOSTNAME

IpConfig/NetBIOS **Registry Key**

NAME

IpConfig/NetBIOS

DEFAULT

enabled

DESCRIPTION

You can access the JNIOR using the unit's Hostname. The process required to convert the text name into the IP address needed to locate the JNIOR on the network is called Name Resolution . Most computers will attempt to utilize NetBIOS in resolving a name. By default the JNIOR supports this method. You may need to specifically enable it on some Linux based machines. This Registry key can be used to disable the NetBIOS service.

The NBTSTAT command displays the current NetBIOS status for the JNIOR. Note that the unit registers the Hostname and the default name which is "jr" combined with the Serial Number (jr615010258 for instance). The latter is considered to be the unit's Birth Name. Only the first 15 alphanumeric characters of the current Hostname are used and the default Birth Name is always available. You can use these names in addition to the IP address to reach the JNIOR.

NOTES

When DHCP is enabled the assigned IP address may remain stable for a long time but it is subject to change. Access using the Hostname will avoid loss of connectivity.

SEE ALSO

HELP Topics: HOSTNAME, NBTSTAT

IpConfig/Allow Registry Key

NAME

IpConfig/Allow

DEFAULT

None

DESCRIPTION

This Registry key defines filtering to be applied to incoming connection requests. This uses the network capture filter syntax. This not only provides for the ability to specify IP addresses that are allowed to connect to the JNIOR but gives you the flexibility to block IP addresses. This includes domain ranges and destination ports. This filter can be used to not only control who can access the unit, it can also be used to define what they can access.

Care must be exercised in setting this key remotely. If the capture filter is improperly defined you may prevent your own access. Doing so will require that you subsequently access the unit through the serial COM port and correct the key through the Command Console.

SEE ALSO

HELP Topics: FILTERING, SAFEMODE

IpConfig/Greylisting **Registry Key**

NAME

IpConfig/Greylisting

DEFAULT

Disabled

DESCRIPTION

Greylisting is a technique that has been utilized by email servers with great success in limiting the level of SPAM email. JANOS can use a similar approach to greatly reduce the number of unwanted external connections. When the IpConfig/Greylisting registry key is set to *enabled* any initial TCP/IP connection request (SYN) is ignored and considered to be *Noise*. The connection will be accepted when the client properly retries. The concept here being that bots and malicious actors pushing volumes of connection attempts do not take the time to retry nor do so in any normal way.

When Greylisting is in use your connections continue to function since the browser and other applications that we use all adhere to standards, use the standard built-in network stack and retry properly.

NOTES

Greylisting when used on a JNIOR connected directly to the Internet has proven to eliminate over 90% of the illicit login attempts.

SEE ALSO

HELP Topics: NETSTAT, IpConfig/Blacklist

IpConfig/Blacklist Registry Key

NAME

IpConfig/Blacklist

DEFAULT

None

DESCRIPTION

This Registry key can define an optional text file containing client IP addresses that are to be blocked. JANOS ignores packets from these clients at the lowest level. The JNIOR becomes invisible to them.

The file is to contain one IP address per line. Any text following the IP address is ignored. This may contain comments or other information. JANOS monitors this Registry entry and the file it references. Any changes are detected and immediately taken into effect.

The NETSTAT sniffer identifies blocked packets using an asterisk character '*' at the far left of the packet detail. These packets are considered to be *Noise* and are not displayed when the NETSTAT -N option is used with the sniffer. The blocked IP addresses will also be displayed with crossed-out font in XTERM terminals supporting color.

The NETSTAT -B option outputs the current blacklist (if any) sorted either by IP address (-B or -B1), by block count (-B2) or by last encountered data (-B3). The output from this NETSTAT command may be edited (piped to EDIT) and reinserted as a new blacklist. In this manner only recent and/or active client IP addresses may blocked.

NOTES

A separate application can monitor the access.log or other files in order to detect and append malicious IP addresses to an active blacklist. We have experimented with this. Contact INTEG for more information.

The IpConfig/Greylisting feature can also be employed to greatly reduce unwanted and potentially malicious connection attempts.

SEE ALSO

HELP Topics: IpConfig/Greylisting, NETSTAT

IpConfig/PingReply **Registry Key**

NAME

IpConfig/PingReply

DEFAULT

enabled

DESCRIPTION

You may use the PING command to query the presence of many devices and systems out on the network. This can represent a security concern given that bots and malicious actors may use the command to locate the JNIOR and to then focus their attack upon it. Many security professionals suggest that replies to the PING command be disabled.

You may prevent the JNIOR from replying to PING commands by setting IpConfig/PingReply to *disabled*.

NOTES

The **traceroute** command present in one form or another in most major operating systems use PING in combination with the Time-To-Live (TTL) parameter to approximate a route to some remote client. When PING replies are disabled the ability to trace the route to the JNIOR may be prevented. Some **traceroute** implementations utilize UDP as an alternative. In this case relying on a PORT UNREACHABLE response. JANOS however also squelches this ICMP message by default. An exception to this has been implemented that allows for route tracing using UDP.

SEE ALSO

HELP Topics: PING

SSL/Enabled **Registry Key**

NAME

SSL/Enabled

DEFAULT

true

DESCRIPTION

Controls the ability to make TLS secured connections. When set to FALSE this disables the Secure Web Server on Port 443 (HTTPS); Removes the ability to upgrade a JNIOR Protocol, JMP Protocol, FTP and Telnet connections to the secured state (disables STARTTLS); And, disables the routine Security Update procedure which otherwise is run to update keys.

The CERTMGR command remains fully functional. Security keys and certificates may still be managed while the ability to make secure connections is disabled. This setting takes effect upon reboot.

SEE ALSO

HELP Topics: CERTMGR

SSL/Required **Registry Key**

NAME

SSL/Required

DEFALUT

false

DESCRIPTION

When TRUE this forces the use of SSL secured connections. No web services are provided on Port 80 (HTTP). All FTP sessions must be secured through the STARTTLS mechanism. The JNIOR Protocol, JMP Protocol and Telnet connections will close should data be received before the connections are secured. This setting takes effect upon reboot. It is ignored if SSL/Enabled is set to FALSE.

Authentication **Security**

BASIC AUTHENTICATION

Access to the JNIOR is password controlled. All protocols provide for a means of login which requires the entry of a username and password. If those connections are not secure (such as standard browser access using HTTP as opposed to HTTPS) then both the username and password may be transferred in clear text. These are easily compromised by the simplest of techniques.

To insure security, you MUST be sure that ALL protocols are set to require password authentication. Otherwise, even when SSL secure connections are made anyone will be able to alter and/or control your JNIOR.

Not all protocols that are typically used in the industry provide for a standard means of password authentication. MODBUSis an example of this. The JNIOR does extend these protocols providing such a means but this must be specifically enabled through this Registry and may require changes to the connecting client.

SEE ALSO

HELP Topics: DEFAULT_ACCOUNTS

Authentication **Security**

DEFAULT CREDENTIALS

Even with care to use both secure connections and password authentication the JNIOR may be easily compromised if the default user accounts are not removed or given unique strong passwords. Surprisingly a large percentage of JNIORs are left with the default user accounts. A common oversight is to change the password on the 'jnior' administrator account while leaving the secondary 'admin' administrator account active and with default credentials.

To insure security, you MUST remove any unused user accounts and change the passwords from their defaults on remaining accounts.

The JNIOR may be supplied with two (2) default administrator accounts 'jnior' and 'admin', a default 'user' account and a default 'guest' account. The default passwords are simply the usernames. JANOS command line functions provide for user management. Use the PASSWD command to alter passwords from their defaults. Use the USERMOD command to disable unused accounts or the USERDEL command to remove accounts. The USERS command is used to list the defined users.

```
jr615010258 /> users
 admin       3  Administrator
 guest       0
 jnior       1  Administrator
 user        2  Control

jr615010258 />
```

Users typically rely on the 'jnior' account for administration. It is recommended that you remove the 'admin' account. The Support Tool defaults to the 'jnior' account. The 'guest' account should also be disabled using the USERMOD D command.

SEE ALSO

HELP Topics: USERS, USERDEL, USERMOD, PASSWD

Users/IgnoreDefault **Registry Key**

NAME

Users/IgnoreDefault

DEFAULT

false

DESCRIPTION

The JNIOR comes with two (2) default Administrator accounts. These are the 'jnior' and 'admin' accounts whose default passwords are 'jnior' and 'admin' respectively. This represents a significant security risk if either account is left active with the default password. Users often alter the 'jnior' account password but neglect to adjust the 'admin' account or vice versa. Periodically JANOS will post a warning to the jniorsys.log file if either default account is determined to still be using the default password.

If you do forget your administrator password(s), the SAFE_MODE access procedure may be used to regain control of your JNIOR. You can then assign a new password.

If you are comfortable with the risk and would like to continue to use the default accounts and passwords, you can eliminate the warnings by setting this Registry key to TRUE.

SEE ALSO

HELP Topics: DEFAULT_ACCOUNTS, SAFEMODE

Public/Private Key Pair   Registry Key

OVERVIEW

Secure communications require RSA keys. 1024-bit or 2048-bit key lengths are typically used today. Longer keys are usually required to protect highly sensitive information and to increase protection as the computer capacity to break (determine the private key associated with a published public key) increases. The JNIOR automation is not intended for use in extremely secure environments and its processing capabilities limit it to a maximum 1024-bit key pair.

As shipped the JNIOR is factory configured with a standard 1024-bit key. At some point if SSL remains enabled and the JNIOR is connected to an active network, JANOS will initiate the 'Security Update' process. This will generate a unique 1024-bit key replacing the default.

The RSA Key or *key pair* is required to establish encrypted SSL/TLS communications. It is the two-part key, with a private part and a public part, that allows two parties to privately exchange information. The key pair is used in creating a *Certificate* that not only conveys the public part of the key to others but serves as device authentication. Certificates are digitally signed using the RSA key.

By default the JNIOR creates, and self-signs, its own Certificate. With JANOS v2.5.1 and later this certificate is instead signed by the INTEG Root Certificate Authority. Both the device certificate and INTEG Root Certificate are supplied upon connection. You may import the root certificate to your Windows Trusted Root Certification Authorities store allowing any JNIOR running JANOS v2.5.1 or later to be connected securely (avoiding warnings). The CERTMGR -V command can be used to verify the current RSA Key and Certificate.

```
bruce_dev2 /> certmgr -v
1024-bit key pair verifies
private key operation requires about 2.3 seconds
certificate:
 Issuer C=US, ST=Pennsylvania, L=Gibsonia, O=INTEG Process Group, Inc.,
      OU=JNIOR Automation, CN=INTEG Root Certificate Authority
 Subject O=INTEG Process Group, Inc., OU=JNIOR Automation, CN=bruce_dev2
 is signed by Issuer
```

As can be seen from this, RSA operations are time-consuming. Security calculations are designed to be so. It is the effort in performing the calculations that makes it extremely difficult for others to attempt to decode the private part of the key. You rely on this. Fortunately, the RSA calculation is performed only once in setting up a secure connection to convey a unique one-time shared secret that the two parties will then use to efficiently encrypt and decrypt their communications.

The CERTMGR command may also be used to install an externally generated RSA key pair. This is limited to a 1024-bit key length. The Security Update process will not overwrite an externally loaded key pair. The CERTMGR command also allows you to install and manage an externally generated Certificate.

SEE ALSO

HELP Topics: CERTMGR

SSL Certificates   Registry Key

OVERVIEW

A TLS secured communications channel requires both the RSA key pair and a SSL Certificate. The CERTMGR command may be used to install an externally generated and signed SSL Certificate that must be associated with the separately installed RSA key pair. Typically the internally generated key pair and certificate are sufficient.

A secure connection to the JNIOR may be flagged by browsers as 'NOT SECURE' or 'UNSAFE'. This is only because the the JNIOR's self-signed Certificate has not been obtained from any of the approved Certificate Authorities. The Certificate may be labeled as 'INVALID'. You may rest assured that the connection is still fully encrypted and 'PRIVATE'.

In the absence of a loaded SSL Certificate, JANOS will generate a certificate using the current RSA key pair. Registry keys are provided which allow you to customize the information provided in this certificate. Since self-signed certificates are not generally recognized as *trusted* by browsers, users will be confronted by a standard warning. The information in the certificate may be configured so your users may recognize the device and decide on their own to accept the connection. The default values provide for a fully functional connection.

The CERTMGR command may also be used to export the internally generated Certificate. The resulting file may be imported into your computer's Trusted Certificate Store. With this step the browser, recognizing a now trusted certificate, will show a secured connection using a symbol such a lock.

SEE ALSO

HELP Topics: SSL/Cert/C, RSA_KEYS, CERTMGR

SSL/Cert/C Registry Key

NAME

SSL/Cert/C

DEFAULT

None

DESCRIPTION

This text string defines the Country in which the JNIOR is located. By default this field is not included in the internally generated self-signed certificate.

SEE ALSO

HELP Topics: SSL/Cert/ST, CERTMGR

SSL/Cert/ST Registry Key

NAME

SSL/Cert/ST

DEFAULT

None

DESCRIPTION

This text string defines the State in which the JNIOR is located. Generally this is not an abbreviation. By default this field is not included in the internally generated self-signed certificate.

SEE ALSO

HELP Topics: SSL/Cert/L, CERTMGR

SSL/Cert/L Registry Key

NAME

SSL/Cert/L

DEFAULT

None

DESCRIPTION

This text string defines the Locality, City or Town. By default this field is not included in the internally generated self-signed certificate.

SEE ALSO

HELP Topics: SSL/Cert/O, CERTMGR

SSL/Cert/O **Registry Key**

NAME

SSL/Cert/O

DEFAULT

INTEG Process Group

DESCRIPTION

This text string defines the Organization. This field is included in the internally generated self-signed certificate.

SEE ALSO

HELP Topics: SSL/Cert/OU, CERTMGR

SSL/Cert/OU **Registry Key**

NAME

SSL/Cert/OU

DEFAULT

JNIOR Controllers

DESCRIPTION

This text string defines the Organizational unit, Division, Department or other. Here we take the opportunity to identify the device. This field is included in the internally generated self-signed certificate.

SEE ALSO

HELP Topics: SSL/Cert/CN, CERTMGR

SSL/Cert/CN **Registry Key**

NAME

SSL/Cert/CN

DEFAULT

Hostname

DESCRIPTION

This text string defines the Common Name or FQDN. For the proper operation of the web site this should reflect the domain in the URL used to reach the JNIOR.

Since in addition to the hostname you may address your JNIOR using its IP address or default hostname ('jr' with serial number), the certificate must be made a bit more general. This is accomplished by including the Subject Alternate Name extension. This extension adds the IP address (both in binary and text forms), the hostname, and the default hostname ('jr' with serial number) to every certificate.

SEE ALSO

HELP Topics: CERTMGR

SSL/Cert/SAN Registry Key

NAME

SSL/Cert/SAN

DEFAULT

List of Hostname, Birth Name and IP Address

DESCRIPTION

Certificates are expected to be created for specific domains and should match the URL used to access the unit. The Common Name or FQDN is by default defined to be the hostname for the JNIOR. Additional identities are included in every certificate. This is accomplished using the Subject Alternate Name extension. This extension adds the IP address (both in binary and text forms), the hostname (if not the defined Common Name), and the default hostname ('jr' with serial number) to every certificate.

If you also want to access the unit using different domain names you can add additional DNS names using this Registry key. One or more names may be added using comma (,) separated list. These will also appear in the Subject Alternative Name extension. Note that you will need to regenerate your certificate if you make changes to SSL/Cert keys. Use the CERTMGR -C.

SEE ALSO

HELP Topics: SSL/Cert/E, SSL/Cert/CN, CERTMGR

SSL/Cert/E Registry Key

NAME

SSL/Cert/E

DEFAULT

None

DESCRIPTION

This text string defines the contact email address. By default this will use the email address defined by IpConfig/EmailAddress . If neither key defines an email address then this field is omitted from the internally generated certificate.

SEE ALSO

HELP Topics: SSL/Cert/Days, IpConfig/EmailAddress, CERTMGR

SSL/Cert/Days Registry Key

NAME

SSL/Cert/Days

DEFAULT

730 (days)

DESCRIPTION

This integer defines the length in days of the period during which the certificate is considered valid. This starts on the date when the certificate is generated or regenerated. By default this is 730 days (2 years). As expiration draws near an internally generated certificate will be automatically renewed for an additional period.

An internally generated Certificate is regenerated automatically when it expires, the Hostname is changed, or the unit's IP address changes.

If you export the certificate to install in a Trusted Certificate Store, you will need to repeat that procedure when the certificate renews. You may elect to use a much longer period with this Registry key.

SEE ALSO

HELP Topics: SSL/Cert/SHA1, HOSTNAME, CERTMGR

SSL/Cert/SHA1 Registry Key

NAME

SSL/Cert/SHA1

DEFAULT

false

DESCRIPTION

The SHA1 cryptographic hash function is no longer considered to be secure. It remains secure for most of the world but those with sufficient resources are assumed now to be capable of breaking it. The JNIOR now uses the SHA256 algorithm (SHA2). You can disable use of SHA2 if you need to communicate securely with legacy systems. This is achieved by setting this key to TRUE.

As with most of the settings in this category, changes take effect when the certificate is regenerated.

SEE ALSO

HELP Topics: CERTMGR

Events/Services **Registry Key**

NAME

Events/Services

DEFAULT

enabled

DESCRIPTION

JNIOR monitors events and responds to certain situations depending on the configuration established by the Registry. JNIOR also can generate an audit trailof events and otherwise routinely logchanges in data. By default these services are available.

Application program startup at boot and email notifications are considered to be EVENTS and are affected by this Registry key. It is recommended that individual events be disabled if necessary as opposed to this setting.

This Registry key can be used to completely disable all such services. A setting of disabled will stop processing without affecting the event configuration. This key takes effect immediately in some cases and a reboot generally stops all services.

SEE ALSO

HELP Topics: Events/OnBoot

Events/OnBoot **Registry Key**

NAME

Events/OnBoot

DEFAULT

enabled

DESCRIPTION

This key can be used to globally enable or disable the activities performed at startup (boot). If set to disabled this will globally disable the startup actions. This includes the running of applications defined by Run keys and the boot email notification.

SEE ALSO

HELP Topics: Events/OnBoot/Email

Events/OnBoot/Email   Registry Key

NAME

Events/OnBoot/Email

DEFAULT

disabled

DESCRIPTION

When enabled this instructs JNIOR to send an Email Notification on Boot. This requires that the JNIOR be properly configured for the network with access to an SMTP Email Server. The IpConfig/MailHost must be configured defining that Email Server. The correct username and password for logging into the Email Server must have been set using either the WebUI or IPCONFIG command. The account owner's Email Address must be properly defined by the IpConfig/EmailAddress key. The email capability can be tested from the command line using the SENDMAIL command.

The Boot Notification email can be fully customized. The default message is relatively simple and conveys important system information. This is configured to send the notification to the account owner. The Subject is "Boot Notification" referencing also the JNIOR's Hostname.

The message indicates that the JNIOR has completed booting. The text includes the content of the jniorboot.log file. The current jniorsys.log file is also attached. All of this is very helpful should the reboot come as a surprise.

SEE ALSO

HELP Topics: IpConfig/MailHost, IpConfig/EmailAddress, SENDMAIL, IPCONFIG, LOGS

Events/OnBoot/EmailBlock   Registy Key

NAME

Events/OnBoot/EmailBlock

DEFAULT

None

DESCRIPTION

This key specifies a node in the Registry Email/ section that defines a custom email message. When this key is undefined the Boot Notification email is sent using the default message definition. A custom or named message might optionally be defined using a named block.

Various keys define the recipients, subject, message detail, and attachments. While when appearing in the Email section these define a default, each can be placed in a named block (node) creating a unique email designed for a specific use. The block name is arbitrary but logically should relate to the email's use. The details involved in designing an email are describe in a subsequent section.

SEE ALSO

HELP Topics: EMAIL_BLOCK

Events/OnBoot/RunEnable Registry Key

NAME

Events/OnBoot/RunEnable

DEFAULT

enabled

DESCRIPTION

During boot applications defined by Run keys are started. Janos is a multi-tasking system and multiple programs can be running simultaneously. This Registry key can be used to temporarily disable program startup on boot.

Programs will also not be started if the JNIOR is in SAFE MODE. If an application is responsible for a reboot loop, SAFE MODE may be required to regain control of the unit.

You may want to work with your JNIOR without the added complication of background programs. The PS command can be used to display running processes. The KILL command can be used to stop processes. This Registry key can be used to prevent programs from running in the first place without a need to remove the associated Run keys.

SEE ALSO

HELP Topics: PS, KILL, SAFEMODE

Events/OnAlarm Registry Key

NAME

Events/OnAlarm

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable all alarm based events. By default the alarm based events must be enabled by their individual keys. This key provides a global means by which alarm events can be disabled.

SEE ALSO

HELP Topics: Events/OnAlarm1, ALARMING

Events/OnAlarm1 Registry Key

NAME

Events/OnAlarm1

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable the Digital Input Counter alarm Type 1 services. This is an alarm that occurs when Limit 1 is reached. These alarms are individually enabled through the IO/Inputs/[DIN]/Alarm1 keys where [DIN] specifies the Digital Input (DIN1 thru DIN12).

SEE ALSO

HELP Topics: Events/OnAlarm2, ALARMING

Events/OnAlarm2 Registry Key

NAME

Events/OnAlarm2

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable the Digital Input Counter alarm Type 2 services. This is an alarm that occurs when Limit 2 is reached. These alarms are individually enabled through the IO/Inputs/[DIN]/Alarm2 keys where [DIN] specifies the input.

SEE ALSO

HELP Topics: Events/OnUsage, ALARMING

Events/OnUsage Registry Key

NAME

Events/OnUsage

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable Usage Alarm services. These alarms are individually enabled through the individual IO/Inputs/[DIN]/Usage/OnAlarm and IO/Outputs/[ROUT]/Usage/OnAlarm keys where [DIN] specifies the input or [ROUT] the output.

SEE ALSO

HELP Topics: Events/OnAlarm, ALARMING

Events/OnConfig   Registry Key

NAME
Events/OnConfig

DEFAULT
enabled

DESCRIPTION
An event occurs when the JNIOR updates the /flash/jnior.ini file in response to changes in the Registry. By default this key enables configuration events.

Events/OnConfig/Email   Registry Key

NAME
Events/OnConfig/Email

DEFAULT
disabled

DESCRIPTION
When settings have been altered in the Registry the /flash/jnior.ini file will be updated. This Registry key can be used to configure the JNIOR to send a Configuration Change Notificationemail.

Events/OnConfig/EmailBlock   Registry Key

NAME
Events/OnConfig/EmailBlock

DEFAULT
OnConfig

DESCRIPTION
When the Configuration Change Notification is enabled the detailed email is described by the settings in the email block defined by this Registry key. By default the block is named "OnConfig" although any other block may be used. The details of email design are covered in another section.

SEE ALSO
HELP Topics: EMAIL_BLOCK

Email Blocks **Registry Key**

EMAIL BLOCK

JANOS can send email messagesin response to certain events. Any number of unique Email messages can be defined for use as the situation requires. A generic (not situation specific) Email is defined by the following keys. A unique Email construct can be defined and assigned to unique Registry sections or email blocks . These may be separately referenced and used as needed. To create a situation specific email message using a unique message identifier [BLOCK] in those keys where it appears.

SEE ALSO

HELP Topics: Email/ToAddress

Email/ToAddress **Registry Key**

NAME

Email/ToAddress
[BLOCK]/ToAddress

DEFAULT

current IpConfig/EmailAddress setting

DESCRIPTION

This defines one or more destination email addresses of the form user@domain.com. Multiple addresses are separated by commas. By default this would send the email to the email account owner.

SEE ALSO

HELP Topics: Email/CcAddress, EMAIL_BLOCK, IpConfig/EmailAddress

Email/CcAddress **Registry Key**

NAME

Email/CcAddress
[BLOCK]/CcAddress

DEFAULT

None

DESCRIPTION

This defines one or more destination email addresses of the form user@domain.com. Multiple addresses are separated by commas. These addresses will receive the defined message as a CC recipient.

SEE ALSO

HELP Topics: Email/BccAddress, EMAIL_BLOCK

Email/BccAddress Registry Key

NAME

Email/BccAddress
[BLOCK]/BccAddress

DEFALUT

None

DESCRIPTION

This defines one or more destination email addresses of the form user@domain.com. Multiple addresses are separated by commas. These addresses will receive the defined message as a BCC blind recipient.

SEE ALSO

HELP Topics: Email/Subject, EMAIL_BLOCK

Email/Subject Registry Key

NAME

Email/Subject
[BLOCK]/Subject

DEFAULT

Varies

DESCRIPTION

This defines the Subject lineto be used with the message. JNIOR requires that a Subject be defined for all messages although this is not strictly a requirement for email itself. If the Subject key is not given, JNIOR will utilize a default Subject as appropriate to the purpose of the email.

SEE ALSO

HELP Topics: Email/Message, BLOCK_EMAIL

Email/Message Registry Key

NAME

Email/Message
[BLOCK]/Message

DEFAULT

Varies

DESCRIPTION

This defines message content to be sent in the email. JNIOR does not require that message contentbe supplied. This may be used in conjunction with a Message File and the text defined here will appear as a prefix to the content of the file. A default message is used with event notifications.

SEE ALSO

HELP Topics: Email/MessageFile, EMAIL_BLOCK

Email/MessageFile **Registry Key**

NAME

Email/MessageFile
[BLOCK]/MessageFile

DEFAULT

Varies

DESCRIPTION

This defines the file that contains textual Message content to be included in the email. If separate Message text is supplied the content of this file will be appended to that text in the message.

For example, the jniorboot.log text file is supplied in the text of the default Boot Notification email.

SEE ALSO

HELP Topics: Email/Attachments, Email/Message, EMAIL_BLOCK, LOGS

Email/Attachments **Registry Key**

NAME

Email/Attachments
[BLOCK]/Attachments

DEFAULT

Varies

DESCRIPTION

This lists one or more files to be sent as attachments with the email message. Each file specification is to be separated by a ';' semicolon. For example, the jniorsys.log file is attached to the default Boot Notification email. Attachments may be of any type although some email servers will not accept certain types of attachments.

SEE ALSO

HELP Topics: Email/HTML, EMAIL_BLOCK, LOGS

Email/HTML **Registry Key**

NAME

Email/HTML
[BLOCK]/HTML

DEFAULT

disabled

DESCRIPTION

This key is to be enabled when an email is properly designed using HTML structure and content.

SEE ALSO

HELP Topics: Email/ToAddress, EMAIL_BLOCK

Email/Port Registry Key

NAME

Email/Port

DEFAULT

25

DESCRIPTION

The Simple Mail Transfer Protocol (SMTP) is used for email delivery. This key may be used to specify a port as may be required by your MailHost. Note that the MailHost and any associated SMTP Authenticationsettings (Username and Password) are set by the IPCONFIG command.

By default JANOS will utilize the STARTTLS capability if offered. The Email/StartTLS Registry key must be enabled.

Port 25 is the standard SMTP port for mail delivery. This port may or may not require authentication (SMTP_AUTH). It may or may not support STARTTLS allowing for the encrypted transfer of content. JANOS will use SMTP_AUTH by default and if STARTTLS is supported will make the secure connection.

Port 587 is the Mail Submission Agent (MSA) port which requires authentication (SMTP_AUTH). This port may also support STARTTLS. If STARTTLS is supported (and generally it is) JANOS will establish an encrypted connection and transfer content securely.

Port 465 is the SMTPS port. This is like the MSA port in that it requires authentication before mail can be submitted. It also requires that a SSL/TLS encrypted connection be established initially. The STARTTLS option is not used. For JANOS to properly transfer mail using this port the Email/SMTPS Registry key must be enabled.

Note that JANOS can successfully post email using any of the above three ports. Generally the email content will be transferred securely using an encrypted connection. That assumes the availability of the STARTTLS option. But if you need to be absolutely certain of a secure transfer, use port 465 and enable the Email/SMTPS key.

SEE ALSO

HELP Topics: IPCONFIG, Email/SMTPS, Email/StartTLS, Email/SMTPS

Email/StartTLS Registry Key

NAME

Email/StartTLS

DEFAULT

enabled

DESCRIPTION

Email deliveries that initially begin with a clear text non-encrypted connection are upgraded to secure using the STARTTLS option (when offered). This Registry key should remain enabled to insure proper security. This can be used to disable SSL/TLS use for email delivery. You should only do so if there are issues with secure connections.

SEE ALSO

HELP Topics: CERTMGR, SSL/Enabled, Email/Port

Email/SMTPS Registry Key

NAME

Email/SMTPS

DEFAULT

disabled

DESCRIPTION

Port 465 can be used for email submission. This uses SMTPS which is essentially SMTP with authentication using SMTP_AUTH. The port also requires an initial SSL/TLS connection. In order for JANOS to know to make that initial secure connection you must set this key to enabled. This should be disabled for email delivery over ports 25 and 587. For either of these ports the Email/StartTLS key should be enabled.

SEE ALSO

HELP Topics: Email/Port, Email/StartTLS

Email/RetryCount Registry Key

NAME

Email/RetryCount

DEFAULT

6 (retries)

DESCRIPTION

There may be difficulties in delivering an email. By default after an attempt has failed JNIOR will reschedule the delivery of the message. Failures on an initial attempt are typical these days as servers are implementing grey-listing techniques to reduce the amount of unsolicited spam email. In general the Internet is a lossy network and retries are not unusual. Set

RetryCount to 0 or 1 to disable retrying.

SEE ALSO

HELP Topics: Email/RetryDelay, EMAIL_BLOCK

Email/RetryDelay **Registry Key**

NAME

Email/RetryDelay

DEFAULT

10 (minutes)

DESCRIPTION

After a failed email delivery attempt JNIOR will reschedule another delivery at a later time. This key defines the delay period in minutes. Email servers implementing grey-listing my routinely reject initial deliveries. These techniques are designed to cause spammers some difficulty and help to cut down the amount of unsolicited email. The JNIOR should be set to attempt repeated deliveries for at least a couple of hours to increase chances of success.

SEE ALSO

HELP Topics: EMAIL_BLOCK

Email/Signature **Registry Key**

NAME

Email/Signature

DEFAULT

By default the JNIOR includes a signature line in all emails indicating the model and serial number of the sending unit. The version of JANOS is also included.

DESCRIPTION

You may provide a custom signature line overriding the default using this Registry entry.

SEE ALSO

HELP Topics: Email/RetryCount, EMAIL_BLOCK

WebServer/Server **Registry Key**

NAME

WebServer/Server

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable the HTTP Server. This may be desirable if communications with JNIOR will be through some other means and connections to the JNIOR HTTP Port are to be ignored. Note that the WebUI is accessed using the WebServer and your browser. A reboot is required when enabling or disabling the WebServer.

SEE ALSO

HELP Topics: WebServer/Port, WebServer/SSLPort

WebServer/SSLPort **Registry Key**

NAME

WebServer/SSLPort

DEFAULT

80

DESCRIPTION

This specifies the TCP/IP port to use for unsecure Hypertext Transfer Protocol (HTTP) services. The default is the standard Port 80.

SEE ALSO

HELP Topics: WebServer/SSLPort

WebServer/SSLPort **Registry Key**

NAME

WebServer/SSLPort

DEFAULT

443

DESCRIPTION

This specifies the TCP/IP port to use for Secure Hypertext Transfer Protocol (HTTPS) connections using TLS/SSL. The default is the standard Port 443.

SEE ALSO

HELP Topics: WebServer/Root, WebServer/SSLPort

WebServer/Login **Registry Key**

NAME

WebServer/Login

DEFAULT

enabled

DESCRIPTION

By default the Web Server requires a successful login. This is highly recommended. If the JNIOR is connected to a private secure network this login requirement can be removed by setting this Registry key to disabled. When Login is disabled you must also define a user account for anonymous login using the WebServer/Anonymous Registry key. These changes take effect immediately. You will not be logged out of your current session. Note that login may still be required if folder or file permissions are restricted (See CHMOD console command). By default initially all users have access to all folders and files.

PUBLIC WEBSITE DATA

It is possible to require a login for some webpages and serve others openly to the public. Any file located within the /flash/public folder will be served without requiring authentication. This assumes that access to the file has not otherwise been restricted by the setting of file permissions.

SEE ALSO

HELP Topics: WebServer/Anonymous, CHMOD

WebServer/Anonymous **Registry Key**

NAME

WebServer/Anonymous

DEFAULT

None

DESCRIPTION

If the Login requirement is removed using the WebServer/Login key a user account must be defined for the JNIOR to use. This Registry key must be set to a valid active user account with the entry of either a UserID or Username. With the default set of user accounts, you would set this key to 'jnior' for example. Note that if the anonymous account is invalid or disabled the JNIOR will continue to request login credentials.

SEE ALSO

HELP Topics: WebServer/Login, USERS

/WebServer/Index Registry Key

NAME

/WebServer/Index

DEFAULT

index.php;index.html

DESCRIPTION

This specifies the name of the website’s home page. This is the document that would be served if a file is not specified in the URL. Multiple files may be specified separated by a semicolon ';'. The search is from left to right so the files are in priority order. The defaults of index.php and index.html are always included in the search as they are automatically appended to the content of this key.

SEE ALSO

HELP Topics: WebServer/Path

WebServer/Root Registry Key

NAME

/WebServer/Root

DEFAULT

/flash/www

DESCRIPTION

This specifies the folder within the JNIOR file system that represents the root of the website. This is the folder that would contain the default website home pageand the related pages would be located in this folder or in subfolders. The default is /flash/www . This folder must be specified as absolute from the root of the file system (starting with a '/'). The trailing '/' is optional.

Files required for a website may be located in folders under the root or may be completely contained within a ZIP library creating a virtual folder.

A website located in this default root will require a login if WebServer/Login is enabled (default). If the JNIOR is to serve a public site then the home page can be located in the /flash/public folder which is not subject to the authentication requirement. The /flash/public location is always checked the /WebServer/Root location.

This provides the ability to have a public site while still requiring login for the WebUI. The WebUI is typically located in /flash/www/config.zip .

SEE ALSO

HELP Topics: WebServer/Index, ZIP, WebServer/Login

/WebServer/Path Registry Key

NAME

/WebServer/Path

DEFAULT

/flash/www/config

DESCRIPTION

This is used to specify alternate search paths for web content. The JNIOR first searches the /flash/public folder and then the /WebServer/Root folder. The default for that is /flash/www . If the requested page is not located then each path defined in the /WebServer/Path key will be searched in sequence. Paths must be specified from the root of the file system starting with a '/' and a trailing '/' is optional. Multiple paths must be separated by a semicolon ';'.

NOTES

The default WebUI is supplied completely enclosed in a single library file named /flash/www/config.zip . A ZIP file creates a virtual folder from which pages may be served. The default for this Registry key is /flash/www/config creating a path to the WebUI. In the absence of a custom website the WebServer looks next to the path specified by this key. With the default it looks for the home page in the folder /flash/www/config and that folder does not exist. Instead it finds the virtual folder created by the ZIP file and in that library it locates a suitable home page. That home page serves the JANOS WebUI.

SEE ALSO

HELP Topics: ZIP

Locators Registry Key

NAME

/WebServer/Locator/[FOLDER]
/WebServer/Public/[FOLDER]

DEFAULT

None

DESCRIPTION

A Locator allows you to redirect a folder specified in the URL to another. The target folder may exist or be created as a virtual folder by a ZIP (or JAR) file named and positioned as would the folder. For example, an application may include configuration web pages along with executable program code. A Locator can be registered to redirect an appropriately named folder to the program JAR file. The target folder may exist anywhere in the JNIOR file system.

The /WebServer/Locator redirects web page access to locations that are subject to authentication (login) as might be required by the setting of the /WebServer/Login key. The folder to be referenced in the URL is defined in the key name replacing [FOLDER] and the key value defines the target folder location.

The /WebServer/Public redirects web page access to locations that are NOT subject to authentication (login) regardless of the /WebServer/Login key. The folder to be referenced in the URL is defined in the key name replacing [FOLDER] and the key value defines the target folder location.

NOTES

The JANOS Help System creates a /WebServer/Public/manpages entry in the Registry which allows web access to images included in Help entries. Although otherwise located those image files then appear to the external browser as being in a manpages folder.

SEE ALSO

HELP Topics: /WebServer/Path, /WebServer/Root

Websocket Registry Key

WEBSOCKET INTERFACE

The WebServer provides the ability to upgrade a connection to support the Websockets Protocol.JANOS supplies a built-in Websocket interface that supports the JANOS Management Protocol (JMP). This can replace all of the functionality of the legacy JNIOR Protocol while providing much more capability. In addition, application programs can be created as custom Websocket servers.

SEE ALSO

HELP Topics: Websocket/Login, JMP

Websocket/Login Registry Key

NAME

Websocket/Login

DEFAULT

enabled

DESCRIPTION

The Websocket interface fully supports administrative management and data monitoring functions.It requires a successful login. When this service is accessed through a local website served by the WebServer the login credentials used to access the web pages are applied automatically to the Websocket interface. If you have disabled the WebServer login you will need to support the Websockets login or otherwise set this key to disabled. This is not recommended as anyone can then do anything with the JNIOR.

SEE ALSO

HELP Topics: Websocket/Anonymous, WEBSOCKET

Websocket/Anonymous **Registry Key**

NAME

Websocket/Anonymous

DEFAULT

None

DESCRIPTION

Defines the user name or ID for anonymous logins. When a Websocket connection requires a login (default) the login must reference a defined username using the correct password for that account. In order to accommodate a scheme whereby data monitoring would not require login but control or configuration would, JANOS allows for anonymous login. When the Websocket/Anonymous key is defined (exists) and the Websocket/Login key is set to disabled, anonymous login is allowed. The key must contain a valid user name or ID for a user account with the permissions appropriate for anonymous use. To prevent anonymous login this key should be removed from the Registry.

SEE ALSO

HELP Topics: Websocket/Files, Websocket/Login, USERS

Websocket/Files **Registry Key**

NAME

Websocket/Files

DEFAULT

enabled

DESCRIPTION

The built-in Websocket interface supports file management. Files may be listed, read, written, renamed and deleted. Similarly folders can be created, renamed and removed. For additional security this feature can be disabled with this key. This removes the file management function from the interface (after a reboot). This key also signals the WebUI to remove the File Folders tab.

SEE ALSO

HELP Topics: Websocket/Console, FILES

Websocket/Console **Registry Key**

NAME

Websocket/Console

DEFAULT

enabled

DESCRIPTION

Each connection to the built-in Websocket interface can support a single command line (console) session. For additional security this feature can be disabled by this key. This removes the console functionality from the Websocket interface (after reboot). The key also signals the WebUI to remove the Console tab.

SEE ALSO

HELP Topics: WEBSOCKET

JMPServer/Server Registry Key

NAME

JMPServer/Server

DEFAULT

enabled

DESCRIPTION

This can be used to disable the JMP Server. This may be desirable if communications with JNIOR will be through some other means and connections to the JMP Port are to be ignored. Changes take effect on reboot.

SEE ALSO

HELP Topics: JMPServer/Port, JMP

JMPServer/Port Registry Key

NAME

JMPServer/Port

DEFAULT

9220

DESCRIPTION

This defines the TCP/IP port on which JNIOR will listen for JMP connections. The default port is 9220. Changes take effect on reboot.

SEE ALSO

HELP Topics: JMP

JMPServer/Login Registry Key

NAME

JMPServer/Login

DEFAULT

enabled

DESCRIPTION

By default the JMP server requires a successful login. This is achieved as part of the protocol. Login is highly recommended. If the JNIOR is connected to a private secure network this login requirement can be removed by setting this Registry key to disabled. The change takes effect immediately. Note that this requires that JMPServer/Anonymous be set.

SEE ALSO

HELP Topics: JMPServer/Anonymous, JMP

JMPServer/Anonymous Registry Key

NAME

JMPServer/Anonymous

DEFAULT

None

DESCRIPTION

Defines the user name or ID applied to anonymous logins. When the JMP server requires a login (default) the login must reference a defined username using the correct password for that account. In order to accommodate a scheme whereby data monitoring would not require login but control or configuration would, JANOS allows for anonymous login. When the JMPServer/Anonymous key is defined anonymous login is allowed. The key must contain a valid Username or ID defining a user account with the permissions appropriate for anonymous use. To prevent anonymous login this key should be removed from the Registry.

NOTES

The User name or ID for any user account can be found using the USERS command at the command line prompt.

SEE ALSO

HELP Topics: JMPServer/Login, JMP, USERS

JniorServer/Server Registry Key

NAME

JniorServer/Server

DEFAULT

enabled

DESCRIPTION

This entry can be used to disable the JNIOR Server. This protocol should be disabled if the JANOS Management Protocol (JMP) is used routinely. Changes take effect on reboot.

SEE ALSO

HELP Topics: JniorServer/Port, JPROTOCOL, JMP

JniorServer/Port   Registry Key

NAME

JniorServer/Port

DEFAULT

9200

DESCRIPTION

This defines the TCP/IP port on which JNIOR will listen for protocol connections. The default port is 9200. Changes take effect on reboot.

SEE ALSO

HELP Topics: JniorServer/Login, JPROTOCOL

JniorServer/Login   Registry Key

NAME

JniorServer/Login

DEFAULT

enabled

DESCRIPTION

By default the JNIOR protocol requires a successful login. This is achieved through a function as part of the protocol. It is highly recommended that Login be accommodated. If the JNIOR is connected to a private secure network this login requirement may be removed. Set this Registry key to disabled. The change takes effect immediately. Note that this requires that JniorServer/Anonymous be set.

SEE ALSO

HELP Topics: JniorServer/Anonymous, JPROTOCOL

JniorServer/Anonymous   Registry Key

NAME

JniorServer/Anonymous

DEFAULT

Defines the user name or ID applied to anonymous logins. When the JNIOR protocol requires a login (default) the login must reference a defined username using the correct password for that account. In order to accommodate a scheme whereby data monitoring would not require login but control or configuration would, JANOS allows for an anonymous login. When this Registry key is defined anonymous login is allowed. The key must contain a valid user name or ID for a user account with the permissions appropriate for anonymous use. To prevent anonymous login this key should be removed from the Registry.

The user name or ID for accounts can be found using the USERS command at the command line prompt.

SEE ALSO
HELP Topics: JniorServer/RemoteIP, JniorServer/Login, JPROTOCOL, USERS

JniorServer/RemoteIP Registry Key

NAME
JniorServer/RemoteIP

DEFAULT
None

DESCRIPTION
The JNIOR protocol server can be configured to maintain a outbound connection to an external JNIOR protocol server. This Registry key defines the IP address of the remote connection point. Once defined the connection will be established.

Outbound connections allow JNIOR communications between an Internet server and individual devices behind a firewall or NAT router. This is best accomplished with an application program which can be written to handle custom protocols as may be required for such a system. The JNIOR Protocol is a binary master-slave interface that takes some care in implementation. The protocol includes unsolicited messages as well which are often overlooked.

SEE ALSO
HELP Topics: JniorServer/RemotePort, JPROTOCOL

JniorServer/RemotePort Registry Key

NAME
JniorServer/RemotePort

DEFAULT
9200

DESCRIPTION
The JNIOR protocol server can be configured to make an outbound connection to one remote host.This is enabled using the JniorServer/RemoteIP Registry key and the Port number may be specified by this key.

SEE ALSO
HELP Topics: JniorServer/RemoteIP, JPROTOCOL

FTP/Server Registry Key

NAME
FTP/Server

DEFAULT
enabled

DESCRIPTION
JANOS supports a fully functional File Transfer Protocol (FTP) server. This FTP Server provides one of the methods available for moving files on and off of the JNIOR.

This Registry key can be used to disable the FTP Server for added security. Changes take effect on reboot.

SEE ALSO
HELP Topics: FTP/Port, FTPCLIENT

FTP/Port Registry Key

NAME
FTP/Port

DEFAULT
21

DESCRIPTION
This defines the TCP/IP port on which JNIOR will listen for FTP command connections. The standard port is 21.

SEE ALSO
HELP Topics: FTP/UnixStyle, FTPCLIENT

FTP/UnixStyle Registry Key

NAME
FTP/UnixStyle

DEFAULT
disabled

DESCRIPTION
The specification for the File Transfer Protocol (FTP) does not specify the format for directory listings. Originally the detail was only for display and could be in the system’s native format. There are two generally used layouts. Systems based on the Windows operating system provide an MS-DOS style listing while most others provide a Unix format. JANOS provides the MS-DOS style by default.

FTP clients typically now need to interpret the listing for graphical display and tracking of directory/folder content. Most client programs will detect the formatting and process the content as needed. Other clients might expect one style or the other.

If an FTP client has difficulty retrieving the directory listing from the FTP Server you may set this Registry Key to enabled. The FTP Server will then supply the Unix formatted directory listing when requested.

SEE ALSO

HELP Topics: FTP/Server, FTPCLIENT

Telnet/Server Registry Key

NAME

Telnet/Server

DEFAULT

enabled

DESCRIPTION

JANOS supports a Telnet server providing access to the Console or Command Line Interface (CLI). Telent simulates serial communications in this case similar to a connection to the RS-232 COM port. Both are a means of working with the command line interface. This is typically used for product configuration, maintenance and diagnostics.

This Registry entry can be used to disable the Telnet Server for increased security. Changes take effect on reboot. The Console is also available through SSH and the WebUI.

SEE ALSO

HELP Topics: Telnet/Port, COM

Telnet/Port Registry Key

NAME

Telnet/Port

DEFAULT

23

DESCRIPTION

This defines the Telnet port. The standard TCP/IP port is 23. A unique port may be used for increased security.

SEE ALSO

HELP Topics: Telnet/Server, COM

SSH/Server **Registry Key**

NAME

SSH/Server

DEFAULT

enabled

DESCRIPTION

Beginning with JANOS v2.5 the JNIOR supports Secure Shell (SSH) connections. This is another means by which the Comand Line Interface (CLI) may be utilized interactively or, with SSH, to execute individual commands remotely. SSH uses cryptographic techniques to both authenticate the JNIOR and establish an encrypted/secure connection. This is typically used for product configuration, maintenance and diagnostics.

The standard SSH port is 22. This is currently fixed and cannot be altered.

This Registry entry can be used to disable the SSH Server for increased security. Changes take effect on reboot. The Console is also available through Telnet and the WebUI.

SEE ALSO

HELP Topics: COM

Beacon/Enabled **Registry Key**

NAME

Beacon/Enabled

DEFAULT

enabled

DESCRIPTION

The BEACON protocol service is used to identify JNIORs on the network, configure IP addressing, and provide management functions. The protocol allows us to communicate with a JNIOR on the local network segment even when its IP configuration is faulty or set for a foreign network. Changes to Registry settings in this section require a reboot in order to become effective.

For added security this protocol may be disabled using this Registry key. The BEACON protocol is required for proper operation of the Support Tool. JANOS also uses this protocol to identify peers on its local network.

SEE ALSO

HELP Topics: Beacon/Announce

Beacon/Announce Registry Key

NAME

Beacon/Announce

DEFAULT

enabled

DESCRIPTION

The BEACON protocol service by default announces the presence of the JNIOR on the network using a broadcast UDP communication. The Support Tool uses this to list local JNIORs on the Beacon tab. This feature may be disabled for added security by setting this key to disabled.

NOTES

On boot JANOS issues a QUERY_ALL BEACON request requesting announcements from its peers on the local network segment.

SEE ALSO

HELP Topics: Beacon/AutoAnnounce

Beacon/AutoAnnounce Registry Key

NAME

Beacon/AutoAnnounce

DEFAULT

disabled

DESCRIPTION

The BEACON protocol service announces the JNIOR on boot by default using a UDP broadcast. This also occurs whenever key configuration settings are changed. There will be otherwise extended periods without any announcement. This Registry Key may be used to actively monitor the health of the JNIOR. The JNIOR will emit a periodic announcement every 30 seconds when this key is set to enabled.

NOTES

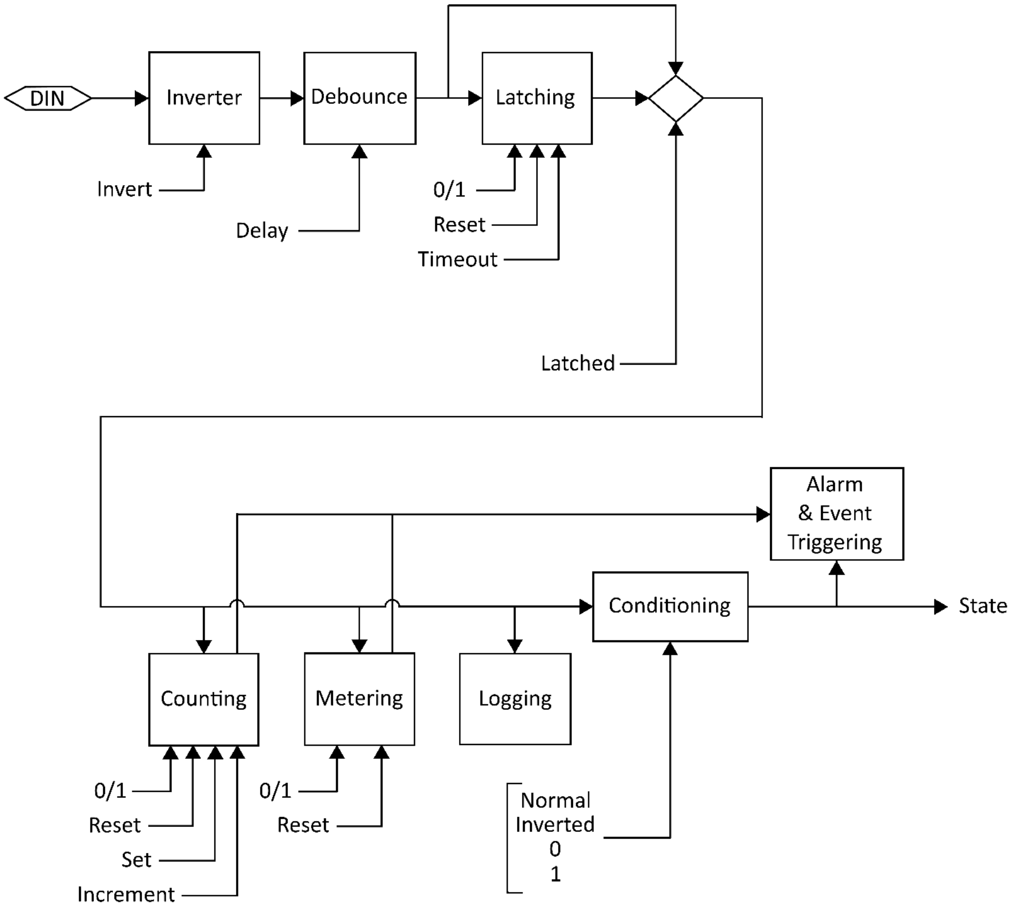
The BEACON broadcasts on UDP Port 4444. Each pack is minimal and while such broadcasts are persistent they do not significantly impact overall network bandwidth.

SEE ALSO

HELP Topics: Beacon/Enabled

OVERVIEW

Digital inputs may be configured in a number of ways to achieve the desired functionality. Each Digital Input is processed as follows:



1. Sampled (Hardware)
2. Inversion
3. Debounce
4. Latching
5. Counting
6. Metering
7. Logging
8. Conditioning
9. Alarming
10. State Reported

All of the above steps are configurable through the WebUI and follow the resulting Registry key settings.

REGISTRY NAMING

Each Digital Input has its own Registry section (node) which is numerically defined. Presently there can be 4, 8 or 12 inputs depending on the JNIOR model. Here we use [DIN] as a placeholder for the appropriate section name. For example using 'din3' for Digital Input 3 we can set a text description as follows:

```
reg IO/Inputs/din3/Desc = "Power Enabled"
```

NOTES

Registry keys are not case-sensitive however case is preserved when a key is first defined. This improves readability without causing difficulty in referencing keys.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Desc, REG, MODELS, INPUTS

Inversion **Inputs**

DESCRIPTION

A Digital Input may be configured to be read as ON when no voltage is applied to the input and be considered OFF when the LED associated with the input is actually illuminated. This is the case when the input is 'Inverted'.

The inversion can be accomplished in two different ways. The input signal may be inverted as it is sampled by the system. It can also be inverted as it is reported by the system. The difference is in how other input features perceive the input state.

Sampled Inversion

The input Debounce, Latching, Counting, Metering, and Logging features operate on the input state as it is sampled. When Inversion is applied to the sampled input all of these features see and respond to the inverted input state. This is useful in accommodating an input signal whose voltage works with opposite meaning (5VDC means not active for instance).

Conditioned Inversion

When an application uses an input state in a sense opposite in meaning to the signal itself, it may be appropriate to invert the reported state. In this case input features work logically and the application is still satisfied. The *Inversion* is applied as a form of state *Conditioning* prior to reporting.

NOTES

State Alarming reflects the reported state. Counting and Metering (Usage) alarms result from the sampled state.

Both Counting and Metering can be configured to respond to either a '0' or '1' state. In effect these each have their own type of inversion. There is sufficient flexibility to accommodate whatever is needed.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Inversion, IO/Inputs/[DIN]/Conditioning

Debouncing Inputs

DESCRIPTION

Relays and switches have mechanical contacts which physically make or break a circuit. Rarely will the contacts come together solidly or separate decisively without bouncing (briefly making and breaking the circuit). This can raise havoc with digital latching and counting circuits that might be monitoring through the relay/switch contact. It can result in latching at the wrong time (when the relay opens for instance) or in extra counts. Both are undesirable.

An input transition is sampled on either the input turning ON or turning OFF.

When an input changes after being stable longer than the defined Debounce delay the input transition is immediately reported and processed. This eliminates filtering delay.

The Debounce delay timer is restarted with each input transition. When the timer is active additional transitions are not processed. This ignores noise from switch and relay contact bounce.

When the Debounce timer expires the state of the input is updated to reflect its current status. In effect this accomplishes pulse stretching. A short input pulse shorter than the defined delay will activate the input which will remain active until the delay expires. This can be long after the pulse completed.

NOTES

Another way to capture short input pulses is Latching. This can be configured to accomplish pulse stretching as well. Additionally a pulse may be captured and require a manual reset through Latching.

Debounce can also be used to achieve a stable state detecting the presence of an AC voltage. In order to avoid counting each period of a 60Hz AC voltage the Debounce setting needs to be at least 167 milliseconds. The default setting of 200 milliseconds is perfect for that. The input detects the presence of the voltage and gives a steady ON result. Note though that an input is rated only to 30V.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Debounce, INPUTS, LATCHING

Latching Inputs

DESCRIPTION

When pulsed signals are applied to a Digital Input the input state may change so fast that it cannot be seen or detected by an application. The solution is to capture the pulse and hold the signal state long enough to be detected and then processed. An input can be configured to latch on either the 1 (ON) state or the 0 (OFF) state. A pulse as short a 1 millisecond can be detected.

Once latched a timer can be configured to reset the latch after a period suitable for the application. Alternatively the latch might hold the condition indefinitely until it is manually reset or acknowledged by the application programming. This may be appropriate in a fire alarm situation.

NOTES

Pulses may also be stretched using Debounce.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Latching, DEBOUNCE

Logging Inputs

DESCRIPTION

Individual changes in I/O state are accurately logged. The IOLOG command can be used to display and save I/O logs. Applications have the ability to query I/O log detail with sufficient accuracy to calculate information such as the RPM (Revolutions Per Minute) of a wind turbine both at high speeds and very low speeds (fractions of RPM). The I/O logs can be used in preference to monitoring the input state itself.

EXAMPLE

I/O Log content:

```
    06/10/21 13:00:45.487, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
    06/11/21 11:10:41.197, DIN ---- 0000 0000, RLY ---- ---- 0000 0001
    06/11/21 11:10:41.297, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
    06/11/21 13:23:29.008, DIN ---- 0000 0000, RLY ---- ---- 0000 0001
    06/11/21 13:23:31.008, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
    06/11/21 13:23:34.813, DIN ---- 0000 0000, RLY ---- ---- 0000 0001
    06/11/21 13:23:34.913, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
    06/11/21 13:28:30.665, DIN ---- 0000 0000, RLY ---- 0001 0000 0000
    06/11/21 13:28:39.023, DIN ---- 0000 0000, RLY ---- 0001 0000 0010
    06/11/21 13:30:24.665, DIN ---- 0000 0000, RLY ---- 0000 0000 0000
```

Note that in this example an external Power 4ROUT was added a one point and one of its relays closed and later opened.

NOTES

High frequency input signals can impact product performance and logging for individual inputs may be disabled if that is of concern. It may be more that a frequently changing signal may mask the activity of other inputs given that the I/O log queue itself is of a fixed size.

SEE ALSO

HELP Topics: IO/Inputs/Log, IOLOG, JRMON

IO/Inputs/Log   Registry Key

NAME

IO/Inputs/Log

DEFAULT

enabled

DESCRIPTION

This key can be used to disable logging of all of the Digital Inputs regardless of the logging settings for individual inputs. This setting does require a reboot to take effect.

NOTES

You might consider disabling input logging if input signals change more than a few times per second. Applications however can refer to the I/O log to perform calculations such as averaging for reporting information such as Revolutions per Minute (RPMs).

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Log, LOGGING, IOLOG

Metering   Inputs

DESCRIPTION

JANOS performs Usage Metering for both Ditigal Inputs and Relay Outputs. This tallies the amount of time that either input or output remains in a defined state. By default this is the ON or 1 state for inputs and the CLOSED or 1 state for relays. The accumulated time is maintained to the millisecond and can be viewed through the Registry to the tenth of an hour. The JRMON command can also display usage meters. These are also displayed by the WebUI.

These meters may be used for preventative maintenance. A Usage Alarm can be enabled to transmit an email notification when a service interval may be approaching.

SEE ALSO

HELP Topics: $HOURMETER, JRMON, DIN

Counting   Inputs

DESCRIPTION

JANOS tallies the number of times a Digital Input enters a predefined state. By default the count reflects the ON or 1 input state. A counter is advanced each time the input transitions from the OFF 0 state to the ON 1 state.

The counters may be viewed, set and reset using the JRMON command. They are also displayed by the WebUI. Applications may also utilize and manage counts.

Alarms may be set and configured to send an email when counts reach either of two separate trigger points (Alarm1 and Alarm2).

SEE ALSO

HELP Topics: ALARMING, DIN, JRMON

Alarming **Inputs**

DESCRIPTION

JANOS is capable of handling a number of Alarm situations. These are events that can be enabled to preform an action or issue a notification. By default a notification can be configured. Applications can be written to respond to alarms and take other actions. Alarms are reported externally through the JMP and JNIOR protocols.

Input Alarms may be defined to react to a specific input state. For example an input wired to a door sensor may be configured to send an email when going to the ON state.

Alarms may be generated when an Input Counter reaches predefined values. Two separate input counter alarm trigger points may be defined: Alarm1 and Alarm2.

And finally, an alarm may be triggered with an Digital Input or a Relay Output reaches a predefined Usage Metering hour total.

SEE ALSO

HELP Topics: JMP, JPROTOCOL, Events/OnAlarm, EventsOnAlarm1, Events/OnAlarm2
Events/OnUsage

Text Descriptions **Registry Key**

NAME

IO/Inputs/[DIN]/Desc

DEFAULT

"Digital Input ##"

DESCRIPTION

This defines a textual description for the associated Digital Input. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application desiring a description for the input.

ON STATE

IO/Inputs/[DIN]/OnDesc

DEFAULT

"On"

DESCRIPTION

This defines the text used to describe the state when the associated input is ON. By default an input is considered to be ON when sufficient voltage is applied illuminating the associated LED.

This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application desiring a description for the input state.

NOTES

An input may be configured to be Inverted either as JANOS perceives the input state or as it is reported. The associated LED follows the voltage state of the input. Depending on configuration the system may report a different condition.

OFF STATE

IO/Inputs/[DIN]/OffDesc

DEFAULT

"Off"

DESCRIPTION

This defines the text used to describe the state when the associated input is OFF. By default an input is considered to be OFF when the associated LED is not illuminated.

This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application desiring a description for the input state.

NOTES

An input may be configured to be Inverted either as JANOS perceives the input state or as it is reported. The associated LED follows the voltage state of the input. Depending on configuration the system may report a different condition.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Inversion, DIN, INPUTS

IO/Inputs/[DIN]/Inversion   Registry Key

NAME

IO/Inputs/[DIN]/Inversion

DEFAULT

disabled

DESCRIPTION

When this Registry key is enabled the JNIOR will invert the sense of the Digital Input as it is sampled. When enabled the input will be considered OFF when sufficient voltage is applied to the external circuit causing the associated LED to be illuminated.

This inversionis applied immediately to the input and affects all other subsequent functions (Debounce, Latching, Alarming, Counting, etc.).

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Conditioning, DIN

IO/Inputs/[DIN]/Conditioning Registry Key

NAME

IO/Inputs/[DIN]/Conditioning

DEFAULT

0 (Normal)

DESCRIPTION

The input state may be Cconditioned prior to being reported and after all other operations. By default the input state is as reported by the latching or debounce stages (Mode 0). You may configure inversion here or force the input to be always read as 0 (OFF) or 1 (ON). Note that counting and usage metering remain operational even when inputs are forced to a fixed state. The following settings are valid:

0	Normal (no change)
1	Inverted
2	Forced to 0 (OFF) state
3	Forced to 1 (ON) state

A value other than those above will be handled as if set to the default.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Debounce, DIN, INVERSION

IO/Inputs/[DIN]/Debounce Registry Key

NAME

IO/Inputs/[DIN]/Debounce

DEFAULT

200 (milliseconds)

DESCRIPTION

This defines the Debounce Delay in milliseconds.

Relays and switches have mechanical contacts which physically make or break a circuit. Rarely will the contacts come together solidly or separate decisively without bouncing(briefly making and breaking the circuit). This can raise havoc with digital latching and counting circuits that might be monitoring through the relay/switch contact. It can result in latching at the wrong time (when the relay opens for instance) or in extra counts. Both are undesirable.

By default the JNIOR digital inputs are debounced . An input must remain quiet (not change) for the specified delay before any transition on that input will be processed (latched, counted or logged).

This is sufficient to eliminate most all of the issues arising from contact bounce.

A setting of 0 disables the debounce. In this case the JNIOR is capable of counting transitions occurring at rates up to roughly 1,800 per second.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Latching, DEBOUNCE, DIN

IO/Inputs/[DIN]/Latching Registry Key

NAME

IO/Inputs/[DIN]/Latching

DEFAULT

disabled

DESCRIPTION

Enable this Registry key when the associated input is to be latched. When enabled, the input will be considered to remain in the state defined by the LatchState setting after the voltage applied to the external input is changed. If the LatchTimeis set to 0 seconds the User must manually reset the input. This can be done through the WebUI or other application.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/LatchTime, IO/Inputs/[DIN]/LatchState, DIN

IO/Inputs/[DIN]/LatchTime Registry Key

NAME

IO/Inputs/[DIN]/LatchTime

DEFAULT

0.0 (seconds)

DESCRIPTION

This defines the time in seconds (0.1 equals 100 milliseconds) that an input remains latched before being automatically reset. A value of 0.0 will require the user to separately reset the latched input through an application or the JRMON command.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/LatchState, DIN, JRMON

IO/Inputs/[DIN]/LatchState Registry Key

NAME

IO/Inputs/[DIN]/LatchState

DEFAULT

1 (ON)

DESCRIPTION

When Latching is enabled this specifies whether the input is latched in the ON state (1) or in the OFF state. The key is set to 1 or 0 respectively.

SEE ALSO

HELP Topics: LATCHING, DIN

IO/Inputs/[DIN]/Log Registry Key

NAME

IO/Inputs/[DIN]/Log

DEFAULT

enabled

DESCRIPTION

This key can be optionally used to disable logging on an input by input basis. If an input is going to be rapidly changing the time spent in the logging process can degrade system performance. In such circumstances it is suggested that logging can be disabled for the input.

SEE ALSO

HELP Topics: IO/Inputs/Log, LOGGING, IOLOG

IO/Inputs/[DIN]/$HourMeter Registry Key

NAME

IO/Inputs/[DIN]/$HourMeter

DESCRIPTION

This dynamic key reports the total number of hours that a digital input has physically been in the state specified by UsageState . This value is nonvolatile and maintains its content through power removal and until it is specifically reset. It is reported here in hours to the one-hundredth. The Hour Meteris accurate to the millisecond and this high resolution value may be read through the JMP Protocol, the JNIOR Protocolor using the JRMON command.

SEE ALSO

HELP Topics: METERING, JMP, JPROTOCOL, JRMON, DIN

IO/Inputs/[DIN]/Alarming   Registry Key

NAME

IO/Inputs/[DIN]/Alarming

DEFAULT

disabled

DESCRIPTION

When enabled an alarm is generated when then associated input enters the specified state. By default the alarm is issued when the conditioned state for the input indicates that the input has turned ON.

NOTES

Inputs may be inverted when sampled, latched and/or conditioned prior to being monitored for alarming.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Alarm/Inversion, DIN, INVERSION, LATCHING CONDITIONING, ALARMING

IO/Inputs/[DIN]/Alarm/Inversion   Registry Key

NAME

IO/Inputs/[DIN]/Alarm/Inversion

DEFAULT

disabled

DESCRIPTION

This setting defines the state triggering the alarm. Enable this key when the associated input is to alarm upon entering the OFF state. This inverts the input state prior to alarm monitoring and essentially changes the triggering state. By default an alarm normally is generated when the input turns ON.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Alarm/Email, ALARMING, DIN

IO/Inputs/[DIN]/Alarm/Email   Registry Key

NAME

IO/Inputs/[DIN]/Alarm/Email

DEFAULT

disabled

DESCRIPTION

This key enables Email Notifications in response to a Digital Input state Alarm.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Alarm/EmailBlock, ALARMING, DIN

IO/Inputs/[DIN]/Alarm/EmailBlock Registry Key

NAME

IO/Inputs/[DIN]/Alarm/EmailBlock

DEFAULT

None

DESCRIPTION

This may be used define a custom Email Notification message transmitted when the input state alarm is triggered.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Alarm/HoldOff, EMAIL_BLOCK, ALARMING, DIN

IO/Inputs/[DIN]/Alarm/HoldOff Registry Key

NAME

IO/Inputs/[DIN]/Alarm/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Digital Input state alarm must remain clear before any subsequent state alarm for this input will be acted upon. The default is 300000 or 5 minutes. When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again. Even at this setting an email notification could be sent once every 5 minutes if the input is actively changing.

SEE ALSO

HELP Topics: ALARMING, DIN

IO/Inputs/[DIN]/CountState Registry Key

NAME

IO/Inputs/[DIN]/CountState

DEFAULT

1 (ON)

DESCRIPTION

This specifies whether an input transition from OFF to ON is counted (1) or if the transition from ON to OFF is counted. The key is set to either 1 or 0 respectively. By default the counters are advanced when the input state transitions from OFF 0 to ON 1.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Count/Units, COUNTING, DIN

IO/Inputs/[DIN]/Count/Units   Registry Key

NAME

IO/Inputs/[DIN]/Count/Units

DEFAULT

"counts"

DESCRIPTION

This defines the text decribing the units to be displayed with the associated input counter. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description of the count units.

The units of count may vary depending on the scaling and sampling options used. By default input transitions are simply counted and the counts are reported.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Count/Multiplier, COUNTING, DIN

IO/Inputs/[DIN]/Count/Multiplier Registry Key

NAME

IO/Inputs/[DIN]/Count/Multiplier

DEFAULT

0.0

DESCRIPTION

When the Count Multiplieris set to 0.0 (default) the absolute counter value is displayed. When a non-zero multiplieris specified the value is used to scale the counter value for display. The scaled counter value is also used for count alarm trigger points.

Input pulses are counted and each count may represent some incremental value of a quantity measured by the remote sensor. For instance each pulse might indicate that 5 gallons of water has passed through a flow sensor. Im this example you might set the multiplier IO/Inputs/[DIN]/Count/Multiplier to 5.0 and the reported units IO/Inputs/[DIN]/Count/Units to "Gallons". The WebUI would then report the accumulated gallons as measured.

SEE ALSO

HELP Topics: IO/Inputs/[DIN]/Count/SampleTime, IO/Inputs/[DIN]/Count/Units
COUNTING, DIN

IO/Inputs/[DIN]/Count/SampleTime Registry Key

NAME

IO/Inputs/[DIN]/Count/SampleTime

DEFAULT

0.0 (seconds)

DESCRIPTION

This defines a sampling period in seconds. A fractional value may be specified.

Normally Counts accumulate until reset separately by the user threw the WebUI, JRMON or other application. This is the case when SampleTime is set to 0.0 (default). When a nonzero time is defined the counter displays the total count accumulated during that period. For instance, with the appropriate combination of Multiplier and SampleTime the counter can display Revolutions Per Minute (RPM) for a input using a Hall Effect sensor mounted on a wheel hub.

NOTES

When RPM is measured in this fashion it is perhaps better to allow an application to perform the calculation. With access to the I/O log and the appropriate Java class the application can average pulses over a moving window or sample time for the accurate real-time measurement of high RPMs. When the wheel is rotating extremely slowly the application can then use the pulse-to-pulse timing to derive an estimate of fractional RPMs and even the rate of change. This would be a useful approach for use with a wind turbine as an example.

SEE ALSO

HELP Topics: JRMON, COUNTING, DIN

Count Alarms   Registry Key

ALARM ENABLES

IO/Inputs/[DIN]/Count/Alarm1
IO/Inputs/[DIN]/Count/Alarm2

DEFAULT

disabled

DESCRIPTION

Set to enable an alarm when the scaled countexceeds the Limit1 or Limit2 value as appropriate.

TRIGGER POINTS

IO/Inputs/[DIN]/Count/Limit1
IO/Inputs/[DIN]/Count/Limit2

DEFAULT

0 (zero)

DESCRIPTION

This defines the trigger point for the associated count alarm. An alarm can be generated when the scaled counter exceeds this value.

SEE ALSO

HELP Topics: COUNTING, DIN

Counter Alarm Email **Registry Key**

EVENT ENABLE

IO/Inputs/[DIN]/Alarm1/OnAlarm
IO/Inputs/[DIN]/Alarm2/OnAlarm

DEFAULT

disabled

DESCRIPTION

Set this key to enable services related to the occurrence of Digital Input Counter Alarms on this input.

HOLDOFF

IO/Inputs/[DIN]/Alarm1/HoldOff
IO/Inputs/[DIN]/Alarm2/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Digital Input counter alarm must remain clear before any subsequent alarm on this input will be acted upon. The default is 300000 or 5 minutes.

When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again.

EMAIL ENABLE

IO/Inputs/[DIN]/Alarm1/Email
IO/Inputs/[DIN]/Alarm2/Email

DEFAULT

disabled

DESCRIPTION

This Registry key enables the Alarm Notification email.

CUSTOM EMAIL NOTIFICATION

IO/Inputs/[DIN]/Alarm1/EmailBlock
IO/Inputs/[DIN]/Alarm2/EmailBlock

DEFAULT
    None

DESCRIPTION
    This may be used define a block that creates a unique Alarm Notification message.

SEE ALSO
    HELP Topics: EMAIL_BLOCK, COUNTING, DIN

Usage **Registry Key**

METERED STATE
    IO/Inputs/[DIN]/UsageState

DEFAULT
    1 (ON)

DESCRIPTION
    This specifies whether usage time is accumulated with the input in the ON state (1) or in the OFF state (0). The key is set to 1 or 0 respectively.

ALARM ENABLE
    IO/Inputs/[DIN]/Usage/Alarm

DEFAULT
    disabled

DESCRIPTION
    Set this Registry key to enable an alarm when the associated usage meter reaches a specified number of hours.

USAGE LIMIT
    IO/Inputs/[DIN]/Usage/Limit

DEFAULT
    0.0

DESCRIPTION
    Defines the alarm setpoint in hours and fractions of hours. The associated input goes into alarm when the usage meter reported by $HourMeter reaches or exceeds this setpoint.

EVENTS ENABLE
    IO/Inputs/[DIN]/Usage/OnAlarm

DEFAULT
    disabled

DESCRIPTION

This key may be optionally defined to enable services related to Digital Input Usage Alarms.

EMAIL ENABLE

IO/Inputs/[DIN]/Usage/Email

DEFAULT

disabled

DESCRIPTION

This Registry key enables Usage Notification email.

CUSTOM NOTIFICATION

IO/Inputs/[DIN]/Usage/EmailBlock

DEFAULT

None

DESCRIPTION

This may be used define a block that creates a unique Usage Notification message.

HOLDOFF

IO/Inputs/[DIN]/Usage/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Digital Input usage alarm must remain clear before any subsequent usage alarm on this input will be acted upon. The default is 300000 or 5 minutes.

When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again.

SEE ALSO

HELP Topics: $HOURMETER, JRMON, DIN

Relay Outputs **Registry Key**

OVERVIEW

The following keys are associated with the Relay Outputs. In each of the keys replace the [ROUT] with the appropriate string with channel number ROUT1 thru ROUT16 depending on the configuration. The Model 410 has 8 relay outputs while the Model 412 has 12 and the Model 414 only 4. Power 4ROUT Expansion Modules may be added to provide additional relays. The first 16 are addressable through the Registry.

IO/Outputs/[ROUT]/Desc Registry Key

NAME

IO/Outputs/[ROUT]/Desc

DEFAULT

"Relay Output ##"

DESCRIPTION

This defines the textual description for the associated Relay Output. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description.

CLOSED STATE

IO/Outputs/[ROUT]/ClosedDesc

DEFAULT

"Closed"

DESCRIPTION

This defines the text shown when the associated relay has been activated and is in the CLOSED state. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description of the output status.

OPEN STATE

IO/Outputs/[ROUT]/OpenDesc

DEFAULT

"Open"

DESCRIPTION

This defines the text shown when the associated relay is in the OPEN state. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description of the output status.

IO/Outputs/[ROUT]/InitialState Registry Key

NAME

IO/Outputs/[ROUT]/InitialState

DEFAULT

undefined

DESCRIPTION

This key is used to define the initial behavior of relay outputs on boot.

The value defines a pulse duration in milliseconds where an entry of 0 indicates infinity. Setting the key to a value of 0 would effectively close the output. Setting the key to a positive integer would cause the output to pulse for the duration defined by the value An undefined or negative value (default) results in no action.

NOTES

On power up all relays are in the inactive state. By default that is the OPEN state where the contacts are not conducting. These are Normally Open (NO) contacts. Depending on the model certain relays may be reconfigured by internal jumper to be Normally Closed (NC). These would be conducting after boot. Consider this option if you need a relay to conduct when the JNIOR is powered down or after it reboots.

IO/Outputs/[ROUT]/$HourMeter Registry Key

NAME

IO/Outputs/[ROUT]/$HourMeter

DESCRIPTION

This dynamically reports the total number of hours that the relay output has been in the CLOSED state. This value is non-volatile maintaining content through power loss and until it is specifically reset. It is reported here in hours to the one-hundredth. The Hour Meteris accurate to the millisecond and this high resolution value may be read through the JMP Protocol, the JNIOR Protocolor using the JRMON command.

SEE ALSO

HELP Topics: JRMON, HOURMETER, JMP, JPROTOCOL

Usage Registry Key

NAME

IO/Outputs/[ROUT]/UsageState

DEFAULT

1 (CLOSED)

DESCRIPTION

This specifies whether usage time is accumulated when the relay is in the CLOSED state (1) or in the OPEN state (0). The key is set to 1 or 0 respectively.

Note that certain relays may be reconfigured from Normally Open (NO) to Normally Closed (NC) by jumper. This may affect the choice of metering state.

ALARM ENABLE

IO/Outputs/[ROUT]/Usage/Alarm

DEFAULT

disabled

DESCRIPTION

Set to enable an alarm when the associated usage meter reaches the Limit specified.

USAGE LIMIT

IO/Outputs/[ROUT]/Usage/Limit

DEFAULT

0.0

DESCRIPTION

Defines the alarm setpoint in hours and may include a fractional part. The associated relay output goes into alarm when the usage meter reaches or exceeds this setpoint.

EVENTS ENABLE

IO/Outputs/[ROUT]/Usage/OnAlarm

DEFAULT

disabled

DESCRIPTION

This key may be optionally defined to enable services related to Relay Output Usage Alarms.

EMAIL ENABLE

IO/Outputs/[ROUT]/Usage/Email

DEFAULT

disabled

DESCRIPTION

This Registry key enables Usage Notification email.

CUSTOM EMAIL NOTIFICATION

IO/Outputs/[ROUT]/Usage/EmailBlock

DEFAULT

None

DESCRIPTION

This may be used define a block that creates a unique Usage Notification message.

HOLDOFF

IO/Outputs/[ROUT]/Usage/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Relay Output usage alarm must remain clear before any subsequent usage alarm on this input will be acted upon. The default is 300000 or 5 minutes.

When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again.

SEE ALSO

HELP Topics: EMAIL_BLOCK

Output Logging **Registry Key**

LOGGING ENABLE

IO/Outputs/Log

DEFAULT

enabled

DESCRIPTION

This key can be used to disable logging of all of the Relay Outputs. This setting requires a reboot.

ENABLE BY OUTPUT

IO/Outputs/[ROUT]/Log

DEFAULT

enabled

DESCRIPTION

This key can be optionally used to disable logging on an output by output basis. If an output is going to be rapidly changing the time spent in the logging process can degrade system performance. In such circumstances it is recommended that logging be disabled for the relay output.

NOTES

The logging process would impact performance significantly with Series 3 JNIOR (Models 310, 312 and 314). This was due to the fact that I/O changes were immediately logged to the jniorio.log file. With Series 4 JNIOR (Models 410, 412, 414 and 412DMX) I/O changes are queued in high-speed local memory. This process has little if any impact on performance. The jniorio.log file is then generated on-demand using the IOLOG console command.

SEE ALSO

HELP Topics: IOLOG

Serial Comm   Registry Key

OVERVIEW

The JNIOR (Models 410, 412 and 414) support two serial ports, the COM RS-232 Port and the AUX Serial port. Both ports may be used by application programs to communicate with and control other devices. By default the COM port provides Diagnostic output information which generally reports status during the boot process. Once the product is up and running the COM port may be used to access to the JANOS Command Line Console. This can be disabled using the MODE command to insure dedicated communications with external equipment.

The default communications parameters are 115.2K baud, 8 data bits, 1 stop bit with no parity or handshake. The COM port supports only 3-wire communications. This port does not include hardware handshake lines. The AUX port provides for RTS and CTS handshake signals which may be optionally enabled. In addition the AUX port on the Model 410 may be configured for RS-422 or RS-485 communications. In the latter case the output driver may be software controlled supporting multi-drop serial networks.

NOTES

Access to the Command Line Console may be enabled for the AUX Serial port on a session by session basis using the MODE command.

The AUX Serial port is also supported by the IOLOG command. A bi-directional transmission log is maintained showing recent communications. This data can be displayed or saved to an auxio.log file for further analysis. It is a very useful diagnostic tool.

The Model 412DMX eliminates the AUX Serial port. It is replaced by a dedicated DMX512 Universe 5-pin output.

SEE ALSO

HELP Topics: MODELS, COM, AUX, MODE, IOLOG

AUX Serial   Registry Key

OVERVIEW

The AUX Serial port is available on Models 410, 412, and 414 JNIOR products. It is located at the top of the JNIOR next to the POWER and Sensor Port Expansion Bus connections. This port supports RS-232 communications with optional capability for RTS/CTS hardware handshake. A software XON/XOFF handshake for pacing communications is also possible.

The Model 410 additionally supports RS-422 and RS-485 communications that provide longer distance communications capabilities or multi-device serial networking. It is possible to configure a Model 410 to generate a standard DMX512 Universe output for controlling stage lighting.

NOTES

The AUX Serial Port is not available on the Model 412DMX. This is replaced by a dedicated 5-pin DMX output channel.

SEE ALSO
HELP Topics: AUX_PORT

AUX Serial **Registry Key**

BAUDRATE
AUXSerial/Baudrate

DEFAULT
115200 (115.2 kBaud)

DESCRIPTION
The default baud rate is 115.2K baud. The communications baud rate may be modified through this Registry key either directly, by application program or using the WebUI. Valid settings are:

250000, 128000, 115200, 57600, 38400, 31250, 28800, 19200,
14400, 9600, 4800, 2400, 1200, 600, 300, 150, and 110

The 250K baud setting is for supporting the DMX512 standard used by stage lighting equipment over RS-485.

DATABITS
AUXSerial/Databits

DEFAULT
8 (bits)

DESCRIPTION
The default setting is 8 data bits. Valid settings are 7 and 8. The 7 data bit mode is most often used with either ODD or EVEN parity wherein the parity bit is added maintaining the normal 8 bit stream.

STOPBITS
AUXSerial/Stopbits

DEFAULT
1 (bits)

DESCRIPTION
The default setting is 1 stop bit. Valid settings are 1 or 2. The typical asynchronous receiver always recognizes the end of a character using a single stop bit since there can be any amount of time between characters unless the protocol specifically sets a timeout. The transmitter uses this stop bit setting to stretch the minimum time between characters by one extra bit time.

PARITY
AUXSerial/Parity

DEFAULT

NONE

DESCRIPTION

The default setting is for No Parity (NONE or 0). Valid settings are 0, 2 and 3 where 0 means No Parity or NONE, 2 indicates EVEN parity and 3 ODD parity. An additional bit is added to the transmitted stream when EVEN or ODD parity is specified. When either EVEN or ODD is specified the received data is expected to contain a parity bit which is checked and removed. This bit is in addition to that specified by the data bit setting.

SEE ALSO

HELP Topics: AUX_PORT, AUX_FLOW

AUXSerial/Flow Registry Key

NAME

AUXSerial/Flow

DEFAULT

0 (NO_CONTROL)

DESCRIPTION

The default setting is NO_CONTROL or 0 meaning that no flow control or handshaking either by hardware or software is used. For the AUX port the valid settings are:

0	(NO_CONTROL)
1	(RTSCTS_IN)
2	(RTSCTS_OUT)
3	(RTSCTS)
4	(XONXOFF_IN)
8	(XONXOFF_OUT)
12	(XONXOFF)

The RTSCTS_IN setting uses the available CTS hardware handshake line to control the flow of data from an external source (IN). To hold off incoming data the JNIOR activates the CTS line when internal buffers near capacity. In RTSCTS_OUT mode the AUX port monitors the RTS line and stops transmission when it is activated. The RTSCTS mode employs the handshake bidirectionally.

The XONXOFF_IN handshake transmits the XOFF character (Ctrl-S 0x13) when internal buffers reach capacity to hold off the incoming data. The XON character (Ctrl-Q 0x11) is later sent to resume communications. Similarly in XONXOFF_OUT mode the AUX port listens for the XOFF character and stops transmission when received. When a subsequent XON character is received the communications resume. Both the XON and XOFF characters are filtered from the stream. The XONXOFF setting applies these rules bidirectionally.

SEE ALSO

HELP Topics: AUX_PORT, AUX_RS485, ASCII

AUXSerial/RS485 Registry Key

NAME

AUXSerial/RS485

DEFAULT

disabled

DESCRIPTION

By default the RS485 mode is disabled. RS485 communications are only available with the Model 410 JNIOR. When enabled the RX, TX, RTS and CTS lines are reconfigured. The transmit drivers are disabled and can be controlled by the application program.

Originally the Model 410 JNIOR included internal jumpers allowing the unit to be configured for RS-422 or RS-485 wiring including optional termination resistors. In general these requirements are now achieved with external wiring. Some 410 PCBs still have an unpopulated location for jumpers that may be used.

SEE ALSO

HELP Topics: AUX_PORT, AUX_FLOW

COM Serial Registry Key

OVERVIEW

The COM RS-232 port is located at the bottom of the JNIOR next to the Ethernet LAN connector. This port supports 3-wire RS-232 communications with optional capability for software XON/XOFF handshake for pacing communications.

By default the COM port also provides diagnostic output during boot and serves as a serial access point to the Command Line Console. This port is available for connection to remote equipment.

In connecting a remote serial device it is recommended that you first use the AUX port. The AUX port is by default dedicated to application use; It is supported by IOLOG providing comprehensive transmission logging; It provides no unexpected output such as diagnostics; And, there are additional communications lines and communication modes.

NOTES

The MODE -S command can be used to silence diagnostic output and to disable access to the Command Line Console. The Boot Dialog may also be disabled through the WebUI under the Serial I/O Configruation tab.

SEE ALSO

HELP Topics: COM_PORT, AUX_PORT, MODE, IOLOG

COMSerial/BootDialog   Registry Key

NAME

COMSerial/BootDialog

DEFAULT

enabled

DESCRIPTIOTN

The COM port by default supplies reports during the boot process. Once the unit is up and running this port can also be used to access the command line console. When the port is employed in communicating with another device these messages can cause protocol issues. The unwanted messages can be disabled using this Registry key.

Note that the application program should also disable the boot dialog and command line capabilities to insure reliable port use. This is done using the com.integpg.comm.COMSerialPort.setBootDialog() static method. This can also be controlled from the command line using the MODE -S command.

Diagnostic port information is included in the jniorboot.log file. This eliminates the prior need to observe the boot through the serial port while debugging. Additionally, the jniorboot.log.bak file accumulates prior boot detail providing an expanded record of boot detail.

NOTES

Log retention can be greatly expanded by running the JBakup utility.

SEE ALSO

HELP Topics: COM_PORT, MODE, JBAKUP

COM Serial   Registry Key

BAUDRATE

COMSerial/Baudrate

DEFAULT

115200 (115.2 kBaud)

DESCRIPTION

The default baud rate is 115.2K baud. The communications baud rate may be modified through this Registry key either directly, by application program or using the WebUI. Valid settings are:

250000, 128000, 115200, 57600, 38400, 31250, 28800, 19200,
14400, 9600, 4800, 2400, 1200, 600, 300, 150, and 110

DATABITS

COMSerial/Databits

DEFAULT

8 (bits)

DESCRIPTION

The default setting is 8 data bits. Valid settings are 7 and 8. The 7 data bit mode is most often used with either ODD or EVEN parity wherein the parity bit is added maintaining the normal 8 bit stream.

STOPBITS

COMSerial/Stopbits

DEFAULT

1 (bits)

DESCRIPTION

The default setting is 1 stop bit. Valid settings are 1 or 2. The typical asynchronous receiver always recognizes the end of a character using a single stop bit since there can be any amount of time between characters unless the protocol specifically sets a timeout. The transmitter uses this stop bit setting to stretch the minimum time between characters by one extra bit time.

PARITY

COMSerial/Parity

DEFAULT

0 (NONE)

DESCRIPTION

The default setting is for No Parity (NONE or 0). Valid settings are 0, 2 and 3 where 0 means No Parity or NONE, 2 indicates EVEN parity and 3 ODD parity. An additional bit is added to the transmitted stream when EVEN or ODD parity is specified. When either EVEN or ODD is specified the received data is expected to contain a parity bit which is checked and removed. This bit is in addition to that specified by the data bit setting.

SEE ALSO

HELP Topics: COM_PORT, COM_FLOW

COMSerial/Flow **Registry Key**

NAME

COMSerial/Flow

DEFAULT

0 (NO_CONTROL)

DESCRIPTION

The default setting is NO_CONTROL or 0 meaning that no flow control or handshaking is used. For the COM RS-232 port the valid settings are:

```
0   (NO_CONTROL)
4   (XONXOFF_IN)
8   (XONXOFF_OUT)
12  (XONXOFF)
```

The COM port does not support hardware handshaking.

The XONXOFF_IN handshake transmits the XOFF character (Ctrl-S 0x13) when internal buffers reach capacity to hopefully hold off the incoming data. The XON character (Ctrl-Q 0x11) is later sent to resume communications. Similarly in XONXOFF_OUT mode the COM port listens for the XOFF character and stops transmission when received. When a subsequent XON character is received the communications resume. Both the XON and XOFF characters are filtered from the stream. The XONXOFF setting applies these rules bidirectionally.

SEE ALSO

HELP Topics: COM_PORT, ASCII

ZIP/JAR Compression   Registry Key

OVERVIEW

JANOS supports ZIP library files. In fact the WebServer uniquely uses a ZIP library to create virtual folders allowing an entire website to be contained within a single file. Applications written in Java utilize a JAR library which is nothing more than a renamed ZIP file.

ZIP/JAR files usually contain multiple files in an efficient compressed form. The compression is performed when files are added to a library. While there are optional compression algorithms, JANOS supports the DEFLATE compression. This is compatible with libraries generated by most systems.

The ARC command, and its aliases ZIP and JAR, can be used at the command line to manage a compressed library file. When adding files the necessary compression is handled by JANOS. There are a couple of options affecting the compression procedure and these are controlled by Registry settings. Changes in these settings do not affect the ability to extract files from libraries generated with other settings by the JNIOR or any remote PC.

SEE ALSO

HELP Topics: ZIP

Zip/Window   Registry Key

WINDOW PARAMETER

Zip/Window

DEFAULT

16384

DESCRIPTION

The DEFLATE algorithm compresses a file by locating combinations of bytes or characters that repeat. The redundancy is removed and replaced by an efficient pointer to the original grouping. The most efficient compression then would remove any and all redundant groups from an entire file. This is certainly possible for small files. With large files the pointers need to address data further and further away. As the distance grows so do the pointers and efficiency suffers. The solution is to limit the distance using a sliding window through the file.

By default JANOS uses a 16KB (16384 byte) sliding window. This Registry key may be used to adjust the window from a minimum of 2KB (2048) to a maximum of 32KB (32768). In practice there should be no reason to alter this setting. A change in this setting affects the very next compression that is performed.

DEPTH PARAMETER

Zip/Depth

DEFAULT

256

DESCRIPTION

With each successive character in a file the compressor looks back over the sliding window for groupings where replacement by pointer would provide the greatest compression. This is a time consuming endeavor. As a tradeoff the JANOS routine employs a queue of likely targets in the window for each unique character. This reduces the search effort and the time it takes to perform the compression.

By default the search queue depth is set at 256 entries. Values may range from a minimum of 16 to a maximum of 1024. In practice there should be no reason to alter this setting. A change in this setting affects the very next compression that is performed.

SEE ALSO

HELP Topics: ZIP, COMPRESSION

JMP Protocol

OVERVIEW

The JANOS Management Protocol (JMP) is available to remote devices and computers for control and management of the JNIOR. Available by default on Port 9220 this protocol replaces the deprecated JNIOR Protocol and provides for better security and a greater range of capabilities. The protocol is based on the JSON data-interchange format.

The JNIOR WebUI also uses JMP through a Websockets connection to perform all of the functions it offers.

While the JNIOR Protocol remains a viable option for controlling and monitoring I/O on the JNIOR the JANOS Management Protocol or JMP (pronounced "JuMP") offers a single connection point allowing the JNIOR to be fully managed and monitored. The older binary JNIOR Protocol can be a challenge to implement and is not recommended for new development.

SEE ALSO

HELP Topics: JMPCONNECT, JSON

JMP Protocol

DESCRIPTION

There are two methods of achieving a JMP protocol connection. Both provide access to the full capabilities of the protocol.

WEBSOCKET

A WebSocket connection creates a full-duplex communications channel as would be available by direct connection to a TCP port but using the HTTP or HTTPS mechanism. This enables direct interaction between a website and JANOS. By default a WebSocket channel supports the JMP protocol. This is how the JNIOR WebUI performs tasks such as are available through the Folders, Console and Syslog tabs.

Websocket has been standardized by the IETF https://www.ietf.org/ as RFC 6455 https://tools.ietf.org/html/rfc6455 . The JNIOR WebUI is installed by the file /flash/www/config.zip and in particular the JavaScript file comm.js in that library handles the Websocket communications. You are free to use that source code as reference or to incorporate any part of it in your custom website.

Note that the JMP protocol requires a login. This is critical as the protocol is very powerful. When a website login to the JNIOR is successful (or if the login is disabled) a Session Cookie is generated. This is passed when a related HTTP connection is elevated to Websocket. It then is accepted as a valid login credential providing seamless operation.

PROTOCOL PORT

By default a connection to TCP Port 9220 provides direct access to the JMP protocol. In this case there is a special wrapper that must be used in transporting the JSON messages.

One of the issues in using JSON in communications protocols stems from the lack of message length information. In the absence of a length the communications driver must count open '{' and close '}' curly braces in order to ascertain when an entire structure has been read from the channel. This is complicated by the fact that curly braces may appear in string data and those must be ignored. The algorithm, while not complicated, is an annoyance. The JMP connection uses a wrapper that conveys a message length.

Once a successful connection is made to the JMP Server port, messages may be exchanged. With one exception all messages conform to the JSON format using the ASCII printable character set. The high-level message format must be as follows. This forms the message wrapper which is a 2-element JSON Array construct.

```
    [ length , object ]
```

Where length defines the exact size of the object in bytes excluding leading and trailing white-space if any. Leading and trailing white-space, which can include newline characters, may be present surrounding both the length value and the object. Here object must be a fully formed and valid JSON Object beginning with '{' and ending with '}' curly braces. Both these curly braces and any characters in between are included in the length value. The leading '[' opening square bracket, ',' comma, and trailing ']' closing square bracket are required. The opening and closing JSON Object curly braces are also verified. If there is any violation to this format the message will be simply ignored. There is no response or indication of error. All bytes outside of the square brackets are ignored as well.

A valid parsing strategy would be as follows:

* Read and ignore bytes up to a '[' opening square bracket
* Read and ignore white-space characters (space, tab, newline, etc.)
* Accumulate a decimal length (must be digits 0-9, the result must be >= 2)
* Read and ignore white-space
* Read and confirm the presence of the ',' comma
* Read and ignore white space
* Extract the JSON Object of precise length defined by the numeric value
* Read and ignore white-space
* Read and confirm the ']' closing square bracket (no other character is acceptable)
* Confirm that the JSON object is properly enclosed by '{' and '}' curly braces
* Process the JSON object and repeat

This wrapper is not used by the Websocket connection since Websocket already includes message length information.

EXAMPLE

All TCP/IP Port 9220 communications utilize the 2-element JSON Array format for conveying valid JSON Objects. This is not used in WebSocket communications. In describing JMP protocol Messages the 2-element JSON Array format will be assumed. We will only show the enclosed JSON Objects.

To initialize communications the client should send a blank or empty message. The following is acceptable.

```
    {
      "Message":""
    }
```

This message properly formatted for JMP Port 9220 would be transmitted as follows.

```
    [14, {"Message":""} ]
```

The connection will proceed depending on the authentication requirements established by configuration and the client environment for the connection.

NOTES

It is important to note that the TCP/IP connection is a streaming channel and one or more network packets may be required to convey an entire message. Similarly a packet may include the final bytes of one message and those beginning the next. A reliable implementation will buffer incoming data until an entire message is received. Once the message is processed it is removed from the buffer leaving any additional data which will be required to form the message that follows.

JMP is not Master-Slave. Many requests do solicit a response but not all. There are also unsolicited messages produced by the server. These alert the client to I/O changes as well as many other events.

The protocol allows you to specify any amount of META data with your request. That data is echoed in the associated response. This can be used to maintain synchronization between request and response. It is a very flexible means of synchronization and can be used to convey, for example, detailed processing instructions for the response.

SEE ALSO

HELP Topics: SECURITY, JMP, JSON

JMP Protocol

SECURITY

Any protocol providing control and management functions must employ some form of security preventing unauthorized access and abuse. By default the JMP Server requires authentication (login). While the login requirement may be disabled it is not recommended. When the login is disabled an account must be specified for the anonymous login. This is configured through the Registry. We strongly urge you to accommodate the login requirement.

In addition to user authentication the JMP Server supports a TLSv1.2 secure connection. A secure connection is established by first connecting to the JMP Server port and issuing the following clear-text command exactly as shown below. This is the one exception to the 2-element JSON Array formatting mentioned earlier.

```
    [STARTTLS]
```

Immediately following the ']' closing square bracket the JNIOR will begin a SSL/TLS negotiation. The client should expect to do the same. If successful all further communications will be encrypted.

NOTES

When accessing JMP through a Websocket connection the login credentials that may have been used to access the website are passed through a Session Cookie. This creates seamless use under the browser. If for any reason the cookie is out of date, the Websocket driver in comm.js in the WebUI distribution file /flash/www/config.zip will initiate its own login dialog requesting new credentials.

A Websocket secure connection is achieved by using the WSS:// URL protocol specifier as opposed to WS:// . The WebUI utilizes that appropriate protocol to track with either HTTPS:// or HTTP:// respectively.

SEE ALSO

HELP Topics: INITIALIZE, JMP, JMPCONNECT

JMP **Protocol**

INITIAL CONNECTION

To initialize communications the client should send a blank or empty message.

```
{
  "Message":""
}
```

This message properly formatted for JMP Port 9220 would be transmitted as follows.

```
[14, {"Message":""} ]
```

The connection will proceed depending on the authentication requirements established by configuration and the client environment for the connection.

With the login requirement the exchange will proceed as follows. In this example the client properly utilizes the supplied Nonce to properly calculate a digest inclusive of the login credentials for the username 'jnior'. The response indicates successful login and that the account has Administrator and Control permissions. All Administrators have the ability to control the JNIOR. Not all accounts with Control permission are administrators.

```
        TRANSMITTED                        RECEIVED

    {
      "Message":""
    }

                                       {
                                         "Message":"Error",
                                         "Text":"401 Unauthorized",
                                         "Nonce":"5d894efb48e1c3bc074fe78e7a5f"
                                       }

    {
      "Auth-Digest":"jnior:65f2d1cb66ef63f7d17a764f3a2f2508"
    }

                                       {
                                         "Message":"Authenticated",
                                         "Administrator":true,
                                         "Control":true
                                       }
```

A "Monitor" message will likely immediately follow. This might even be received before the "Authenticated" message. That is the asynchronous nature of the connection.

DIGEST CALCULATION

When the JMP connection requires a login it will respond with a "401 Unauthorized" error text. The server provides a unique "Nonce" string as part of this message. This can be used in conjunction with the username and password to calculate the appropriate Authorization Digest. This requires a MD5 message digest calculation which generates a 16 byte digest represented as 32 hexadecimal characters. The calculation proceeds as follows:

```
Digest = Username + ":" + MD5(Username + ":" + Nonce + ":" + Password)
```

Where Username, Password, Nonce and Digest are all strings. The resulting Digest string is returned in the "Auth-Digest" member.

SEE ALSO

HELP Topics: MESSAGING, SECURITY, JMP, JMPCONNECT

JMP Protocol

MESSAGING

The JMP server implementation is not Master-Slave however there are a number of 'Requests' that have 'Responses' which is typical for such a server. In addition to this, unsolicited messages may be received from the server. These provide immediate notification for changes in I/O status and updates in configuration settings for instance. Any use of this implementation must handle the presence of unsolicited messages. Care is also required to pair responses with the associated requests as messaging order is not guaranteed.

Optional Meta data supplied with a Request is returned with the Response unmodified. This can then be used to identify each response and the action it then requires.

Common Message Structure

All messages use JSON formatting. Each consists of a set of members enclosed by curly braces '{' and '}'. An empty set is acceptable '{}' although it would be ignored by the server and solicit no response. A set may consist of any number of members separated by commas. Each member represents a name/value pair where the name is separated from the value by a colon ':'. The value can be a string, number, object, array, true, false or null. The members are referenced by name and therefore may appear in any order. An array however consists of 0 or more elements each of which are values separated by a commas and presented in sequence dependent order.

THE MESSAGE MEMBER

JMP requires that each valid message contain a 'Message' member. This is a name/value pair where the name is exactly the string "Message" and the value separated by the colon be any one of the following.

Client generated messages:

```
"Status"
"Control"
"Registry List"
"Registry Read"
"Registry Write"
"Registry Write Encrypted"
"Enumerate Devices"
"Read Devices"
"Write Devices"
"Console Open"
"Console Stdin"
"Console Close"
```

Server generated responses:

```
"Registry List Response"
"Registry Response"
"Enumerate Devices Response"
"Read Devices Response"
"Write Devices Response"
"Console Response"
"Error"
"Authenticated"
```

Server generated messages (unsolicited):

```
"Monitor"
"Registry Update"
"Console Stdout"
```

Messages received by the server not containing a valid "Message" member are ignored. These will not cause an error or solicit any response.

META MESSAGE MEMBER

The "Meta" message member is entirely optional and since its associated value may be an object it can contain any information and any amount of information. The value of this message pair is ignored by the server. However, the entire pair is returned unmodified with the associated response. The "Meta" object then can contain detailed application specific information that later can be used by the client to synchronize Responses and Requests or to determine any other appropriate course of action when the Response is received.

GENERAL MESSAGE CONTENT

Any number of message members may appear in the message although only those appropriate for the specific request will be used. All others will be ignored. One possible use for any extra message members beyond those required by the request is in providing debug information when viewed/logged on the wire using Wireshark https://wireshark.org for instance.

SEE ALSO

HELP Topics: INITIALIZE, JMP, JMPCONNECT

JMP Protocol

MONITOR MESSAGE

Here is an example of the "Monitor" message. In addition to the State and Count for each Digital Input in sequence and Relay Output in sequence, there is information about the JNIOR including a timestamp. The "Monitor" message will be sent by the server whenever any I/O status changes.

```
{
  "Message":"Monitor",
  "Model":"410",
  "Version":"v1.4",
  "Serial Number":614070500,
  "Inputs":[
    {"State":1,"Count":49},
    {"State":0,"Count":360},
    {"State":0,"Count":8},
    {"State":0,"Count":38},
    {"State":0,"Count":3},
    {"State":0,"Count":4},
    {"State":0,"Count":5},
    {"State":0,"Count":7}
  ],
  "Outputs":[
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0}
  ],
  "Timestamp":1444155435066
}
```

Note that the number of inputs and outputs vary depending on the model of JNIOR and number of 4ROUT external modules. The standard Model 410 has 8 inputs and 8 outputs. The Model 412 has an additional 4 outputs for 12 and correspondingly less inputs where there are only 4. Similarly the Model 414 has 4 additional inputs for 12 and correspondingly fewer outputs where there are only 4.

There may be additional outputs included. The JNIOR will include up to 8 additional Relay Outputs from up to 2 external 4ROUT modules in this message. The order in which the external relay modules are assigned into the output sequence is managed by the Registry and the EXTERN command based upon each external module's ID.

STATUS REQUEST

The "Monitor" message previously discussed is an unsolicited message however, the message may be requested using the "Status" request message. This is not typically required as a "Monitor" message is sent immediately after a connection is authenticated and whenever there is a change thereafter. If for any reason this initial message is not processed you can request the information using the "Status" request.

```
        TRANSMITTED                      RECEIVED

    {
      "Message":"Status"
    }

                                 {
                                   "Message":"Monitor",
                                   "Model":"410",
                                   "Version":"v1.4",
                                   "Serial Number":614070500,
                                   "Inputs":[
                                     {"State":1,"Count":49},
                                     {"State":0,"Count":360},
                                     {"State":0,"Count":8},
                                     {"State":0,"Count":38},
                                     {"State":0,"Count":3},
                                     {"State":0,"Count":4},
                                     {"State":0,"Count":5},
                                     {"State":0,"Count":7}
                                   ],
  "Outputs":[
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0}
  ],
  "Timestamp":1444155435066
}
```

Recall that messages are encapsulated with length information. Just as a reminder the Status request/command is actually sent as follows where whitespace outside of the JSON content is ignored:

```
[ 20, {"Message":"Status"} ]
```

JMP Protocol

CONTROL MESSAGES

Each "Control" message must contain a "Command" member which may be one of the following valid values:

```
"Toggle"
"Close"
"Open"
"Reset Latch"
"Reset Counter"
"Reset Usage"
```

Each "Control" Message must contain a numeric "Channel" member specifying the input/output channel. This parameter is 1-based where the number '1' specifies either the first Digital Input or first Relay Output. This depends on the specific "Command".

There is no formal response to these command messages although a "Monitor" message will invariably follow some for obvious reasons. Monitor messages are sent whenever I/O status changes. These may be unsolicited but if the control message alters I/O status the Monitor message is a logical response. If the control message does not alter I/O status there is no response.

TOGGLE COMMAND

The "Toggle" command inverts the state of the defined output "Channel". If the relay is open it will be closed. If it is closed it will be opened. The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will close Relay Output 1 assuming that it originally is open.

```
{
  "Message":"Control",
  "Command":"Toggle",
  "Channel":1
}
```

Similarly the following will pulse Relay Output 2. Assuming that originally the relay is open, it will be closed for precisely 5000 milliseconds (5 seconds).

```
{
  "Message":"Control",
  "Command":"Toggle",
  "Channel":2,
  "Duration":5000
}
```

Note then that this last version of the Toggle control message will result in 2 Monitor messages. One when the relay closes and another 5 seconds later when it opens.

CLOSE COMMAND

The "Close" command closes the defined output "Channel". If the relay is open it will be closed. If it is closed it will remain closed (state = 1). The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will close Relay Output 1.

```
{
  "Message":"Control",
  "Command":"Close",
  "Channel":1
}
```

Similarly the following will pulse Relay Output 2. It will be closed for precisely 5000 milliseconds (5 seconds). There will be no change if the relay is already closed.

```
{
  "Message":"Control",
  "Command":"Close",
  "Channel":2,
  "Duration":5000
}
```

OPEN COMMAND

The "Open" command opens the defined output "Channel". If the relay is open it will remain so (state = 0). If it is closed it will be opened. The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will open Relay Output 1.

```
    {
      "Message":"Control",
      "Command":"Open",
      "Channel":1
    }
```

Similarly the following will pulse Relay Output 2. It will be opened for precisely 5000 milliseconds (5 seconds). There will be no change if the relay is already open.

```
    {
      "Message":"Control",
      "Command":"Open",
      "Channel":2,
      "Duration":5000
    }
```

BLOCK COMMAND

The "Block" command allows the state of one or more relays to be changed simultaneously. The "Mask" parameter selects the relay or relays to be affected by the command. Here the presence of a '1' bit indicates that the associated relay state is to be affected. The parameter's least significant bit (LSB) represents Relay Output 1. The corresponding bit in the "States" parameter defines the new state of the associated relay where a '1' indicates that the relay is to be closed, a '0' it is to be opened. The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will close Relay Outputs 1 and 3 and open Relay Output 2 all at the same time.

```
{
  "Message":"Control",
  "Command":"Block",
  "Mask":7
  "States":5
}
```

Similarly the following will pulse Relay Outputs 1 and 2 for precisely 5000 milliseconds (5 seconds).

```
    {
      "Message":"Control",
      "Command":"Block",
      "Mask":3,
      "States":3
      "Duration":5000
    }
```

RESET LATCH COMMAND

Latching may be enabled for any of the digital inputs. This is a form of event capture which can be very useful in monitoring pulsed signals. A latching input may be set to trigger on either a positive going or negative going signal edge. In waiting for the event the input is considered to be armed. When the trigger signal is detected the input changes state.

A LatchTime may be configured. This defines a timer setting. The timer starts when the event occurs and the input signal is automatically reset when it expires. This provides for a form of pulse stretching. With a latch time of 10 seconds, pulsing an input for a mere 1 millisecond results in the input being activated for 10 seconds. The very brief event is captured. The result is signaled for a period long enough to alert any monitoring system.

If LatchTime is not configured (default is 0) or configured for 0 seconds there will be no automatic reset. The input state indicating the capture of an event must be manually reset or reset by the monitoring system using the "Reset Latch" command. An example message follows.

```
{
  "Message":"Control",
  "Command":"Reset Latch",
  "Channel":2
}
```

RESET COUNTER COMMAND

Input transitions are tallied. The counter can be configured to tally positive going or negative going edges. This provides an indication of the total number of input pulses detected. The JNIOR can count signals up to 2 kHz but is typically employed to count more reasonable paced events. At some point there may be a need to reset the counts to 0. This might occur each time this "meter" is read for instance and perhaps on a monthly basis. The following command does the job.

```
{
  "Message":"Control",
  "Command":"Reset Counter",
  "Channel":3
}
```

RESET USAGE COMMAND

Often it is necessary to keep track of how long that a piece of equipment is in use. The JNIOR tallies the time that either an input or an output is active. Each I/O point can be configured to tally usage time for either the high/1/ON state or the low/0/OFF state. It is reported as a fraction of hours. At some point you may need to reset this Usage Meter. The following command does the job.

```
{
  "Message":"Control",
  "Command":"Reset Usage",
  "Channel":11
}
```

The JNIOR maintains 16 separate usage meters representing the 16 internal I/O points. This covers a mixture of inputs and outputs that varies depending on JNIOR Model. In this example, if we are running a Model 410 with 8 inputs and 8 outputs, we are resetting the Usage Meter for Relay Output 3. Channels 1 through 8 are inputs and 9 through 16 then correspond to Relay Outputs 1 through 8. So for this example Channel 11 is Relay Output 3.

FILE SYSTEM COMMANDS

The JNIOR supports a file system comparable to that on the PC. It is not possible to support, maintain or program a JNIOR without access to the file system. The JMP Server provides access to files for reading and writing depending on login permissions. This then provides for the greatest flexibility in application development.

FILE LIST REQUEST

The "File List" message is used to request a listing of files in a particular directory/folder within the file system. This solicits a "File List Response" message providing the content. The response echoes the requested "folder" specification and supplies the "Content" as an array of objects each specifying the "Name", "Size", and last modification timestamp "Mod" for the file or folder. Note that a folder is distinguished from a file by the inclusion of a trailing '/' in the name. The folder's size is a count of the items it contains. A trailing '/' is not necessary in the folder specification.

A typical exchange follows. The response message can be quite extensive depending on the number of files your system stores.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File List",
      "Folder":"/"
    }

                            {
                              "Message":"File List Response",
                              "Folder":"/",
                              "Content":[
                                {
                                  "Name":"etc/",
                                  "Size":1,
                                  "Mod":"07 Jul 2016 10:25"
                                },
                                {
                                  "Name":"temp/",
                                  "Size":0,
                                  "Mod":"14 Sep 2016 13:16"
                                },
                                {
                                  "Name":"flash/",
                                  "Size":38,
                                  "Mod":"23 Sep 2016 07:50"
                                },
                                {
                                  "Name":"manifest.json",
                                  "Size":32698,
                                  "Mod":"29 Jul 2016 10:26"
                                },
                                {
                                  "Name":"jniorsys.log.bak",
                                  "Size":65557,
                                  "Mod":"20 Sep 2016 15:49"
                                },
                                {
                                  "Name":"jniorsys.log",
                                  "Size":16526,
                                  "Mod":"23 Sep 2016 07:52"
                                },
                                {
                                  "Name":"jniorboot.log.bak",
                                  "Size":1056,
                                  "Mod":"23 Sep 2016 07:33"
                                },
                                {
                                  "Name":"jniorboot.log",
                                  "Size":1010,
                                  "Mod":"23 Sep 2016 07:50"
                                }
                              ]
                            }
```

FILE READ REQUEST

The "File Read" operation is used to obtain the data for a single file. Data is returned using Base64 encoding. This allows for the transfer of files containing binary data. The "Encoding" parameter indicates "base64". At this time this is the only encoding that is supported. The "Size" parameter indicates the size of the file and the length of the decoded content of the "Data" parameter.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Read",
      "File":"/flash/www/config/folder.png"
    }

                            {
                              "Message":"File Read Response",
                              "File":"/flash/www/config/folder.png"
                              "Size":329,
                              "Encoding":"base64",
                              "Data":"iVBORw0KGgoAAAANSUhEUgAAABAAAAAQCAIAAA...
                                      UQBG+9eyXUtY0pRt27bXtsaWXGtYss2L533Xej...
                                      NEN3vhsJvBA4DS7r5GwgK9bjkyDG7DmNWoxSyw...
                                      RuNikAzjk6AWQvVxDk5KcFEN0QjZAtUG3Q6zh9...
                                      1bhsgLhZhDQjGZIvhUVvuRqhd5NxxEXKcVHHx...
                                      ",
                              "Status":"Succeed"
                            }
```

READING LARGE FILES

For very large files the "File Read Response" can become quite huge. This can lead to memory and performance concerns. Fortunately you can optionally use "Limit" and "Offset" parameters to read sections of the file while limiting the "data" content size. Repeated "File Read" requests can then be used to retrieve the entire file. This is also useful if the application requires the retrieval of only a small amount of information from a certain offset in a file and not the entire file.

When an "Offset" is specified in the "File Read" request the content of "Data" reflects the bytes starting at the file offset. A value of "0" indicates the beginning of the file.

When the "Limit" parameter is specified, the read operation will return only that number of bytes or the balance of the file whichever is less.

When either "Limit" or "Offset" are specified the "File Read Response" will contain a "NumRead" parameter indicating the actual number of bytes read. The "Size" parameter will always reflect the total file size. The following is an example of a the exchanges needed to read a file limiting the message size. Note that you might likely be able to transfer files as large as 128KB in a single message.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Read",
      "File":"/flash/www/config/folder.png"
      "Limit":256,
    }

                                    {
                                      "Message":"File Read Response",
                                      "File":"/flash/www/config/folder.png",
                                      "Size":329,
                                      "Offset":0,
                                      "Limit":256,
                                      "NumRead":256,
                                      "Encoding":"base64",
                                      "Data":"iVBORw0KGgoAAAANSUhEUgAAABAAAA...
                                              GUQBG+9eyXUtY0pRt27bXtsaWXGtYs...
                                              VANEN3vhsJvBA4DS7r5GwgK9bjkyDG...
                                              MxeRuNikAzjk6AWQvVxDk5KcFEN0Qj...
                                              ",
                                      "Status":"Succeed"
                                    }

    {
      "Message":"File Read",
      "File":"/flash/www/config/folder.png"
      "Offset":256,
      "Limit":256,
    }
```

```
                                    {
                                      "Message":"File Read Response",
                                      "File":"/flash/www/config/folder.png",
                                      "Size":329,
                                      "Offset":256,
                                      "Limit":256,
                                      "NumRead":73,
                                      "Encoding":"base64",
                                      "Data":"M0YfZOC0BOfVuGyAuFmENCMZki+FRW...
                                              ",
                                      "Status":"Succeed"
                                    }
```

FILE WRITE REQUEST

The "File Write" operation is used to transfer a file to the JNIOR. The write request specifies the target "File" from the root of the file system. The "File" parameter must be present for the request to be considered valid.

Since files may contain binary data the "Data" portion of the message is encoded with Base64 encoding. The "Encoding" parameter must be specified as precisely as "base64".

The "Size" parameter is required and must define the intended size of the file in bytes. It must match the decoded Base64 "Data" content in length. The data is decoded and the byte count compared to that specified before attempting to write the file.

You may optionally specify the last modification timestamp parameter "Mod" for the file. The timestamp is represented as a Linux time in milliseconds since midnight January 1st 1970 in Universal Coordinated Time (UTC). If present the last modification time for the resulting file will be as specified.

Once the file is written the "File Write Response" is returned. The "File" and "Size" are reflected in the response (as would any "Meta"). The formatted timestamp is also returned in a "Mod" parameter. The "NumWritten" parameter reflects the result of the file write. This should match the specified "Size" value if the write is to be successful. A value less than zero indicates an error. A typical exchange follows.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Write",
      "File":"/temp/main.c",
      "Size":144,
      "Mod":1310414726000,
      "Encoding":"base64",
      "Data":"DQojaW5jbHVkZSAiaW80MzAuaCINCg0KaW50IG1haW4oIHZvaWQgKQ0Kew0KIC...
              bWVyIHRvIHByZXZlbnQgdGltZSBvdXQgcmVzZXQNCiAgV0RUQ1RMID0gV0RUUF...
              dHVybiAwOw0KfQ0K"
    }

                                    {
                                      "Message":"File Write Response",
                                      "File":"/temp/main.c",
                                      "Size":144,
                                      "Mod":"11 Jul 2011 16:05",
                                      "NumWritten":144,
                                      "Status":"Succeed"
                                    }
```

WRITING LARGE FILES

For very large files the "File Write" message can become huge. This can lead to memory and performance concerns. Fortunately, you can optionally use the boolean parameter "Append" to break file writes into manageable blocks.

To append to an existing file you use the "File Write" message exactly as described above. You must include an additional parameter named "Append" set to the value of "true". In this case the file must previously exist and the data included with the "Data" parameter will be appended to it. The write operation will fail if the file is not present. So to transfer a large file using multiple messages the first must not indicate "Append". It would be included only in subsequent "File Write" messages. This will insure that the resulting file will be as you are expecting.

In this case the returned "Size" parameter will increase as the size of the target file increases by the "NumWritten" byte count.

FILE REMOVE REQUEST

One or more files or folders can be removed/deleted using the "File Remove" request. The "Files" parameter is an array of file/folder names. You do not use a trailing '/' when specifying a folder in this request. The JNIOR will attempt to remove each file/folder specified in the array.

Each individual deletion may or may not succeed. The "File Remove Response" will enumerate the successful deletions in a "Succeed" array. Similarly any failures will be listed in a "Fail" array. Depending on the results the response message may contain either a "Succeed" array or a "Fail" array or both. Between the two arrays the results of each attempt for those items listed in the original "Files" array will be reported. For example:

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Remove",
      "Files":[
        "/flash/image.txt",
        "/flash/main.c"
      ]
    }

                                    {
                                      "Message":"File Remove Response",
                                      "Succeed":[
                                        "/flash/image.txt",
                                        "/flash/main.c"
                                      ]
                                    }
```

Here we attempt to remove a folder and the request fails. In this case we expect that it would fail both because the folder contains files and sub-folders (it is not empty) and also because it is a special system folder. You cannot remove the /etc, /flash, or /temp folders. You also cannot remove any content from the /etc folder.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Remove",
      "Files":[
        "/flash"
      ]
    }

                                {
                                  "Message":"File Remove Response",
                                  "Fail":[
                                    "/flash"
                                  ]
                                }
```

FILE RENAME REQUEST

You may rename a file or folder using the "File Rename" request. In this case you specify the file/folder with the "old" parameter and the new file/folder name with the "New" parameter. The files must be specified from the root of the file system and both specifications must be in the same folder. You cannot "move" a file through a rename operation. A file/folder matching the "New" specification cannot already exist.

The "File Rename Response" reiterates the request and adds a "Result" parameter. The "Result" will be either "Succeed" or "Fail" reflecting the result of the rename operation. An example follows.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Rename",
      "Old":"/flash/main.c",
      "New":"/flash/test-prog.c"
    }

                                {
                                  "Message":"File Rename Response",
                                  "Old":"/flash/main.c",
                                  "New":"/flash/test-prog.c",
                                  "Result":"Succeed"
                                }
```

FILE MKDIR REQUEST

The ability to create a folder completes the set of file system functions. Here you can create a new folder using the "File Mkdir" message. The new folder is specified from the root of the file system by the "Folder" parameter.

The "File Mkdir Response" reiterates the "Folder" and adds a "Result" which will be either "Succeed" or "Fail" depending on the outcome of the creation attempt.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"File Mkdir",
      "Folder":"/flash/testing"
    }

                                {
                                  "Message":"File Mkdir Response",
                                  "Folder":"/flash/testing",
                                  "Result":"Succeed"
                                }
```

REGISTRY COMMANDS

The JNIOR is configured by various parameter settings which are stored in the non-volatile Registry. In addition to configuration there are special keys (that start with the dollar sign '$') which record and report dynamic information. The input and output Usage Meter status is reported through a system Registry key named $HourMeter for example. The Registry then plays an important role in monitoring the status of a JNIOR.

REGISTRY UPDATE NOTIFICATION

The "Registry Update" message is an unsolicited message. It is transmitted through the JMP Server whenever there is a change in the Registry. This notifies the client when new keys are created and when they are removed (content is empty/null). It notifies the client whenever the content of a key is changed. This allows the client to respond to the changing configuration of a connected unit as well as to receive information stored in dynamic system keys. The following is a very typical update for a channel's usage meter.

```
{
  "Message":"Registry Update",
  "Keys":{
    "IO/Inputs/din1/$HourMeter":"43.68"
  }
}
```

Note that the "Keys" member passes an object which may contain 0 or more name/value pairs where the name is the Registry Key and the value its content.

Here the $HourMeter reports 43.68 hours of usage. These update every 100th of an hour. That is the resolution of the Usage Meter. In general, Registry Updates will report only one key per message since changes occur in sequence and each change generates an update message through the inter-process messaging system. The Web Server picks up the internal message and broadcasts the information to all active JMP connections.

REGISTRY LIST REQUEST

The Registry stores information that from time to time you may need to retrieve. This is easily done if you know precisely what Registry keys to read. A lot of work can be saved if you can determine easily what Registry keys have been defined and that have data available for reading. The "Registry List" command is used to obtain a listing similar to a file directory or folder listing for a node in the Registry.

The "Registry List" command summons a "Registry List Response" message. A complete exchange is shown below. The Client sends the request and the server supplies the response message. Note how the "Meta" member might be used to pass information to the routine that eventually (and asynchronously) will receive the response.

```
        TRANSMITTED                         RECEIVED

    {
      "Message":"Registry List",
      "Meta":{"Op":"registry","Node":"/IO/Inputs/din1"},
      "Node":"/IO/Inputs/din1"
    }

                                {
                                  "Message":"Registry List Response",
                                  "Meta":{"Op":"registry",
                                            "Node":"/IO/Inputs/din1"},
                                  "Keys":[
                                    "/IO/Inputs/din1/Enabled",
                                    "/IO/Inputs/din1/$HourMeter",
                                    "/IO/Inputs/din1/Conditioning",
                                    "/IO/Inputs/din1/LatchState",
                                    "/IO/Inputs/din1/Desc",
                                    "/IO/Inputs/din1/ClosedDesc",
                                    "/IO/Inputs/din1/OpenDesc",
                                    "/IO/Inputs/din1/Count/",
                                    "/IO/Inputs/din1/ShowCount",
                                    "/IO/Inputs/din1/ShowUsageMeter",
                                    "/IO/Inputs/din1/UsageState",
                                    "/IO/Inputs/din1/CountState",
                                    "/IO/Inputs/din1/ShowControls"
                                  ]
                                }
```

Here we note that a list (or array) of key names is returned in the "Keys" member. Note too that those that end in a forward slash '/' represent sub-nodes which will contain keys or additional nodes which can be retrieved with a subsequent request for that node. There are no empty sub-nodes (subdirectories or subfolders) in the JANOS Registry. Therefore if the node is listed it must have content within its structure somewhere.

REGISTRY READ REQUEST

The "Registry Read" command request is used to retrieve the content of one or more Registry keys. The request includes the "Keys" member which provides an array of Registry keys for which we want the content. Note that the optional "Meta" member is available for use but not employed in this example. The request solicits a "Registry Response" message which returns the "Keys" member which list time returns an object whose members are name/value pairs reporting each key and its content.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Registry Read",
      "Keys":[
        "/IO/Inputs/din1/Enabled",
        "/IO/Inputs/din1/$HourMeter",
        "/IO/Inputs/din1/Conditioning",
        "/IO/Inputs/din1/LatchState",
        "/IO/Inputs/din1/Desc",
        "/IO/Inputs/din1/ClosedDesc",
        "/IO/Inputs/din1/OpenDesc",
        "/IO/Inputs/din1/ShowCount",
        "/IO/Inputs/din1/ShowUsageMeter",
        "/IO/Inputs/din1/UsageState",
        "/IO/Inputs/din1/CountState",
        "/IO/Inputs/din1/ShowControls"
      ]
    }

                                {
                                  "Message":"Registry Response",
                                  "Keys":{
                                    "/IO/Inputs/din1/Enabled":"true",
                                    "/IO/Inputs/din1/$HourMeter":"44.28",
                                    "/IO/Inputs/din1/Conditioning":"1",
                                    "/IO/Inputs/din1/LatchState":"1",
                                    "/IO/Inputs/din1/Desc":"Input 1",
                                    "/IO/Inputs/din1/ClosedDesc":"ON",
                                    "/IO/Inputs/din1/OpenDesc":"OFF",
                                    "/IO/Inputs/din1/ShowCount":"true",
                                    "/IO/Inputs/din1/ShowUsageMeter":"true",
                                    "/IO/Inputs/din1/UsageState":"0",
                                    "/IO/Inputs/din1/CountState":"0",
                                    "/IO/Inputs/din1/ShowControls":"true"
                                  }
                                }
```

Note that there is a name/value pair corresponding to each requested Registry key even if that key is undefined (does not exist). All of the keys requested here in this example have values. If a key is not present it will return the empty or null string value "".

REGISTRY WRITE REQUEST

An external application may need to alter the configuration of a JNIOR. In order to do so it is necessary to create or change the content of a Registry key. The "Registry Write" command is used for this purpose. There is no restriction as to what can be written to the Registry. Specific keys have specific purposes and some are recognized internally by the JANOS operating system. Others pertain to the formatting of the dynamic pages. Still others may be specific to custom applications and programs running on the JNIOR.

The "Keys" member of the "Registry Write" command message provides an object containing 1 or more name/value pairs. Each element represents a write request where the name is the Registry key and the value its intended content. Note that the JANOS Registry stores strings. Only strings can be written however they may encode practically anything. The "Registry Write" request solicits a "Registry Response" returning the keys successfully written.

If there is an error in writing a key, the key will be returned either with an empty or null string ("") or the prior and still valid content. Here is an example changing the description displayed by the configuration pages for Digital Input 2. The write was successful.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Registry Write",
      "Keys":{
        "IO/Inputs/din2/Desc":"Part Produced"
      }
    }

                                {
                                  "Message":"Registry Response",
                                  "Keys":{
                                    "IO/Inputs/din2/Desc":"Part Produced"
                                  }
                                }
```

Not surprisingly this exchange is immediately followed by a "Registry Update" message. This signals to all who are listening that the key has been altered.

```
                                {
                                  "Message":"Registry Update",
                                  "Keys":{
                                    "IO/Inputs/din2/Desc":"Part Produced"
                                  }
                                }
```

REGISTRY WRITE ENCRYPTED

The Registry may store user names and passwords for configured email accounts for example. The user's and administrator's account credentials defined in JANOS are stored very securely internal the processor chip itself. Passwords for other purposes are configured in the Registry and should not be stored in plain text. Note the result of the following "Registry Read" request.

```
      TRANSMITTED                      RECEIVED

    {
      "Message":"Registry Read",
      "Keys":[
        "/IpConfig/Password"
      ]
    }

                                {
                                  "Message":"Registry Response",
                                  "Keys":{
                                    "/IpConfig/Password":"Qrq5CQ/rYBPfye..."
                                  }
                                }
```

This password for the default email account is not readable. This is not just obfuscated from view but securely encrypted by a secret key known only to the JANOS operating system and one that is unique to the unit. Nevertheless an external application (including the configuration pages) needs to be able to set a new password. This cannot be done without special handling as the encryption secret is not externally known and cannot be determined.

To make this possible, the "Registry Write Encrypted" command is available. This is used to write new password credentials for the default email account and indeed any other such account where JANOS later requires access to the plain text password. JANOS needs to be able to decrypt the content. If an application wants to store data securely it can encrypt the data using its own procedures and write the encrypted result using the normal "Registry Write" command. Later the content can be read and decrypted. The special form of write command is used only for information that JANOS stores with its own secure encryption. Data that only JANOS can then decrypt and use.

The "Registry Write Encrypted" command works exactly as does the "Registry Write" command. It also summons a "Registry Response" but one that shows only the encrypted password content. The password is provided in the request in combination with the username and in plain text. It is highly recommended that passwords not be configured through this protocol unless the connection used is secured by TLS/SSL. The procedure for setting a new password can be gleamed from the dynamic web pages supplied with the unit. The steps to handle it are in the Javascript. You can also contact INTEG Process Group, Inc. for assistance if you have trouble. Typically this password is set using the IPCONFIG command in the Console.

JMP Protocol

CONSOLE SESSIONS

A Console Session provides access to the JANOS Command Line interpreter. Practically every operating system has a command line interpreter. Windows(R) has the DOS Command Prompt. JANOS is no different and in fact provides a command line interpreter that recognizes many different commands some of which are similar to commands available in either the DOS or Linux environments. The command line Console provides the tools needed for JNIOR configuration, diagnostics and application development.

The Console can be accessed by 115,200 BAUD serial connection to the RS-232 port directly on the JNIOR. If the unit is configured for operation on the network the Console can also be opened by making a Telnet connection to the unit. The command line interpreter functions identically using either approach. The RS-232 diagnostic port provides some additional information such as a boot dialog chronicling the boot sequence and error messages should critical assertions occur.

The JMP Server also provides access to the command line interpreter. A JMP connection can open a Console Session. This is a separate command process under the control of the JMP Server on behalf of the JMP connection. The client can supply data simulating keystroke entry and consume characters output from the session perhaps for display. Only one session can be opened for each JMP connection although it may be closed and reopened any number of times while the JMP connection is active.

The dynamic configuration pages supplied with the unit support a "Console" tab through which the use can interact with the Console Session in a fashion virtually identical to any Telnet client or serial terminal client application. You can review the Javascript for more insight.

An application may use a Console session to accomplish some action only available through the command line interpreter. In such case the session my be opened, the command or commands executed, and then immediately closed.

CONSOLE OPEN REQUEST

When a JMP connection is made there is no command session associated. If commands are to be fed to the command line interpreter or a console session supported it must be opened. The "Console Open" command is then required and this solicits a "Console Response" message whose "Status" member provides the status of the result. The outcome can be either "Established" or "Failed". Below a Console Session is started.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Console Open"
    }

                                {
                                  "Message":"Console Response",
                                  "Status":"Established"
                                }
```

Note that while a Console session is open all other JMP requests and unsolicited messaging are still valid and active. The console session can be supported in parallel with all other activity over the connection.

CONSOLE STDIN MESSAGE

The "Console Stdin" message passes character data to the command line interpreter through its stdin serial stream. These characters function exactly as if they were typed at the keyboard in a Telnet session. You use "\r" as the ENTER keystroke. An UP-ARROW or DN-ARROW keystroke is replaced by its VT-100 escape sequence which the Series 3 and Series 4 JNIORs have come to expect. Characters entered through the Console tab in the dynamic configuration pages are each sent immediately as typed one at a time to the stdin stream. Note that the console session command line interpreter echoes character input just as it does everywhere else.

```
{
  "Message":"Console Stdin",
  "Data":"dir\r"
}
```

CONSOLE STDOUT MESSAGE

With every stdin stream there is likely a stdout and the Console Session is no exception. The "Console Stdout" message is transmitted by the server and it supplies data available for display. This may be echoed characters or command output. It is delivered asynchronously and therefore may contain 1 or more characters. It may contain the entire output of a command or only part depending on JANOS activity levels. In other words this is a character stream and a single "Console Stdout" message may contain multiple lines of output or the output from multiple commands. The output from a single console command may be spread across multiple messages. Applications must be coded with this in mind. For example this is data from the Console session tab where the command was typed in and executed.

```
    TRANSMITTED                     RECEIVED

{"Message":"Console Stdin","Data":"d"}
{"Message":"Console Stdin","Data":"i"}
{"Message":"Console Stdout","Data":"d"}
{"Message":"Console Stdin","Data":"r"}
{"Message":"Console Stdout","Data":"i"}
{"Message":"Console Stdin","Data":"\r"}
{"Message":"Console Stdout","Data":"r"}

                            {
                              "Message":"Console Stdout",
                              "Data":"\r\netc\r\nflash\r\njniorboot.log\r\n
                                      jniorboot.log.bak\r\njniorsys.log\r\n
                                      jniorsys.log.bak\r\nmyfile.txt\r\nphp
                                      .log\r\ntemp\r\n\r\nBruce_Dev /> "
                            }
```

This would be the same command executed by an application. The results may not be consistent although the output of the command certainly should.

```
    TRANSMITTED                     RECEIVED

{
  "Message":"Console Stdin",
  "Data":"dir\r"
}

                            {
                              "Message":"Console Stdout",
                              "Data":"dir\r\netc\r\nflash\r\njniorboot.log
```

```
                                          \r\njniorboot.log.bak\r\njniorsy"
                                }

                                {
                                  "Message":"Console Stdout",
                                  "Data":"s.log\r\njniorsys.log.bak\r\nmyfile.
                                          txt\r\nphp.log\r\ntemp\r\n\r\nBruce
                                          Dev /> "
                                }
```

An application would likely buffer all data until the command line prompt is detected. Only then can it interpret the list of files supplied reliably.

CONSOLE CLOSE REQUEST

A Console session will remain active until closed. It is automatically closed should the JMP connection terminate. It is good practice however to close the command session if there is no immediate need for it. This keeps the load on JANOS to a minimum and keeps the process slot open for other activities. The "Console Close" command solicits a "Console Response" message whose "Status" member indicates "Closed" in all cases.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Console Close"
    }

                                {
                                  "Message":"Console Response",
                                  "Status":"Closed"
                                }
```

EXAMPLE CONSOLE SESSION

Here is a example of opening a command session and logging in using the default credentials. The session is then closed once the prompt has been reached. Note how the entry of the password is not echoed. This is just as it is in any JNIOR Telnet session.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Console Open"
    }

                                {
                                  "Message":"Console Response",
                                  "Status":"Established"
                                }

                                {
                                  "Message":"Console Stdout",
                                  "Data":"\r\nWelcome to the JNIOR Model 410...
                                      Copyright (c) 2012-2015 INTEG Process ...
                                      Local time: Wed Oct 07 13:45:38 EDT 20...
                                      Bruce_Dev login: "
```

```
                                    }

        {
          "Message":"Console Stdin",
          "Data":"jnior\r"
        }

                                    {
                                      "Message":"Console Stdout",
                                      "Data":"jnior\r\nBruce_Dev password: "
                                    }

        {
          "Message":"Console Stdin",
          "Data":"jnior\r"
        }

                                    {
                                      "Message":"Console Stdout",
                                      "Data":"*****\r\n\r\nBruce_Dev /> "
                                    }

        {
          "Message":"Console Close"
        }

                                    {
                                      "Message":"Console Response",
                                      "Status":"Closed"
                                    }
```

While access to the Console offers a great amount of flexibility for any application it should not be abused.

EXTERNAL DEVICES

There are a number of external modules that can be used with JNIOR. These attach to the Sensor Port and can be daisy-chained. The most popular of these is the Power 4ROUT modules adding an additional 4 relay outputs to the JNIOR I/O set. Up to two 4ROUT modules can be used which will logically extend the number of relay outputs reported in the "Monitor" message. But additional 4ROUT and other modules can be used limited only by the power load on the sensor port/network. Modules are read and written using their ID string as an address.

Each interaction with an external module involves the exchange of a Data Block. The data blocks will differ depending on whether a device is being read or written. These blocks define a structure of fields. The definitions for the device blocks are provided as part of the JNIOR Protocol Specification.

ENUMERATE DEVICES REQUEST

Each external module has a unique ID. This is a 16 character hexadecimal string representing 8 bytes. The least significant byte or rightmost 2 characters always specify the type of module. This would be 'FB' for a standard 4ROUT external module. The 5 bytes or 10 characters immediately preceding the type can be considered a Serial Number of sorts. Typically these are constrained to the digits 0 through 9. The first byte or 2 characters is a check byte and the byte following a software code (typically but not always a '11').

The "Enumerate Devices" command is used to retrieve a list of the active modules connected to the JNIOR. This solicits an "Enumerate Devices Response" which includes a "Devices" list of 0 or more module IDs. Note that the "Meta" member can be included in the request and will be returned unmodified in the response. This can be used to pass information to the routine that will process the response. For example we have this exchange.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Enumerate Devices"
    }

                                {
                                  "Message":"Enumerate Devices Response",
                                  "Devices":[
                                    "CD111090708109FB",
                                    "16111100125011FE"
                                  ]
                                }
```

This tells us that the JNIOR has two connected modules. One is type 0xFB which is a 4ROUT module. The other a type 0xFE which is the Analog 4-20 ma module. The device types are described in the JNIOR Protocol Specification document.

READ DEVICES REQUEST

The "Read Devices" command is used to obtain the current data block from one or more devices. The format of the data block is specific to the device type. This solicits the "Read Devices Response" which includes only those devices successfully read and the data block content encoded in a "Hex" string. Here we read both of the devices reported in the previous enumeration.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Read Devices",
      "Devices":[
        "CD111090708109FB",
        "16111100125011FE"
      ]
    }

                                {
                                  "Message":"Read Devices Response",
                                  "Devices":[
                                    {
                                      "Address":"CD111090708109FB",
                                      "Hex":"0F000000000000000000"
                                    },
                                    {
                                      "Address":"16111100125011FE",
                                      "Hex":"000000000000000000000000"
                                    }
                                  ]
                                }
```

The content of these blocks can be interpreted using the formats defined in the JNIOR Protocol Specification document. From this response we can see that all of the relays on the 4ROUT device are open and not activated. The 4-20 module is connected but since in this instance it is not wired to any current loop devices it reports all inputs at 4 ma (0x0000) and its two outputs are set to 4 ma (0x0000).

WRITE DEVICES REQUEST

The "Write Devices" command is used to write to an external module. Here we pass a properly formatted data block to the 4ROUT module reported in the prior example. The goal is to close the 3rd relay (Relay Output C). This is achieved by setting the mask (first byte) to 0x04 informing the module that we will only be setting the state of the 3rd relay. We define the state (second byte) as 0x04 to close that relay. The command solicits the "Write Devices Response" which returns the result of each write attempt. The "Result" member will be 'true' if the write is successful and 'false' otherwise.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Write Devices",
      "Devices":[
        {
          "Address":"CD111090708109FB",
          "Hex":"04040000000000000000"
        }
      ]
    }

                                {
                                  "Message":"Write Devices Response",
                                  "Devices":[
                                    {
                                      "Address":"CD111090708109FB",
                                      "Result":true
                                    }
                                  ]
                                }
```

Note that the relays in the 4ROUT module can be pulsed. Here we simply turned Relay C on. The value for its pulse duration being 0x0000 in the block.

EXPANSION MODULES

The following module types are typically used with JNIOR. The type is represented in hexadecimal. This appears as the last two characters in a module's ID string.

```
    Type 10 -- Temperature Probe
    Type 26 -- Temperature Probe
    Type F9 -- 3-Channel LED Dimmer
    Type FA -- Rack Mounted User Panel
    Type FB -- 4ROUT Quad Relay Output Module
    Type FC -- RTD Temperature Module
    Type FD -- 10V Analog Module
    Type FE -- 4-20ma Analog Module
```

READ DATA BLOCK

The read and write data blocks appropriate for each module are defined in the JNIOR Protocol Specification. The data blocks for the 4ROUT Quad Relay Output module are represented here as an example of translation between the binary descriptions and that required for this protocol.

```
    4ROUT Read Data Block

    "Hex":"00000000000000000000"
           | | |   |   |   |
           | | |   |   |   0000  Relay D Pulse Time Remaining
           | | |   |   |         (0 to FFFF hexadecimal milliseconds)
           | | |   |   0000  Relay C Pulse Time Remaining
           | | |   |         (0 to FFFF hexadecimal milliseconds)
           | | |   0000  Relay B Pulse Time Remaining
           | | |         (0 to FFFF hexadecimal milliseconds)
           | | 0000  Relay A Pulse Time Remaining
           | |       (0 to FFFF hexadecimal milliseconds)
           | 00  Bit mapped relay status (0-open 1-closed)
           00  Bit mapped last relay mask used (1-selected)

      Bit mappings (mask and status)
      +-------+-------+-------+-------+-------+-------+-------+-------+
      |   0   |   0   |   0   |   0   | Rly D | Rly C | Rly B | Rly A |
      +-------+-------+-------+-------+-------+-------+-------+-------+
```

Of most importance here are the last 4 bits of the second byte. This is basically the 4th character of the "Hex" string encoding which relays are closed and which are open. '0' indicating that all of OFF. 'F' indicating all are ON.

WRITE DATA BLOCK

4ROUT Write Data Block

```
    "Hex":"00000000000000000000"
           | | |   |   |   |
           | | |   |   |   0000  Relay D Pulse Time
           | | |   |   |         (0 to FFFF hexadecimal milliseconds)
           | | |   |   0000  Relay C Pulse Time
           | | |   |         (0 to FFFF hexadecimal milliseconds)
           | | |   0000  Relay B Pulse Time
           | | |         (0 to FFFF hexadecimal milliseconds)
           | | 0000  Relay A Pulse Time (0 to FFFF hexadecimal milliseconds)
           | 00  Bit mapped relay state (0-open 1-closed)
           00  Bit mapped relay selection mask (1-selected)

      Bit mappings (mask and state)
      +-------+-------+-------+-------+-------+-------+-------+-------+
      |   0   |   0   |   0   |   0   | Rly D | Rly C | Rly B | Rly A |
      +-------+-------+-------+-------+-------+-------+-------+-------+
```

The state of the relays corresponding to the '1' bits in the 'mask' are changed to the desired 'state'. For a permanent/static change the corresponding Pulse Time must be 0000. To pulse Relay A ON for 5 seconds the Pulse Time field would be set to 5000 milliseconds which is represented as 1388 hexadecimal. The "Hex" string for this command would be "01010000000000001388". Note that the mask indicates the target relay. The state indicates the desired change and the length of the pulse in milliseconds is defined.

REALTIME CLOCK

Access to the JNIOR's realtime clock is provided. This can be used to obtain and display the clock as it is maintained by the JNIOR. This exchange can be useful as a tick allowing you to detect the loss of connection.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":"Clock Read"
    }

                                {
                                  "Message":"Clock Response",
                                  "Time":1452012668787,
                                  "Date":"Tue, 05 Jan 2016 16:51:08 GMT"
                                }
```

An Administrator may adjust the JNIOR's realtime clock. There is no response.

```
    {
      "Message":"Clock Set"
      "Time":1452012668787
    }
```

REBOOT NOTIFICATION

This message is sent when the JNIOR is shutting down for a reboot.

```
    {
      "Message":"Device Shutdown"
    }
```

SYSTEM LOGGING

JANOS logs system events to the jniorsys.log file. When this file reaches a certain size it is aged to the jniorsys.log.bak file. The content of the latter is discarded. As a result there can be as much as 128KB of system logs.

The "Syslog Read" request will return the log history in sequence from oldest to latest. This includes both the content of both files, as much as 128KB worth of log information.

```
        TRANSMITTED                      RECEIVED

    {
      "Message":"Syslog Read"
    }

                                     {
                                       "Message":"Syslog Read Response",
                                       "Data":[
                                         "10/10/16 10:28:16.645, -- JANOS 410 ...",
                                         "10/10/16 10:28:16.683, Registry expo...",
                                         "10/10/16 10:28:17.791, Added: WebSer...",
                                             .
                                             .
                                             .
                                         "10/20/16 12:55:26.582, -- JANOS 410 ...",
                                         "10/20/16 12:55:26.596,  Warning: P...",
                                         "10/20/16 12:55:49.467, Requesting ti...",
                                         "10/20/16 12:55:55.000, Clock synchro...",
                                         "10/20/16 13:26:15.698, Starting sess...",
                                         "10/20/16 13:26:15.939, Successful lo...",
                                         "10/20/16 14:02:33.633, FTP/10.0.0.20...",
                                         "10/20/16 14:02:40.130, FTP/10.0.0.20..."
                                       ]
                                     }
```

Note that the "Syslog Read Response" can be quite lengthy. Each line of the log is supplied in sequence in the "Data" string array.

As new entries are posted to the jniorsys.log file the JMP Server will supply them. This is a real-time update and these messages are unsolicited. Note here the the "Data" is simply a string and not an array. These messages supply one line at a time.

```
        {
          "Message":"Syslog Update",
          "Data":"10/20/16 14:11:10.561, [logger] This is a new log entry"
        }
```

AUTH-DIGEST

The JMP connection requires a login and will respond with a "401 Unauthorized" error text pending a successful login. The server provides a unique "Nonce" string as part of this message. This can be used in conjunction with the username and password to calculate the appropriate Authorization Digest. This requires a MD5 message digest calculation which generates a 16 byte digest represented as 32 hexadecimal characters. The calculation proceeds as follows:

```
    Digest = Username + ":" + MD5(Username + ":" + Nonce + ":" + Password)
```

Where Username, Password, Nonce and Digest are all strings. The resulting Digest string is returned in the "Auth-Digest" member. Here is an example login with the default administrator's account.

```
        TRANSMITTED                     RECEIVED

    {
      "Message":""
    }

                                {
                                  "Message":"Error",
                                  "Text":"401 Unauthorized",
                                  "Nonce":"bc581a9683d3e1857218db135e4b"
                                }

    {
      "Auth-Digest":"jnior:6b7b418f223e7e0dc600c41c7b6644b3"
    }

                                {
                                  "Message":"Authenticated",
                                  "Administrator":true,
                                  "Control":true
                                }
```

NOTES

The login requirement can be disabled. This creates a huge security vulnerability and is to be highly discouraged. Do not disable login requirements.

Programming Overview

OVERVIEW

Anyone with basic programming skills can develop an Application Program to run on JNIOR. JANOS can in fact run several such applications simultaneously. A small additional program is sometimes needed to accomplish a particularly custom requirement. In order to provide this capability JANOS application programs utilize the Java language.

Java is a high-level language and is typically the first language students encounter in an introduction to programming course. Java is a general purpose language that is designed to be for the most part independent of hardware configuration and operating system version. Application programs need not be recompiled when platform characteristics change. Programs once written for JNIOR, run on every Series 4 and later JNIOR with little or no maintenance.

SEE ALSO

HELP Topics: JAVA, JVM

JVM Programming

DESCRIPTION

Java programs are compiled into bytecode which is independent of the underlying computer architecture. The resulting compiled classes can run on any Java virtual machine (JVM). The JANOS JVM is a 'clean-room' implementation developed entirely from 'The Java(tm) Virtual Machine Specification' written by Tim Lindholm and Frank Yellin published by Addison Wesley Longman, Inc. Copyright (c) 1997 Sun Microsystems, Inc.

Each application program is executed by its own instance of JVM. Each appears as a separate process. Each program may have any number of independently running threads. As JANOS can execute as many as 16 separate processes and understanding that several processes need be reserved for network and system activity, JANOS can reliably run several instances of the JVM getting the job done for you.

RUNTIME

Java is a class-based, object-oriented programming language. The java.lang.Object is the root of the entire Java class hierarchy. Every class has Object as a superclass. The /etc/JanosClasses.jar file located on every JNIOR in read-only memory contains the necessary java. class library as well as additional libraries as are necessary for programs to interface to JNIOR hardware and the rest of the world.

To be successful, application programs developed for JNIOR must be built entirely on JanosClasses.jar and not with respect to any libraries that might otherwise be installed in combination with the IDE and compiler you use. The JanosClasses.jar file may be uploaded from the JNIOR and specified in the -bootclasspath option to the compiler. A program built in this way is guaranteed to have everything it needs to run reliably without Exception on any JNIOR.

The JanosRuntime_2.0.jar runtime library file can separately be obtained from the INTEG website at jnior.com . This file contains the same class libraries that are available in JanosClasses.jar, additionally including Javadoc and source code detail to support development using an IDE. While either file will generate the same program the latter is invaluable in getting the most out of your IDE and JNIOR.

NOTES

Programs access JNIOR hardware and other capabilities using a low-level native interface. A optimized call-by-name method is used permitting the operating system to be freely updated without creating a need to recompile application programs. Once a built-in method is located its location is cached and programs execute fast and efficiently.

SEE ALSO

HELP Topics: COMPILING, PROGRAMMING, JanosClasses.jar

Program Files Programming

DESCRIPTION

Application programs are written in the Java language. The application program and any other supporting .java files are compiled into .class files. The resulting class files which contain the bytecode are then packaged into a single library file with the .JAR extension.

In addition to class files the JAR file contains a Manifest.mf file used by the JVM among other things to locate the main() program entry point. An AppInfo.ini file may be present. The presence of this file is detected by JANOS during boot an used to Register the application. Registered applications show up in the WebUI Configuration Applications tab.

There may be other files added to the JAR file as needed by the application. Sometimes the developer will include the source files. This is the case with JBakup.jar for instance.

COMPILING

For proper operation the application program MUST be compiled against the JanosClasses.jar runtime library or the expanded JanosRuntime_2.0.jar runtime (available from jnior.com). With Java being standard a simple "Hello World" program compiled with standard Java libraries will, in fact, execute properly on the JNIOR. With those libraries however, you will not be able to utilize the unique classes that provide access to all of JNIOR features and hardware.

Depending on your choice of IDE or compiler the procedure will vary. With NetBeans (https://netbeans.apache.org//) when a Project is created you need to specify JanosRuntime_2.0.jar as a Library in the Project Properties dialog. With that JAR you can edit the library entry to indicate that it contains both Javadoc and Sources.

Additionally in the Project Properties under Build and Compiling you must add a -bootclasspath option as an Additional Compiler Option. For example:

```
    -bootclasspath "C:\My Projects\JanosRuntime_2.0.jar"
```

The above instructs the compiler to build on the JANOS runtime only. Adding the library to the project tells the IDE about classes unique to JNIOR.

One last thing that will help the Netbeans IDE popup useful information as you develop your program is to edit one of the project.properties in the nbproject folder. You can make the following setting or otherwise point the endorsed.classpath to the JanosRuntime_2.0.jar file.

```
    endorsed.classpath=${javac.classpath}
```

This setting insures that only JANOS pertinent information is displayed eliminating references to the standard libraries. If you do not make this change you might be led to use a class or method that is actually not supported on the JNIOR. With the -bootclasspath setting above the program will not successfully compile when it encounters the unknown.

NOTES

The .JAR file extension identifies the library as containing an application that can be executed by JANOS using the JAVA command. JAR files located in the /flash folder are in the default search path for programs and can be executed by name on the command line without specifically using the JAVA command. This allows application programs to masquerade as custom commands. The FtpClient is an example where /flash/ftp.jar creates an FTP command for interaction with an external FTP server.

A JAR file is identical in structure to a ZIP file. These can be manipulated with the ARC command (same as ZIP and JAR commands).

SEE ALSO

HELP Topics: JVM, ARC, JAR, JanosClasses.jar, JAVA, JBakup, FtpClient

Web Development

OVERVIEW

JANOS supports a highly capable WebServer which can handle multiple connections from multiple clients simultaneously. Both non-secure (HTTP) and secure (HTTPS) connections are possible for pages served publicly and those requiring authentication.

A Hypertext Preprocessor modeled after PHP is available providing the ability to create dynamic and fully-featured websites. This general purpose scripting language is also uniquely available for program and batch file use in the Command Line Console environment.

Each WebServer connection can be dynamically upgraded to support the Websocket protocol providing full-duplex general-purpose communications with JNIOR. By default a Websocket connection supports the JANOS Management Protocol (JMP), a rich JSON based message exchange capable of all aspects of product administration. This includes file transfer, command line console access, Registry manipulation and I/O control and monitoring. In short, the entire product can be managed through a single HTTP/HTTPS connection.

Inter-process communications are provided allowing an Application Program to be written as a network server. Custom protocols are then possible and proprietary protocols can be accommodated.

Finally, uniquely the JANOS Webserver can serve an entire website directly from a single ZIP library file. This incredible feature allows the website to be installed and updated as a single file eliminating any risk that files may be missing or go out of sync. For example the entire default WebUI is contained within the /flash/www/config.zip file. This file need never be expanded.

NOTES

The default WebUI demonstrates the power of the JANOS WebServer. These dynamic configuration pages leverage the power of the Websocket connection and the strength of the JMP protocol.

SEE ALSO

HELP Topics: WebServer/Server, WEBSOCKET, JMP, WEBUI, ZIP

WebUI   Web Development

DESCRIPTION

By default the JANOS WebServer provides access to the Dynamic Configuration Pages User Interface (WebUI). This default website provides immediate access to JNIOR I/O, product configuration, command line console (CLI) services, file management and much more. The entire product can be managed through this one connection and a remote browser.

OPERATION

When a browser accesses the JNIOR IP address the WebServer looks to the default root location /flash/www for a Home Page named index.html or index.php . The WebServer also looks in /flash/public where pages not subject to authentication can be placed. No home page will be found in these locations on a factory fresh JNIOR.

When a home page is not found in the normal root locations the WebServer refers to the /WebServer/Path Registry key for additional paths to search. The default value of that key is /flash/www/config . The WebServer then looks in that folder for a home page. This would be the same location that a URL would reach had it included the /config sub-folder after the units IP address or domain name.

On a factory fresh unit the /flash/www/config folder is not present. Here a unique feature of the JANOS WebServer comes into play. The ZIP library named /flash/www/config.zip in fact is present on a new JNIOR. This file actually creates a virtual folder providing content at the /flash/www/config location. A home page providing the JANOS WebUI will be located in this file along with all of the other files necessary to support this default website.

NOTES

A custom website can be designed and served by the JNIOR. These new pages can be located in the /flash/www default WebServer root folder. This will then be found by the browser overriding the default configuration. Access to the default WebUI will remain possible simply by including the /config folder in the URL when accessing the JNIOR.

A /flash/www.zip file can also house a custom website. The Webserver in checking the defualt /flash/www root folder will find the desired home page from the virtual folder created by /flash/www.zip . If a file is found in an actual folder the WebServer stops the search. This file then would override any file by the same name present in a corresponding virtual folder.

SEE ALSO

HELP Topics: /Webserver/Path, WEBSERVER

Overview Scripting

OVERVIEW

The JANOS Web Server utilizes a *Hypertext Preprocessor* modeled after the popular PHP general-purpose scripting language. This is not an official version of PHP and so it is referred to as a PHP-like scripting language.

Web developers familiar with PHP will find working with scripting on JANOS to be very similar. JANOS scripting is a stable environment benefiting from a commitment to backwards compatibility. JANOS scripting can offer functionality tuned for use with JNIOR products.

JANOS scripting implements a subset of the PHP Hypertext Pre-Processor. This allows segments of script to be interposed into HTML web content and used by the server to generate context specific web content on the fly and on demand. This may be used simply to label a page uniquely based on unit configuration. Or, a page may consist entirely of script and respond to parameters supplied in the URL to provide support for *AJAX* type requests and dynamic HTML.

Uniquely JANOS scripting extends beyond the WebServer where it is an important tool in rendering HTML. Scripting can be included as part of a command line batch file. In the batch environment scripts can conditionally render commands generating a batch file as appropriate for the current state of JNIOR. This proves to be very powerful and avoids having a separate and yet different scripting environment for batch.

Scripts can also be written to be executed as a program. While batch files use the .BAT extension, scripted programs use the .PRG file extension and can be executed using the RUN command. Of course in this case the script simply renders general output. This can be invaluable in testing. Script snippets can also be directly entered at the command line.

JANOS scripting is compiled. This is critical in attaining performance both in rendering websites and executing command line programs.

SEE ALSO

HELP Topics: SCRIPT, WEBSERVER, RUN, CKSUMS

Script Tags Scripting

DESCRIPTION

Script is inserted using the **<?php** opening tag and **?>** closing tag. A closing tag at the end of a file is not required. This avoids the insertion of unnecessary trailing white space. The **<?php=** opening *shortcut* can be used with the following detail assumed to be parameters to an ECHO statement.

With JANOS scripting the preference is to use the generic scripting tags **<?** and **?>** . The "php" characters are optional in the opening tags. So to add lines of script you can just use **< ?** or for the shorthand echo statement **<?=** .

WEBSERVER

The JANOS Web Server interprets PHP script in files with the .PHP extension. The index.php file is a default home page which if it exists takes precedence over and index.html file. The PHP file is assumed to contain HTML content which would be served like any other page with the exception of any script which is identified by the special tags. A .PHP file when served first executes script (if any) generating a .HTML file which subsequently is served to the client browser. Scripts then are designed to render HTML.

BATCH PROCESSING

From the JANOS Command Line you can execute *Batch Files* which have the .BAT extension. Uniquely script may be interposed in these files for pre-processing. The syntax is identical to that used in the HTML implementation including the **<?** and **?>** tags. The script renders commands formatted as if entered at the command line the result of which is then executed. You can use script to conditionally customize and/or generate the commands.

SCRIPTED PROGRAMS

The scripting implementation is very powerful. While such scripting is usually implemented by an interpreter, JANOS compiles these scripts prior to execution and caches the compiled code for reuse. As a result scripts execute fast and efficiently. This can be used to create utility and even application programs. A Program File can be created with the default extension .PRG and executed directly using the RUN command. These program files are logically created just as PHP HTML pages or scripted batch files. One or more blocks of script are interposed using the **<?** and **?>** tags. In this case, text outside of the script is merely echoed as program output.

INLINE SCRIPT

Script may be entered at the command line. The line must begin with the opening **<?** tag and be terminated with **?>**. The script therein generates the command that then is executed. This can be useful in testing fragments of script.

Inline script entered in this fashion must also simulate an ENTER keystroke by including a trailing newline character '\n'. Output without the newline is simply displayed and execution is not attempted. The **puts($string)** function echoes the **$string** followed by the necessary carriage return and linefeed for execution. For example:

```
bruce_dev /> <? puts("date");?>
date
Sun Jun 27 08:02:45 EDT 2021

bruce_dev /> <? echo "date\n";?>
date
Sun Jun 27 08:03:02 EDT 2021

bruce_dev /> <?="date\n";?>
date
Sun Jun 27 08:03:11 EDT 2021

bruce_dev /> <?="date";?>
date
```

```
bruce_dev />
```

Inline script can also simply generate output that would not be interpreted as a command. A line of script may be entered following an exclamation point '!'. This syntax assumes the opening and closing tags. These should not then be entered. For example:

```
bruce_dev /> ! puts("Hello World.");
Hello World.
```

NOTES

Errors in scripts are reported in the php.log file. Inline script errors are reported to the console.

```
bruce_dev /> <? echo "Hello World." ?>
Scripting error: /temp/tmp31076 (Line 1)
1:  <? echo "Hello World." ?>
1:                         ^ expected semicolon

bruce_dev />
```

SEE ALSO

HELP Topics: VARIABLES, FUNCTIONS, SCRIPTING, RUN

Variables   Scripting

DESCRIPTION

JANOS scripting is modeled after PHP and just as is PHP variable names always start with the dollar sign '$' character. By convention the next character in a name must be either the underscore '_' or an upper or lowercase letter in the set [a-zA-Z]. Variable names are case-sensitive. The name can be any length and the remaining characters may also be a digit [0-9].

TYPES

Variables store information that is needed by the script. These information types are supported.

* Booleans
* Integers
* Float Point Numbers
* Strings
* Arrays
* NULL

Script is loosely typed. You do not declare the variable type. That is defined by what you store in them. A variable can contain different types at different times. In fact you generally needn't worry about conversions either. Except for rare situations this is handled for you.

Boolean variables store either *True* or *False* . These literal terms are case-insensitive. Boolean variables are great as flags to control script operation or to store the results of comparisons.

Integers are in the range from -2,147,483,648 to 2,147,483,647 inclusive. An overflow can occur when a result exceeds the largest integer value at either end of the range.

Floating point values are supported to 6 significant digits. The IEEE 754 format is used. Care should be used with floating point as the limited precision can lead to rounding errors and the error can easily compound and accumulate.

Strings can be of any length and can contain the values from 0x00 to 0xff inclusive. Binary data can be stored by String variables.

Arrays are *name-value* pairs with the name being the array index and the value any variable type. Arrays may be multi-dimensional as the values can be arrays as well.

STRINGS

String literals are defined using single quotation marks (') as follows:

```
'This is a string literal'
```

Escape sequences such as '\n' are not converted within literals. Everything between the single quotes including line breaks are part of the string. The only escape sequence recognized is that escaping a single quote itself.

```
bruce_dev /> echo 'Bruce\'s test literal';
Bruce's test literal

bruce_dev />
```

A string enclosed in double-quotes (") is subject to further processing. In addition to the handling of special characters using escape sequences any included variable names are expanded into a string representation of the value. This is a very powerful formatting tool.

Strings may be concatenated using the period '.' operator.

```
bruce_dev /> !="TEST"."ING";
TESTING

bruce_dev />
```

ARRAYS

Arrays are created using the **array()** function. These can be fully defined using the following construct. This takes any number of **key => value** pairs as arguments.

```
array(
    key  => value,
    key2 => value2,
    key3 => value3,
    ...
)
```

BUILT-IN VARIABLES

JANOS provides a small set of built-in variables.

$_GET[ ]

This array provides access to parameters supplied in the GET request URL. For example **$_GET['name']** returns "INTEG" if **?name=INTEG** is supplied in the URL. This would return **NULL** if it is not present. If a parameter appears in the URL without a value defined it is set to an empty string ("").

When used from the Command Line the **$_GET** array enumerates the command line parameters following the command (either the batch file name or RUN command).

$_POST[ ]

This array provides access to parameters supplied as data in a POST request. HTML forms data may be submitted by either GET or POST methods. In the case of the latter the **$_POST** array provides access.

$_SERVER[ ]

This array provides access to parameters supplied by the Web Server. This includes the HTTP-Request headers.

```
array $_SERVER {
  'HTTP_GET' => string ('/test.php HTTP/1.1'),
  'HTTP_HOST' => string ('bruce_dev'),
  'HTTP_CONNECTION' => string ('keep-alive'),
  'HTTP_UPGRADE_INSECURE_REQUESTS' => string ('1'),
  'HTTP_USER_AGENT' => string ('Mozilla/5.0 (Windows NT 6.1; ...
  'HTTP_ACCEPT' => string ('text/html,application/xhtml xml, ...
  'HTTP_ACCEPT_ENCODING' => string ('gzip, deflate, sdch'),
  'HTTP_ACCEPT_LANGUAGE' => string ('en-US,en;q=0.8'),
  'HTTP_COOKIE' => string ('JANOS-Session-Id=6fe5fd609c4abb7f ...
  'REQUEST_URL' => string ('/test.php'),
  'SERVER_ROOT' => string ('/flash/public'),
  'REQUEST_LOC' => string ('/'),
  'DOC_SPEC' => string ('/flash/public/test.php'),
  'DOC_NAME' => string ('test.php'),
  'FILE_SPEC' => string ('/flash/public/test.php'),
  'REMOTE_ADDR' => string ('10.0.0.20'),
  'REMOTE_PORT' => string ('11099'),
  'TLS_SECURED' => string ('FALSE')
}
```

NOTES

You can escape a dollar sign '$' in a double-quoted string if necessary to avoid a variable expansion. This would be required to output USD currency amounts.

While double-quoted strings can include variables in formatting the output string, The JANOS script engine also supports the **printf()** function providing access to C Language string formatting. This offers a much greater level of control over numeric formats.

SEE ALSO
HELP Topics: STATEMENTS, FUNCTIONS, SCRIPT

Script Statements   **Scripting**

DESCRIPTION

JANOS scripting supports most of the standard control structures. The syntax are consistent with Standard C Language and PHP. Note that multiple statements may be grouped into a single statement using curly braces { }. All forms of commenting are available.

```
// Whitespace is ignored allowing you to format your code as you are
//  accustomed to doing.
if (expr)
  statement;

/ Statements are terminated with a semicolon ';' just like in the C
  Language. In all of these constructs an individual statement may be
  replaced with a group of statements enclosed in curly braces '{}'.
  Format it according to your own standards.
/
if (expr) {
  statement;
  statement;
  statement;
}

// In addition to the one-line C+ style comments the one line
//  shell-style comment which starts with '#' can be used.
if (expr)
  statement;   # executed when expr is TRUE
else
  statement;

# The elseif construct is supported
if (expr)
  statement;
elseif (expr)
  statement
else
  statement;    / default condition /

// switch-case statements
switch (expr) {
  case expr1:
    statement;
    statement;
    break;
  case expr2:
    statement;
    statement;
    break;
  default:
    statement;
    statement;
    break;
}

while (expr)
  statement;

// while-loops support single-level 'break' and 'continue'.
while {
  if (expr)
    break;    // exit the loop early
  statement;
}

// The do-while form is available.
do {
  statement(s)
} while (expr);

/ The for-loop follows the C Language implementation. /
for (expr1; expr2; expr3)
  statement;

/ The foreach construct provides an easy way to iterate over arrays. /
foreach (array_expression as $value)
    statement;
foreach (array_expression as $key => $value)
    statement;

/ 'echo' is a native constructs but 'print' is a function. The former
  therefore does not require parentheses although if you like them
  feel free to include them.
/
echo expr;
echo expr1, expr2, ... ;
echo(expr1, ...);

/ 'exit' (and its alias 'die') are also native constructs and not
  functions. They therefore do not require parentheses either. With
  these constructs once the expressions have been echoed the rendering
  process terminates.
/
exit;
exit expr;
exit expr1, expr2, ... ;
exit (expr1, ...);

die;
die expr;
die expr1, expr2, ... ;
die (expr1, ...);
```

SEE ALSO

HELP Topics: EXPRESSIONS, FUNCTIONS, VARIABLES, SCRIPT

Expressions Scripting

DESCRIPTION

Expressions in the JANOS scripting language combine operands, operators and variables and when fully evaluated result in a value or string. An expression is evaluated from left to right in accordance with a defined *Order of Precedence*. Once processed the result may be stored in a variable, output, or applied in a comparison.

The *operators* can perform arithmetic or logic operations. Some operators involve two operands, a left and right. Others may be unary and affect the handling of the operand either to the left (suffix operator) or right (prefix operator).

ARITHMETIC OPERATORS

Some of the simplest expressions manipulate numbers in performing a calculation. The obvious being the four operations:

'+'	addition: 2 + 2 = 4
'-'	subtraction: 8 - 5 = 3
'*'	multiplication: 2 * 3 = 6
'/'	division: 12 / 4 = 3

Common but less obvious are the modulo and exponentiation operations.

'%'	modulo: 12 % 5 = 2
'**'	exponentiation: 3 2 = 9

Modulo arithmetic is useful in many situations when employed creatively. This returns the remainder or signed remainder of the division. The '%' operator does this with integers and returns an integer remainder. The **fmod()** function described later can be used with floating point (double) values.

Exponentiation, taking a number to a power, such as squaring can be performed with the '**' operator. This is a shortcut for the **pow()** function to be described later. This operator is unique to JANOS scripting as it is not part of the PHP language. It is used in languages like Python and Basic. The '^' operator may be written in texts to indicate superscript and the raising of a number to some power but in this, and many languages, it is reserved for a logical operation.

UNARY ARITHMETIC OPERATORS

A unary operation involves just one operand either that immediately before or after the operator. There are only few such *unary* operations and they are typically a kind of shorthand.

'++'	increment by 1
'--'	decrement by 1

These are applicable only to variable values in that their use not only returns the incremented or decremented value but also alters the variable's value for the future. They can be used either as a prefix or suffix. As a *prefix* the operation increments the variable and returns the incremented value for use. But as a *suffix* the variable's value is returned for use but then incremented as stored for future reference.

```
++$a    returns $a + 1 and the value of $a is then
        also incremented. Note the sequence:

            $a = $a + 1;
            echo $a;

$a++    returns $a but increases $a by 1 for its
        next use. Note the sequence:

            echo $a;
            $a = $a + 1;
```

There are additional unary operations that relate to bitwise logical operations or variable type casting. In these cases they are only valid as a prefix to their operand and are not limited to variables. Those will be detailed in the sections that follow.

LOGICAL OPERATORS

A variable not only represents a number (either integer or double), it may also take on a *boolean* value. There are only the **TRUE** or **FALSE** values in that case. Boolean values are critical in handling the result of numeric comparisons and in *logical* expressions. A boolean value is set using those two keywords (not case-dependent).

```
$perfect = TRUE;
$sloppy = FALSE;
```

There are four (4) basic logical operations: AND, OR, XOR and NOT. The first three being binary operations takin two operands and the last, NOT, being a unary prefix.

The **AND** logical operation returns TRUE only when both operands are also TRUE. If either operand is FALSE then the result of the AND is FALSE. Both the 'and' and '&&' operators are used for this logic. You may code the operation either way although, as we will see in a moment, there is a difference in the Order of Precedence.

```
true and true = true
true and false = false
false && true = false
false && false = false
```

Similarly there is the **OR** logical operation which returns TRUE when either of its operands is also TRUE. The OR is FALSE when both operands are FALSE.

The 'or' may also be coded as '||' with two vertical bars.

```
true or true = true
true or false = true
false || true = true
false || false = false
```

The **XOR** logical operation performs the *exclusive_or* which returns TRUE only when both operands differ.

```
true xor true = false
true xor false = true
false xor true = true
false xor false = false
```

There is no alternative form (such as '&&') for this XOR operation. The '^' operator performs a bitwise logical exclusive-or however that operates on numeric (integer) values as we will see shortly.

The NOT operation uses the '!' operator to invert a boolean value. In this case there is no 'not' form and the exclamation point must be applied as a prefix on the value to be inverted.

```
!true = false
!false = true

$a = false;
echo !$a;
TRUE
```

Boolean variables store either TRUE or FALSE. These have equivalent integer values of 1 and 0 respectively. In fact any non-zero numeric value is considered equivalent to TRUE. Any 0 value is considered as FALSE. This permits mixed variable types to be used in logical expressions. Even a string representation of a value may be used. Therefore:

```
echo "1" || false;
TRUE
```

The AND '&&'" and OR '||' operators are executed carefully in that the left hand operand is evaluated and if that determines the outcome of the logical operation the right hand operand IS NOT executed. This is important to know if the right hand operand is an expression that might modify variables either using the inc/dec unary operators or through a function call. For example consider the difference here:

```
$a = 0;
echo false && $a++;
FALSE
echo $a;
0

$a = 0;
echo true && $a++;
FALSE
```

```
echo $a;
1

$a = 0;
echo true && ++$a;
TRUE
echo $a;
1
```

In the first example the right hand operand $a+ is not evaluated and the value of $a is not altered. This is because the outcome of the AND operation is false regardless of the right hand expression. However in the next two examples the right hand operand must be evaluated to determine the result of the logical operation. Here we show the difference in the increment operator used first as a suffix and then as a prefix. $a is altered in both cases but only when the incremented value is used with the expression represent TRUE.

BITWISE LOGICAL OPERATORS

Integer values are stored using 64 *bits* each being either a 0 or 1. This enables a variable to store a large range of integers either positive or negative.

There are a number of logical operations that may be performed between two integers taking each associated bit as either TRUE (1) of FALSE (0). This would allow a single integer to store a number of *flags* that could be set, reset or sampled with a logical operation. These operations can sometimes be employed to modify or test an integer value knowing the binary relationship between bits and integer value.

'&' bitwise AND where a bit is 1 if and only if the corresponding bits in the two operands are also 1.

'|' bitwise OR where a bit is 1 if either of the corresponding bits is a 1.

'^' bitwise XOR where a bit is 1 if the two corresponding bits in the operands differ (not both 0 or 1).

There is one prefix unary operator that performs a bitwise operation but on all of the bits of the integer value.

'~' bitwise complement where each bit is toggled from a 0 to 1 or 1 to 0.

Negative integers are store where the most significant (leftmost) bit indicates the sign. A byte (8 bits) can represent a positive integer from 0 to 255 or a signed integer from -128 to 127. SO for a signed byte integer we would have:

```
00000000 = 0
00001000 = 8
01111111 = 127
```

```
11111111 = -1
10000000 = -128
```

The system uses two's complement math. As an example of the complement '~' operation we can perform a two's complement negation by complementing a value and adding 1.

```
$a = 1;
echo ~$a + 1;
-1

00000001 = 1
11111110 = ~1 or -2 at this point
11111111 = -1 after adding 1
```

While not strictly a logical operation there are two operators that are used to shift an integer's bits either left or right.

'<<' shift left the number of bits defined by the right operand. Each left shit multiplies the integer by 2.

'>>' shift right the number of bits defined by the right operand. Each right shift divides the integer by 2.

Note that integers are 64-bit signed values. Therefore shifting a value right retains the sign (most significant) bit as would simple division by 2. Shifting a negative number to the right returns a negative number. The following is also true. Why?

```
echo -1 >> 1;
-1
```

You can however shift a value to the left enough to overflow the integer and create a negative value.

```
echo 1 << 63;
-9223372036854775808
```

That result being the minimum 64-bit integer that can be used. The maximum 64-bit value can be obtained using the complement '~' operator as follows:

```
echo ~(1 << 63);
9223372036854775807
```

STRING CONCATENATION

The '.' period operator is used to concatenate strings and variables. When a mixed variable that may be numeric or boolean is concatenated or otherwise included in a string, a string representation of the variable is created. For example:

```
echo "This " . "is " . "a " . "test";
This is a test
```

```
$a = false;
echo "The variable is ".$a;
The variable is FALSE

$a = false;
echo "The variable is $a";
The variable is FALSE

$a = false;
echo "\$a is ".$a;
$a is FALSE
```

Note that there are other ways to echo the string with the value of $a. Also note the need to escape the '$' if the intention is not to include the variable's value at that point in the string. The ECHO statement will also process a list of expressions separated by commas which will appear essentially as a concatenation.

ASSIGNMENT OPERATORS

Variables are assigned values using the '=' equal sign. There are a number of assignment operators that combine the various arithmetic, logical and string operations so as to modify a variable's content. The following two lines each attain the same result.

```
$a = $a + 3;
$a += 3;
```

The following operators may be used to assign and/or modify a variable.

'='	set the variable's value
'+='	add the right operand to the variable
'-='	subtract the right operand from the variable
'*='	multiply the variable's value by the right operand
'/='	divide the variable's value by the right operand
'.='	concatenate to a string variable
'%='	update the variable's value modulo the right operand
'&='	update the variable using bitwise AND
'|='	update the variable using bitwise OR
'^='	update a variable performing bitwise exclusive-OR
'<<='	update the variable by shifting left the number of bits defined by the right operand
'>>='	update the variable by shifting right the number of bits defined by the right operand

For example it is common in programming to use bits in an integer as flags which can be set to indicate different situations/modes. A bit position is usually assigned for some purpose. That bit can be selected in these bitwise operations using an integer with only that bit set.

```
$flags = 0;
$flags |= 8;            set the 4th bit
$flags &= ~8;           clear the 4th bit
$flags ^= 8;            toggle the 4th bit
if ($flags & 8)         test the 4th bit
```

Of course it would be simpler to just assign a single boolean variable for each situation. Bit flags are used often in protocols as they are compact and easier to communicate as a set.

COMPARISON OPERATORS

Values and variables may be compared in a number of ways. This is often required to control flow of the program through loops and conditional execution. Each comparison operator takes a left and right operand. The result of the comparison is a boolean value. For instance:

```
echo 100/25 == 4;
TRUE
```

The result being TRUE as the left operand evaluates to the same value as the right operand.

Functions **Scripting**

DESCRIPTION

Functions are sections of code that perform a specific task. A function contains program statements that while written only once can be invoked multiple times, as many as is needed. The function takes parameters which are the variables upon which the task is performed. Very importantly the function returns a value as a result.

A *Function* always returns a value even if none is required. In that case a value of NULL would be returned. Typically a function will return the result of a calculation or other operation.

The CKSUMS scripting example utilizes a function whose purpose is to format and output a text string as an ECHO command for proper batch operation. This function does not return anything of use. It is just used to repeat an output operation in a defined manner. This is a custom function.

USER-DEFINED FUNCTIONS

Any number of functions may be defined in developing script. Each function may have zero or more *parameters* and may optionally return a *result* . A function need not be defined in a script before it is invoked.

```
Function functionName($param1, $param2, ...) {

    ... program statements ...

    return $result;
}
```

Function names consist of one or more characters from the set [_a-zA-Z0-9] where the first character cannot be a digit [0-9]. This is similar to the restriction on variable names.

ARGUMENTS

Functions may be defined with any number of arguments or none at all. A call to the function provides values for the parameters. The call may supply fewer parameters than provided in the function definition in which case the additional defined parameters will receive a NULL value or may be defaulted in the function definition as follows. If too many arguments are supplied the additional will be ignored.

```
function foo($arg, $str = 'default')
{
  // function body
  return $ret;
}
```

RETURNED VALUES

A function may return a value using a <u>return</u> statement as shown in the examples above. If the function completes without executing a <u>return</u> statement a NULL value is returned. Any number of return statements may appear anywhere in the function body.

VARIABLE SCOPE

Each function has its own local variable scope. Variables defined in a function are available only in that function. A variable may be defined with the same name as a global variable (those available to the main program) and not affect or otherwise corrupt the global value. Global variables are not accessible by default within a function.

GLOBAL VARIABLE REFERENCES

Global variables are those defined in the top-level program. They can be accessed from a function using the global statement.

```
global $gvar1, $gvar2, [..., $gvarN];
```

The global statement creates a alias for the global variable in the local scope. Subsequent references to the variable retrieve the global variable value and the global variable may be modified. For example:

```
$a = 1;
$b = 2;

function Sum()
{
global $a, $b;

$b = $a + $b;
}

Sum();
echo $b;
```

The above when executed will output the value 3.

RECURSION

Functions may call other functions and may be used recursively. Functions may define other functions and may redefine themselves.

NOTES

If you need to conditionally define a function then it must be defined before it is referenced. This would assure that the proper form of the function is used. Otherwise results may not be as expected.

SEE ALSO

HELP Topics: CKSUMS, PRINT, STRINGS, VARIABLES, SCRIPT

Built-In Functions Scripting

DESCRIPTION

Functions perform operations on a set of parameters and potentially return a result. A function is usually created when the task it performs will be required at various different points during a script. It is a write-once use-often kind of a programming feature.

Some functions perform a task so common that they are needed in script after script. These are the kind of functions where it is useful to maintain in a library. JANOS scripting does support the include statement which permits you to create a PHP file with such functions and to simply include that file with each script.

To support many of the very common functions JANOS scripting provides a *Built-In Function* library. As scripting has been modelled after public PHP many of the common PHP functions can be found in the JANOS library as well as some that are very custom. These built-in functions eliminate the need to maintain a separate library of useful functions. These are also implemented at a native level and therefore operate much more efficiently that with compile bytecode.

The *Built-In Library* supplies functions support a number of programming categories from string and array operations to system and Registry access.

SEE ALSO

HELP Topics: OUTPUT, PRINT

RENDERING AND OUTPUT

The following functions generate output. When the script is referenced by the WebServer this output becomes part of the HTML stream. When the script is used in the command line batch file the output is then interpreted as a command line entry. In program execution this is simply just output.

int print (mixed $var)

Outputs the **$var** as a string. It is the functional equivalent of the ECHO statement. This always returns 1.

int puts (mixed $var)

Outputs the **$var** as a string followed by the "\r\n" sequence. In addition to generating a newline for formatting general output this appends the ENTER termination needed for command execution in batch use. This always returns 1.

string printf (string $format [, mixed $param])

Outputs the formatted string defined by $format. This uses the Standard C Library format specifiers. A variable number of **$param** values may be supplied. The formatted string is also returned. The **sprintf()** function is available for only formatting the string.

void header(string hdrline)

Adds the supplied $hdrline to HTTP response headers when rendering HTML through the WebServer.

var_dump (var1 [, var2 [, ...]])

Outputs a useful description of each variable. If **var_dump()** is issued without a parameter it will dump ALL of the local variables excluding the predefined arrays.

SEE ALSO

HELP Topics: STRINGS, LIBRARY, PRINTF

STRING OPERATIONS

The following functions perform operations on string variables.

string chr(int $val)

Returns a string of length 1 containing the character represented by the integer value $val.

string ltrim(string $str [, string $character_mask])

Strip whitespace (or other characters) from the beginning of a string.

string rtrim(string $str [, string $character_mask])

Strip whitespace (or other characters) from the end of a string.

string trim(string $str [, string $character_mask])

Strip whitespace (or other characters) from both the beginning and end of a string.

int strlen(string $string)

Returns the byte length of the given string.

int chrlen(string $string)

Returns the character length of the given string. UTF-8 encoded characters count as 1.

string strtolower(string $str)

Returns string with all alphabetic characters converted to lowercase.

string strtoupper(string $str)
Returns string with all alphabetic characters converted to uppercase.

string ucfirst(string $str)
Returns string with the first character of the first word converted to uppercase.

string ucwords(string $str)
Returns string with the first character of each word converted to uppercase.

string strval (expr)
Returns a string representation for the value of the expression or variable.

string substr (string $str, int $start [, int $length])
Returns a portion of the string specified by the start and length parameters.

int strpos (string $haystack, string $needle [, int $start])
Returns the position in $haystack of **$needle** if the string occurs at or after **$start**. Returns -1 otherwise.

int stripos (string $haystack, string $needle [, int $start])
Returns the position in $haystack of **$needle** if the string occurs at or after **$start**. Returns -1 otherwise. The comparison is case-independent.

int strrpos (string $haystack, string $needle [, int $start])
Returns the last position in $haystack of **$needle** if the string occurs at or after $start. Returns -1 otherwise.

int strripos (string $haystack, string $needle [, int $start])
Returns last the position in $haystack of **$needle** if the string occurs at or after $start. Returns -1 otherwise. The comparison is case-independent.

bool startsWith(string $haystack, string $needle)
Returns TRUE if **$haystack** starts with the string **$needle**.

bool endsWith(string $haystack, string $needle)
Returns TRUE if **$haystack** ends with the string **$needle**.

int strcmp(string $str1, string $str2)
Compares two strings in a binary safe manner. Returns 0 if both strings are equal. Returns a negative value (<0) if **$str1** less than **$str2** and a positive value (>0) if **$str1** is greater than **$str2**.

string bin2hex (mixed $var)
Returns a String containing the hexadecimal representation of each character in **$var**. **$var** is converted to its string representation if not initially a String.

string hex2bin (string $hex)
Returns a string where the 2-byte hexadecimal representation of each character is supplied. Returns NULL is an the hexadecimal string

contains an odd number of characters or any character not in the valid hexadecimal set [0-9a-fA-F].

string sprintf (string $format [, mixed $param])
Returns a formatted string as defined by **$format**. This uses the Standard C Library format specifiers. A variable number of **$param** values may be supplied.

string crc (string $message)
Returns a string of length 8 containing the hexadecimal CRC32 checksum calculated for the contents of **$message**.

string md4 (string $message)
Returns a string of length 32 containing the hexadecimal MD4 message digest calculated for the contents of **$message**.

string md5 (string $message)
Returns a string of length 32 containing the hexadecimal MD5 message digest calculated for the contents of **$message**.

string sha1 (string $message)
Returns a string of length 40 containing the hexadecimal SHA1 message digest calculated for the contents of **$message**.

string sha2 (string $message)
Returns a string of length 64 containing the hexadecimal SHA256 message digest calculated for the contents of **$message**.

int strlev(string $word1, string $word2)
Returns the *Levenshtein* "distance" between two strings. This is the minimum number of single-character edits (insertions, deletions or substitutions) required to change one word into the other. This is particularly useful in detecting misspellings.

SEE ALSO
HELP Topics: ARRAYS, LIBRARY

ARRAY OPERATIONS

There are a couple of functions supporting array variables specifically.

int count(variable [, recursive])
Returns the count of elements in an array or other variable. Includes recursive counts for multi-dimensional arrays if the recursive option is set to 1.

array array_remove(array $arr, string $key)
Returns a copy of the array $arr without an element with the specified **$key**.

SEE ALSO
HELP Topics: MATH, LIBRARY

MATH FUNCTIONS

The standard C library math functions are provided. In all cases the mixed **$var** parameters are first converted to double.

double sqrt (mixed $var)
Determines the *square root* of a number.

double ceil (mixed $var)
This function rounds a number upwards to its nearest integer.

double floor (mixed $var)
This function rounds a number downwards to its nearest integer.

double round (mixed $val , int $prec)
Returns the double value of **$val** rounded to the defined **$prec** precision. if **$prec** is 0 or omitted, **$val** is rounded to the nearest integer. The rounding is up for positive values and down for negative. Values between 0.5 and 1.49 would round to 1.0. Values between -0.5 and -1.49 would round to -1.0 . The **$prec** specifies the number of significant places either right of the decimal point (positive **$prec**) or left (negative **$prec**). If **$prec** is 1 then **$val** is rounded to the nearest tenth. If **$prec** is 2 then the value is rounded to the nearest 1/100th. If **$prec** is -1 the value is rounded to the nearest 10 (5.7 rounds to 10.0).

double fabs (mixed $var)
This returns the *absolute value* of a number. The result is always a positive value relating to the magnitude of the supplied value.

double fmod (mixed $dividend , $mixed $divisor)
This returns the remainder of **$dividend** divided by **$divisor**. The modulus operator '%' works only with integers. This is the floating point version of the operation. This **fmod(23.5, 5)** returns the value 3.5 as 5 goes into 23.5 only 4 times leaving 3.5 as the remainder.

TRIGONOMETRY

In mathematics a *transcendental function* is an analytic function that does not satisfy a polynomial equation (algebraic formula). JANOS provides the standard exponential, logarithm and trigonometric functions. With the trig functions (sin, cos) the parameters are given in *radians*. Similarly the arc functions (asin, acos) return radian values.

degrees = radians * 180 / pi

radians = degrees * pi / 180

pi / 2 radians = 90 degrees

Note that the function **pi()** supplies a good estimate of that constant.

double pow (mixed $var , mixed $exponent)
This function raises **$var** to the power defined by **$exponent**. A number will be *squared* when the exponent is 2. Similarly when the exponent is 1/2 or 0.5 this function returns the same value as **sqrt()**.

JANOS scripting as of v2.5 also supports the exponentiation operator '**' as may be found in other languages such as Basic, JavaScript and Python. Therefore both **2 3** and **pow(2, 3)** return the same double value result of 8. The '^' caret operator performs bitwise exclusive-OR.

double pi ( )
Returns 3.14159265358979323846 as best the double precision floating point numeric encoding can provide.

double sin (mixed $x)
Returns the sine of x (x in radians). The sine of 90 degrees or **sin(pi()/2)** is equal to 1.

double cos (mixed $x)
Returns the cosine of x (x in radians). The cosine of 180 degrees or **cos(pi())** equals -1.

double tan (mixed $x)
Returns the tangent of an angle x (x in radians). The tangent of 45 degrees or **tan(pi()/4)** is equal to 1.

double asin (mixed $var)
The arcsine returns the angle (in radians) whose sine is **$var**. The parameter must be in the range -1 to 1.

double acos (mixed $var)
The arccosine returns the angle (in radians) whose cosine is **$var**. The parameter must be in the range -1 to 1.

double atan (mixed $var)
The arctangent returns the angle (in radians) whose tangent is **var**. Since the tangent represents the ratio of the side opposite the angle to the side adjacent to the angle (not the hypotenuse) the parameter may be any value. For a 45 degree angle those two sides are equal with a ratio then of 1.

```
atan(1) * 180 / pi() = 45
```

double atan2 (mixed $opposite , mixed $adjacent)
This alternaive form of the arctangent takes as parameters the two sides of the right triangle and returns the angle in radians.

The 30 degree right triangle is easy to remember. When the side opposite the angle is 1 the hypotenuse is 2. Therefore the side adjacent to the angle must be sqrt(3) in order to satisfy the Pythagorean theorem where the square of the sides add to give the square of the hypotenuse. For this case we have:

```
atan2 ( 1, sqrt(3) ) * 180/pi() = 30
```

EXPONENTIALS & LOGARITHMS

We frequently find situations where things increase *exponentially*. For example the computation of compound interest. The equations for such things often involve the mathematical constant 'e' (Euler's number) which has an approximate value of 2.71828.

double exp (mixed $var)

The *exponential* function returns the value of 'e' raised to the power defined by **$var**. We can retrieve from this the value of 'e'. Try the following at the command line:

```
bruce_dev2 /> !printf( "%.15f", exp(1) );
2.718281828459043
```

double log (mixed $var)

The *natural logarithm* function **log()** returns the power to which the base 'e' would have to be raised to equal **$var**.

```
log( exp(x) ) = x
log( 2.718281828459043 ) = 1
```

double log10 (mixed $var)

This is the base 10 logarithm. The **log10()** function returns the power to which the base 10 would have to be raised to equal **$var**.

```
log10( 10**x ) = x
log10( pow(10, x) ) = x
```

SEE ALSO

HELP Topics: CONVERSIONS, LIBRARY

DATA CONVERSION

int intval (mixed $var)

Returns an integer value for the variable. Returns null if a string cannot be interpreted as a number.

double floatval (mixed $var)

Alias for doubleval().

double doubleval (mixed $var)

Returns a double value for the variable. Returns null if a string cannot be interpreted as a number.

mixed unpack (string $str, int $offset, int $length [, boolean $float])

This function is used to extract data packed into the string (binary byte array) **$str**. Values are assumed to be packed in big-endian order beginning at the provided **$offset**. The size of the parameter is defined by **$length**. The optional boolean **$float** is FALSE by default and if set to TRUE indicates that data is stored in IEEE 754 floating point format.

With **$float** set to FALSE this returns an INTEGER whose value is stored starting at **$offset** in **$str** for **$length** bytes. This will retrieve a byte value ($length = 1), a short value ($length = 2) or an int ($length = 4).

64-bit values cannot be directly retrieved as there is no 64-bit PHP integer variable type. Values less than 4 bytes in length are unsigned.

With **$float** set to TRUE this returns a DOUBLE whose value is stored in IEEE 754 format at **$offset** in **$str** for $length bytes. This retrieves a float value (length = 4) or a double value (length = 8).

A NULL value is returned for any invalid combination of **$length** and **$float**. A NULL value is also returned for any attempted out of bounds string (array) reference.

mixed endian (mixed $var)
Reverses the endian order of a numeric value. This returns a variable of the same type and affects only numeric values.

string urlencode (mixed $var)
Encodes any non-alpha characters not in the set [-_a-zA-Z] using %## encoding. Plus symbols ('+') replace space characters.

string urldecode (mixed $var)
Decodes any %## encoding in the given string. Plus symbols '+' are decoded to a space character.

string base64_decode(mixed $var)
Decodes Base64 encoded string.

string base64_encode(mixed $var)
Encodes string in Base64.

DATE AND TIME

int time (void)
Returns the current time in seconds since midnight Jan, 1 1970 UTC. Same as getutc() .

int getutc (void)
Returns the current time in seconds since midnight Jan, 1 1970 UTC. Same as time() .

string date (string $format, [int time])
Returns a string formatted according to the given format using the specified timestamp or the current time if no timestamp is provided. If omitted the timestamp would be the value of time() . A partial set of PHP-like formatting specifiers are supported. Either UTC or Local Time may be represented depending on the occurrence of 'U' or 'L' in the format string. Local Time is the default. Daylight Saving Time (DST) is applied if appropriate for the local timezone.

	Day
d	Day of the month, 2 digits with leading zeros (01-31)
D	A textual representation of the day, 3 letters (Mon-Sun)
j	Day of the month without leading zeros (1-31)

Month

m	Numeric representation of the month, with leading zeros (01-12)
M	A short textual representation of a month, 3letters (Jan-Dec)
n	Numeric representation of a month, without leading zeros (1-12)

Year

Y	A full numeric representation of a year, 4 digits
y	A two digit representation of a year

Time

a	Lowercase Ante meridiem or Post meridiem (am or pm)
A	Uppercase Ante meridiem or Post meridiem (AM or PM)
g	12-hour format of an hour without leading zeros (1-12)
G	24-hour format of an hour without leading zeros (0-23)
h	12-hour format of an hour with leading zeros (01-12)
H	24-hour format of an hour with leading zeros (00-23)
i	Minutes with leading zeros (00-59)
s	Seconds with leading zeros (00-59)

Timezone

U	Represent Universal Coordinated Time (UTC)
L	Represent Local Time (default)
e	Timezone identifier, same as 'T' (EST or UTC)
T	Timezone abbreviation (EST or UTC)

string gmtime ([int time])

Formats a time value as a string. If the parameter is omitted the current time is formatted. The time value is in seconds since midnight Jan, 1 1970 UTC. The resulting string is formatted, for example, as:

```
"Thu, 19 Nov 2015 13:13:12 EST".
```

This is the same as:

```
date("D, d M Y H:i:s T").
```

FILE OPERATIONS

int filesize(string $filename)

Returns the length of the file in bytes.

int filemtime (string $filename)

This function returns the timestamp when the content of the file was last changed. This is the number of seconds since midnight Jan 1, 1970 in UTC.

bool file_exists(string $filename)

Returns TRUE if the file/directory referenced by the supplied specification exists and FALSE otherwise.

bool is_file(string $filename)

Returns TRUE if the file referenced by the supplied specification exists and is not a folder.

bool unlink(string $filename)

Deletes the specified file. Returns TRUE if successful.

int fopen(string $filename, string $flags)

Opens a file for reading, writing, etc. The $flags parameter defines the mode of access following the Standard C Liobrary conventions. For reading a file would typically be opened using the flag string "rb". For writing the string "wb" would be appropriate.

int fread(int $handle [, int $length])

Returns a string containing up to $length bytes from the file. If $length is omitted the entire content of the file will be read.

int fread(string $filename)

Returns a string containing the entire content of the file defined by the supplied specification.

int fwrite(int $handle, $string [, int $length])

Writes the content of $string to the associated file. If specified, a maximum of $length bytes will be written. Returns the number of bytes written or FALSE on error.

int fwrite(string $filename, $string)

Creates the file defined by the supplied specification containing the content of $string.

bool feof(int $handle)

Returns TRUE if the file has reached the end-of-file.

int fclose(int $handle)

Closes the file resource. It is good practice to close files that have been opened for reading or writing. There are only a limited number of available file handles.

String getcwd( )

Returns the current working directory.

bool chdir(string $directory)

Change working directory. Returns FALSE if the new specification does not result in an existing folder.

array scandir(string $directory)

Return an array of files and folders from the referenced directory.

bool is_dir(string $directory)

Returns TRUE if the directory referenced by the supplied specification exists and is not a file.

bool mkdir(string $directory)

Creates the specified folder if it does not exist. Returns TRUE if successful.

bool rmdir(string $directory)

Removes the specified folder if it does not exist. Returns TRUE if successful.

string file_crc (string $filename)

Returns a string of length 8 containing the hexadecimal CRC32 checksum calculated for the contents of the file.

string file_md4 (string $filename)

Returns a string of length 32 containing the hexadecimal MD4 message digest calculated for the contents of the file.

string file_md5 (string $filename)

Returns a string of length 32 containing the hexadecimal MD5 message digest calculated for the contents of the file.

string file_sha1 (string $filename)

Returns a string of length 40 containing the hexadecimal SHA1 message digest calculated for the contents of the file.

string file_sha2 (string $filename)

Returns a string of length 64 containing the hexadecimal SHA256 message digest calculated for the contents of the file.

JSON SUPPORT

Support for JSON (JavaScript Object Notation - json.org) is provided. JSON is used in many different ways. It is also a good means of preserving a PHP array structure in file storage and in thereby implementing a rudimentary database.

array json_decode(string $json)

Returns an array structure for the JSON object supplied in JSON string representation.

string json_encode(array $json)

Returns the JSON string representation of an array object.

array json_load(string $filename)

Returns an array structure representing the JSON object stored in the referenced file. The file contains the string representation of the JSON object.

boolean json_save(string $filename, array $json)

Stores an array structure representing a JSON object in the referenced file. The file will contain the string representation of the JSON object. Returns TRUE when the write is successful.

LANGUAGE SUPPORT

There are functions provided that ascertain the status of a variable.

bool is_null(mixed $var)

Tests if a variable is NULL. Returns True or False .

bool is_bool(mixed $var)

Tests if a variable is Boolean. Returns True or False .

bool is_int (mixed $var)
Tests if a variable is an Integer. Returns True or False .

bool is_double (mixed $var)
Tests if a variable is a Double. We store all floating point values as Double. Returns True or False .

bool is_string (mixed $var)
Tests if a variable is a string. Returns True or False .

bool is_array (mixed $var)
Tests if a variable is an array. Returns True or False .

bool isset (mixed $var)
Returns TRUE is the variable has been assigned a value.

bool empty (mixed $var)
Determine whether a variable is considered to be empty. A variable is considered empty if it does not exist or if its value equals FALSE. This is equivalent to:

```
isset($var) || $var == false.
```

REGISTRY ACCESS

The Registry stores name-value data typically for configuration. A script may need access to defined settings or be able to preserve settings of its own. These function access the JANOS Registry system.

string getRegistryString(string $key [, string $default])
Gets the content of the supplied Registry key. Note that this returns an empty string if the key has not been defined. Note also that an empty string is considered to be a FALSE boolean so the returned string can be used in a conditional statement.

bool getRegistryBoolean(string $key [, boolean $dflt])
Returns the boolean equivalent of the Registry key value.

bool setRegistryString(string $key, string $value)
Sets the content of the supplied Registry key. The key is deleted if the supplied value is an empty string.

string[] getRegistryList(string $node [, $children = False])
Returns and array of fully qualified keys for entries (children = False) or child nodes (children = True) within the specified node.

SYSTEM FUNCTIONS

void syslog (string $message)
Enters the message in the system log jniorsys.log file.

void flush (void)
Flushes buffers and attempts to send any output generated to the browser or console.

void sleep (int $milliseconds)

Flushes buffers and sleeps the process for the defined number of milliseconds. If a script must wait for an external event it is important to allow the processor to perform other tasks.

void yield (void)

Yields the process. This should be used by extremely lengthy procedures to reduce the load on the processor and avoid watchdog timeouts.

REGULAR EXPRESSIONS

Regular Expressions (REGEX) define string search patterns. JANOS scripting can utilize these.

int ereg (string $pattern, string $substring [, array $regs])

Returns the position in $substring of a match with $pattern. Returns FALSE otherwise. If $regs is supplied on a match it is set as an array whose first element is the matched string.

int eregi (string $pattern, string $substring [, array $regs])

Returns the position in $substring of a match with $pattern. Returns FALSE otherwise. If $regs is supplied on a match it is set as an array whose first element is the matched string. Case-independent comparisons are performed.

array split(string $pattern, string $substring [, int $limit])

Returns an array of string tokens from $substring using matches to $pattern as the separators. If $limit is provided the returned array will be limited to that number of entries where the last entry will contain the balance of the original string.

array spliti (string $pattern, string $substring [, int $limit])

Returns an array of string tokens from $substring using matches to $pattern as the separators. If $limit is provided the returned array will be limited to that number of entries where the last entry will contain the balance of the original string. Comparisons are case-independent.

string ereg_replace (string $pattern, string $replacement, string $substring)

Replaces all matches to $pattern in $substring with the string $replacement. Returns FALSE on error. Returns the original string if no matches are found.

string eregi_replace (string $pattern, string $replacement, string $substring)

Replaces all matches to $pattern in $substring with the string $replacement. Returns FALSE on error. Returns the original string if no matches are found. Comparisons are case-independent.

Include Statement   Scripting

DESCRIPTION

The include statement inserts and processes the specified file.

```
include $filename;
```

The $filename argument must evaluate to a string and specify a valid existing file. An absolute file specification (beginning with '/') may be used to retrieve files from anywhere in the JANOS file system. If only a file name is specified or a relative path is used the system searches for the file relative to the root of the website (typically /flash/www) using the same procedures used to retrieve standard web pages.

File contents are included in HTML Mode. If the file has a file extension other than .PHP the file is included in the output stream without interpretation. If the file extension is .PHP then PHP content in the file will be interpreted and processed in normal PHP Mode as appropriate.

Files may be included at any point in PHP code where a valid PHP statement is accepted. Files may be conditionally included. You may include a file any number of times. The content is cached. An included file may include other files.

An error encountered during the interpretation of an included file will be reported with the line number and file name of the included file.

SEE ALSO

HELP Topics: SCRIPT

Error Handling   Scripting

DESCRIPTION

The JANOS PHP implementation compiles script to bytecode. After a reboot any PHP source file will be compiled when referenced. The compiled bytecode will be executed to render the page. The compiled code will be retained until the source file or any included files are modified or until the JNIOR is rebooted. Subsequent page references use only the cached compiled code. The bytecode contained therein executes much more efficiently. Pages render faster and more reliably.

Errors during the compilation phase are reported in three places. When an error is encountered an error page is rendered and displayed in the browser. This will define the error, display the faulty source line, and indicate the error with a pointer. The same information is appended to the php.log file in the file system root. An error message is also appended to the system log jniorsys.log . Typically these are Syntax Errors but missing parentheses or semicolons and numerous other conditions will be specifically called out. This greatly enhances the debugging experience.

The following errors are reported:

Syntax Error
    There is something wrong with the program syntax. The compiler was expecting something in the PHP source that it did not find.

Undefined Function Reference
    You have referenced a function but it has not been defined. The first use of the missing function will be displayed.

Expected Semicolon
    There appears to be a missing semicolon. All statements need to be terminated with a semicolon. Additionally the semicolon should be properly used in the FOR statement syntax.

Illegal Break
    A break statement appears outside of a FOREACH, WHILE, DO-WHILE or SWITCH structure.

Illegal Continue
    A continue statement appears outside of a FOREACH, WHILE, DO-WHILE or SWITCH structure.

Expected Paren
    Either an open or close parenthesis is missing.

Unusable Function Name
    Reserved words or built-in function names cannot be used in the definition of user functions. You cannot override existing functions.

Function Name In Use
    JANOS does not allow you to redefine a function. Standard PHP implementations may allow this. If there is a valid application for this behavior then this can be reported as a bug. INTEG may then opt to eliminate this restriction.

Illegal File Specification
    A file path or name includes an illegal character.

File Does Not Exist
    You attempted to include a file that cannot be located. The include statement presently requires an absolute file path. If you have an application that requires the use of a relative path or to specify a file location relative the the WebServer path, report this as a bug. INTEG may expand the functionality here.

At runtime, when compiled bytecode is executed, certain runtime errors may occur. Since a page is likely partially rendered before the error occurs it will appear to stall. The runtime error will be reported in two places. First and error message will be appended to the system log jniorsys.log . Secondly the same error message will be added to the php.log file in the file system root. In addition, the compiler is asked to locate the related line of source code. This is displayed in the php.log file as well. In this case the pointer indicates the rough area where execution failed.

The following runtime errors may be reported:

Stack Error

This indicates a PHP logic fault. If this occurs and the related PHP code appears to be normal then it should be reported as a bug. It indicates that the expected results of expressions or functions are missing. Normal PHP would not normally cause this to occur.

Unknown Operation

This will occur if a PHP operator has been used that has not been implemented. The JANOS implementation is a subset of standard PHP and not all operations have been implemented. This error should be extremely rare. But if you do attempt to use an operation that might be defined in the table of precedence but not logically implemented you will get this error. There should be a simple work-around. You may report this as a bug. INTEG would promptly address the issue.

Not An Array

This runtime error will occur if you attempt to reference a non-array variable using array syntax. This would be the result of an issue in the PHP source. If the program is proper and the statement would have performed in some acceptable way under standard PHP, you may report this as a bug.

Bad Bytecode

This indicates a compiler failure and should be reported as a bug. This is a good indication that system integrity has been lost. It should not happen.

Example Script   Scripting

DESCRIPTION

The JANOS scripting language can be used in the batch environment. Here the script renders commands which are then executed. This is similar to its use in the WebServer situation where PHP renders the HTML page which then is served. The batch script renders commands which are then executed. One difference being that as each command is created it is executed. A complete batch file is not rendered and then run. This allows script to respond to the results of a previous command.

EXAMPLE

Batch files have the ability to masquerade as console commands. Here a script creates a CKSUMS command which reports general message digest and checksum information for requested files. For example:

```
bruce_dev /> cksums jniorsys.log /flash/cksums.bat
   file: /jniorsys.log
   date: 1624647433 2021-06-25 18:57:13 UTC
    crc: f76beec3
    md4: 51b9e5115b62af92df900ee7e66b4d68
    md5: 6c958d3dce3edc8ef9a44e380030419b
   sha1: 1b962afcdae46e666407cd64a97ca772d4ee9a8d
 sha256: 69ccdf8f3236d976e244c15994e80271eee1ff2ba72ce0f71268d51fa7357361
```

```
       file: /flash/cksums.bat
       date: 1614090556 2021-02-23 14:29:16 UTC
        crc: 5a9ae151
        md4: 2869eedfa73a81d63c99fe60899b2f87
        md5: ef3121cafc74a6ffbb179806d4c7dcef
       sha1: 71fa94ec88fceaea208a2c284f16f7d59911e9ac
     sha256: 44d4e35d87148c63acbdf408d4c94cbcd862d106c5d502ea6da6ba1d22535d17

    bruce_dev />
```

Here we request digests for the system log and the script itself. Note that the last modified date for the file is also reported. This can be very useful in checking file validity by comparing these against digests calculated on the original file by the source.

In considering the script needed to perform this we first see that command line parameters are possible and our script needs to process 1 or more as necessary. In fact the script allows wildcards and can report for all matching files. Secondly the script is executed as a batch file but yet is outputting formatted results as opposed to executable commands alone.

The solution to the command line parameters is to loop through each available one and with each parameter gather all matching files looping through each of those. Since we had wanted to act like a built-in command we needed to work in the batch environment. So to get formatted output we employ the ECHO command. A feature of that command under JANOS is that quotation marks may be used to avoid white space trimming that can occur under other operating systems.

So here is the script for review:

```
    bruce_dev /> cat flash/cksums.bat
    <?
    function println($s) {
        puts("@echo \" ".$s."\"");
    };

    for ($n = 1; $n < count($_GET); $n++) {
        $list = scandir($_GET[$n]);
        foreach ($list as $arg) {
            if (is_file($arg)) {
                $time = filemtime($arg);
                println("  file: $arg");
                println("  date: $time ".date("UY-m-d H:i:s T", $time));
                println("   crc: ".file_crc($arg));
                println("   md4: ".file_md4($arg));
                println("   md5: ".file_md5($arg));
                println("  sha1: ".file_sha1($arg));
                println("sha256: ".file_sha2($arg));
                println("");
            }
        }
    }
```

```
bruce_dev />
```

The /flash/cksums.bat batch file and therefore this custom command is provided by default with JNIORs shipped from the factory.

NOTES

There are many ways to accomplish this script. Consider the following alternative. This eliminates the function println() that issued text as an ECHO command and utilizes the JANOS script printf() feature where the ECHO is handled in the format string.

```
<?
$format = "@echo \"%7s: %s\"\n";

for ($n = 1; $n < count($_GET); $n++) {
    $list = scandir($_GET[$n]);
    foreach ($list as $arg) {
        if (is_file($arg)) {
            printf($format, "file", $arg);

            $time = filemtime($arg);
            printf($format, "date", "$time ".
                date("UY-m-d H:i:s T", $time));

            $content = fread($arg);
            printf($format, "crc", crc($content));
            printf($format, "md4", md4($content));
            printf($format, "md5", md5($content));
            printf($format, "sha1", sha1($content));
            printf($format, "sha256", sha2($content));
        }
    }
}
```

The result is quite the same although this executes a bit faster in that it reads the file content only once.

```
bruce_dev /> cksums etc/JanosClasses.jar
   file: /etc/JanosClasses.jar
   date: 1614613137 2021-03-01 15:38:57 UTC
    crc: e352e30a
    md4: ca9352ee0b28c7ffc7986ef93c9e489b
    md5: 343527bed395496dd31e181895f4b1eb
   sha1: b1f8b5676ecfaaac5eb384a3866330add442ef12
 sha256: 79c14030548637a7009b4812fcbe50677ed89fa72b115b19ab04f9bf6ff123c8

bruce_dev />
```

You can execute this script using the RUN command to examine the command output before it is interpreted for batch execution. The RUN command can be helpful in debugging scripts that are meant to be used in this fashion. In this case you do have to fully specify the script file name since the RUN command uses the .PRG extension by default.

```
bruce_dev /> run cksums.bat /flash/jbakup.jar
@echo "   file: /flash/JBakup.jar"
@echo "   date: 1680189500 2023-03-30 15:18:20 UTC"
@echo "    crc: c5ef5f45"
@echo "    md4: f07aa62c88cff004c64061f51cc4c87a"
@echo "    md5: b8abf72c38da6e409575c9c4304995f9"
@echo "   sha1: 911b8b5484c2f467c9a668ded93cacc30a6905af"
@echo " sha256: 634e105d1f734126a6782da0a7449ccaf466d0e88b9eb0e84a4d81181d865497"
@echo " "

bruce_dev />
```

SEE ALSO

HELP Topics: ECHO, CAT, RUN

JNIOR Models

There are four (4) models of the JNIOR. These differ only in the mix of I/O. Generally each supports 16 I/O points comprising of a mixture of Digital Inputs and Relay Outputs. All models provide wired LAN connectivity, a Sensor Port (Expansion Bus), and at least one RS-232 serial port (DB-9F).

```
                     DMX
         PWR   EXP   AUX
       +-----------------+
       |  O O            |
       |                 |
      [| O             O |]
      [| O             O |]
    A [| O             O |] D
      [| O             O |]
       |                 |
      [| O             O |]
      [| O             O |]
    B [| O             O |] C
      [| O             O |]
       |      JNIOR      |
       |                 |
       +-----------------+
          LAN       COM
```

PWR	12 VDC
EXP	Sensor Port Expansion Bus
LAN	100 MBit Ethernet
COM	RS-232 COM Port (DB-9F)
AUX	RS-232 AUX Port (DB-9F) Models 410, 412, and 414
DMX	DMX-512 (5-pin) Model 412DMX
A-D	Digital I/O

Model 410
- 8 Digital Inputs (Connectors A and B)
- 8 Relay Outputs (Connectors C and D)
- AUX Port RS-232, RS-422 and RS-485 capable.

Model 412
- 4 Digital Inputs (Connector A)
- 12 Relay Outputs (Connectors B, C and D)
- AUX RS-232 Port

Model 414
- 12 Digital Inputs (Connectors A, B and D)
- 4 Relay Outputs (Connector C)
- AUX RS-232 Port

Model 412DMX
- 4 Digital Inputs (Connector A)
- 12 Relay Outputs (Connectors B, C and D)
- Single DMX-512 Universe

SEE ALSO

HELP Topics: PWR, RELAYS, INPUTS

Power Supply

JNIOR should be powered by a 12VDC regulated power supply capable of providing up to 1 AMP of current.

The Model 410, 412 and 414 can use a range of supply voltage including AC although use of a 12VDC supply is highly recommended. The flexibility is provided for applications that may need to operate in unique situations. The unit will operate reliably with voltages as low as 10VDC and as high as 24VDC. Use of voltages much above 12VDC may lead to excessive waste energy in terms of heat and perhaps reduced product life.

An AC voltage source may be used to power these models. In this case it is the peak voltage that is of concern. An AC supply in excess of 16VAC (RMS Voltage Vrms) has peaks over 24V and will exceed the rated maximum for the product. An advantage to the AC capability is that the DC supply leads may be accidentally miswired in reverse and the product will still operate.

The 412DMX must use a 12VDC source.

Connector

The PWR connector is 4-pin terminal block header on a 0.200" (5.08 mm) pitch (Weidmuller 1515110000 for instance). The proper 4-pin screw terminal plug is supplied with an INTEG Power Supply or with the 5-piece connector kit.

Connections

The two left positions (closest to the corner of the JNIOR) are (+) positive voltage inputs and the two right positions the (-) voltage inputs. The pin pairs are buses (connected internally) allowing you to tap off of the power supply for additional I/O wiring. This should be done with care as switching noise and other issues may result from the external connections that can interfere with the JNIOR power quality causing reboots or other events.

```
     + 12VDC -
       |   |
       |   |
   +   +   -   -
+-----------------+
| (\) (|) (/) (\) | Screw Terminal
+-----------------+    Block
 |   |   |   |   |
 |   |   |   |   |
  --- --- --- ---
```

NOTES

The Models 410, 412 and 414 will operate if the power supply positive and negative wires are reversed. The 412DMX requires proper wiring. Care should be taken if you plan to tap the supplied voltage for other uses. Use a voltmeter to verify proper polarity.

SEE ALSO

HELP Topics: MODELS

Relay Outputs

JNIOR models support from 4 to 12 internal SPST relays. These are small signal relays rated for a maximum current of 1A (Contact Rating). The switching voltage capability of these relays can be up to 220VDC (250VAC).

```
Maximum Ratings:    1A    60V
-----------------------------
```

For higher currents (up to 10A) INTEG supplies the Power 4ROUT external module. One or more modules can be connected through the Sensor Port expansion bus and add to the relay complement of a JNIOR.

Relay Ouptuts are dry-contact outputs and do not supply voltage. An externally supplied voltage must power the circuit to be switched by the relay output. This is import when using the output to signal other equipment expecting a voltage input.

By default Relay Outputs are Normally Open (NO) not enabling the external circuit until activated. When a relay is closed by the JNIOR the associated red LED will illuminate.

Internally the JNIOR offers jumpers that can reconfigure a relay output to Normally Closed (NC) constantly enabling the external circuit being switched. In this case the relay is activated to interrupt the circuit. This may be useful perhaps to temporarily remove power from an external device effectively resetting it.

The NC option on the Model 410 is available for the top 2 relays on connector D (see MODELS). The Model 412 (and Model 412DMX) offer 4 configurable relays. These are the top 2 on connectors B and D. The Model 414 has 2 configurable relays being the top 2 on connector C.

Connector

Relays are grouped 4 to a connector. These are 8-pin terminal block headers on 0.200" (5.08 mm) pitch (Weidmuller 1510910000 for instance). The proper 8-pin screw terminal plugs are supplied with the connector kit.

Connections

Each relay uses a pair of adjacent pins. These are completely independent of the other relay connections.

SEE ALSO

HELP Topics: MODELS, INPUTS

Digital Inputs

The JNIOR Digital Inputs are voltage sensing. Any voltage applied in excess of 2.5V will activate the input. The red LED will illuminate. These are not high impedance inputs and have an equivalent resistance of about 1,200 Ohms. The connected signal source must be capable of supplying at least 25ma of current in order to trigger an input.

```
Maximum Voltage Rating:    30V
-------------------------------
```

Inputs are filtered and will detect and count transitions to a frequency of about 1,800 Hz. These inputs are also debounced by default. This is configurable by Registry setting.

Higher voltages may be sensed by inserting an additional series resistance.

Connector

Inputs are grouped 4 to a connector. These are 8-pin terminal block headers on 0.200" (5.08 mm) pitch (Weidmuller 1510910000 for instance). The proper 8-pin screw terminal plugs are supplied with the connector kit.

Connections

Each input uses a pair of adjacent pins. The (+) positive input of each pair is that closest to the top (PWR end) of the JNIOR. This is true even with Digital Inputs located on the opposite side of the product as in the Model 414.

SEE ALSO

HELP Topics: MODELS, RELAYS, DIN

COM Serial Port

Both the COM and AUX (when present) serial ports use a D-sub DB-9F connector defined to be compatible with a a simple M-F DB9 extension cable and connection to a standard PC serial port. Since the latter is rare these days a USB-to-Serial adapter with DB-9M connector can make the connection.

The RS-232 COM port, located at the bottom of the JNIOR next to the LAN Ethernet port, supports a 3-wire serial connection. The default is 115,200 Baud using 8 Data bits, 1 stop bit and no parity. Only software flow control is available. Flow control is disabled by default.

```
 ---------COM---------
\ (5) (4) (3) (2) (1) /         DB9F Connector Front View
 \  (9) (8) (7) (6)  /
   -----------------

Pin Assignments
    Pin 2  -  Transmit Out (Tx) Active driver output from JNIOR
    Pin 3  -  Receive In (Rx) from remote system
    Pin 5  -  Ground reference (GND)
    other  -  No connection.
```

NOTES

The GND is not equivalent to the (-) negative power input in all models except the 412DMX (which requires DC power). This GND floats somewhere between the (+) positive and (-) negative power connections.

The JNIOR serial ports are not isolated. Care should be taken not to create unwanted ground loops.

SEE ALSO

HELP Topics: MODELS, AUX_PORT, IOLOG

AUX Serial Port

Both the COM and AUX (when present) serial ports use a D-sub DB-9F connector defined to be compatible with a a simple M-F DB9 extension cable and connection to a standard PC serial port. Since the latter is rare these days a USB-to-Serial adapter with DB-9M connector can make the connection.

The RS-232 AUX port is located at the top of the JNIOR next to the POWER and Sensor Port Expansion Bus connections. In addition to the 3-wire communication connections this port also supports RTS/CTS hardware handshake. The default is 115,200 Baud using 8 Data bits, 1 stop bit and no parity. Both hardware and software flow control are disabled by default. The hardware RTS/CTS lines need no connection for port operation.

```
 ---------AUX---------
\ (5) (4) (3) (2) (1) /         DB9F Connector Front View
 \  (9) (8) (7) (6)  /
   -----------------

Pin Assignments
    Pin 2  -  Transmit Out (Tx) Active driver output from JNIOR
    Pin 3  -  Receive In (Rx) from remote system
    Pin 5  -  Ground reference (GND)
    Pin 7  -  Request to Send In (RTS) from remote system
    Pin 8  -  Clear to Send Out (CTS) Active signal output by JNIOR
    other  -  No connection.
```

RS-422/RS-485

On the Model 410 the AUX port may be configured for RS-422 or RS-485 operation. The latter allowing applications to fully support 2 and 4 wire full-duplex multi-drop communication networks at up to 250 kBaud.

Early Model 410 PCBs included internal jumpers providing an easy way to bridge Receive and Transmit lines for 2-wire RS-485. A third jumper provided the necessary 120 Ohm termination resistor. For proper balancing a termination resistor should be located at both ends of an RS-485 communication line.

While the jumper location on the PCB is no longer populated it remains available and may be optionally soldered for this purpose. The bridging and termination resistor can also be externally applied.

```
 ---------AUX---------
\ (5) (4) (3) (2) (1) /         DB9F Connector Front View
 \  (9) (8) (7) (6)  /
   -----------------

Pin Assignments (RS-422 and RS-485 Modes)
    Pin 2  -  485TX (-) Active driver output from JNIOR
    Pin 3  -  485RX (-)
    Pin 5  -  Ground reference (GND)
    Pin 7  -  485RX (+)
    Pin 8  -  485TX (+) Active driver output from JNIOR
    other  -  No connection.
```

Proper RS-485 bridging (bi-directional 2-wire communications):

* short Pin 2 (485TX-) with Pin 3 (485RX-)
* short Pin 8 (485TX+) with Pin 7 (485RX+)
* include 120 Ohm resistor between plus (+) and minus (-) lines at transmitter and farthest end of the line.

The Java com.integpg.comm.AUXSerialPort class provides support for configuring and controlling the AUX Serial Port. This includes the driver control necessary to support full-duplex 2-wire networking.

NOTES

The GND is not equivalent to the (-) negative power input in all models except the 412DMX (which requires DC power). This GND floats somewhere between the (+) positive and (-) negative power connections.

The JNIOR serial ports are not isolated. Care should be taken not to create unwanted ground loops.

SEE ALSO

HELP Topics: MODELS, COM_PORT, IOLOG

Sensor Port Expansion Bus

The Sensor Port Expansion Bus is located at the top of the JNIOR between the POWER and AUX serial port. This is a proprietary 6-wire communication bus.

INTEG provides a number of expansion modules that are connected in a daisy-chain fashion to this port. These modules include a Power 4ROUT module offering 10A relays, both 10V and 4-20ma analog modules, and a rack-mounted Control Panel. In addition there are temperature and humidity sensors available.

CABLES

Standard length cables are supplied with purchased expansion modules. Custom length cables may be requested or constructed by the customer. The maximum overall network length should not exceed 50 feet or 15 meters.

Wire - 6-conductor flat modular cable (26 AWG)
Plug - 6p6c (RJ12) unshielded IDC (2 required)
Tool - RJ11/RJ12/RJ45 Network & Phone Crimp Tool

```
                                               tab   ---\
/-----+                                             +-----+
|     |=============================================|     |
+-----+                                             +-----/
  \---  tab
```

Note: Tab locations for proper cable construction.

NOTES

Devices generally are connected in a serial daisy-chain fashion. The network length is measured from the JNIOR to the furthest connected device. Success with various cable lengths will be highly dependent on factors many of which are not predictable. Your experiences may vary. Operation is not guaranteed with network lengths over 20 feet or 6 meters. Performance is also dependent on the number and types of modules employed.

If a sensor must be located far from the JNIOR consider placing the JNIOR closer to the sensor as opposed to a lengthy cable. This will reduce communications errors and retries which ultimately will improve performance.

SEE ALSO

HELP Topics: MODELS

ETC Reference

DESCRIPTION

The /etc folder is a read-only section of the File System. This presently contains the JanosClasses.jar runtime library used by the JNIOR Java Virtual Machine (JVM) in executing application programs.

The JanosClasses.jar file may be downloaded and used in compiling Java programs designed to run on the JNIOR. These program should be built with this JAR as the 'bootclasspath'. This provides the complete set of runtime classes required by JNIOR application programs.

More information on compiling applications for JNIOR can be obtained through the website at integpg.com or jnior.com .

SEE ALSO

HELP Topics: PROGRAMMING, JVM, JAVA

FLASH Reference

DESCRIPTION

The JNIOR maintains a File System in several memory areas. The contents of the /flash folder are stored in non-volatile Flash Memory. This provides safe storage for application programs, web pages and other critical data.

SEE ALSO

HELP Topics: JRFLASH

DESCRIPTION

The JNIOR maintains a File System in several memory areas. The /temp folder is available for temporary file storage. The contents are erased after a reboot.

JANOS can be updated by uploading the appropriate UPD file. This file is quite large and is only required during the update. The /temp folder is an ideal destination for the upload. The JRUPDATE command can then reference the file and it is removed during the reboot in completing the update.

The network PCAPNG capture file that can be generated by the NETSTAT command is quite large and is therefore placed in the /temp folder. It must be downloaded before a reboot.

SEE ALSO

HELP Topics: JRUPDATE, NETSTAT

USERS MANUAL Reference

A complete and printable Users Manual is available when accessing the Help System through the WebUI.

DESCRIPTION

The Help System auto-generates the *Users Manual* specific for the content of the current JNIOR. This not only includes Help information for the version of JANOS operating system but also that available for any installed applications.

Creation of the custom Users Manual can take several seconds. The result is printable and can be saved as a PDF depending on your computer's print capabilities. When saved as a PDF the links may be active, providing an interactive manual that may be shared among JNIOR users.

SEE ALSO

HELP Topics: HELP, SUPPORT

TIMEZONES Reference

The clock subsystem is generally configured using the DATE command. JANOS defines a set of Timezones for use in displaying local time. These timezones may or may not utilize Daylight Saving Time (DST). The DATE -T command displays the current set of available timezones.

The rules for DST may change from time to time as governments alter their policies. The default list of timezones will likely become incorrect at some point. JANOS provides a means by which you may define a custom timezone with or without a DST rule. You may even correct an existing timezone.

DESCRIPTION

The following key format is used to create a new timezone or overwrite an existing timezone. Note that timezones are identified by their standard abbreviation (ABBSTD). The timezone for Eastern Standard Time is identified as "EST". Since the default definition of this timezone includes a Daylight Saving Time (DST) rule, the DATE command can also select this timezone using the DST abbreviation "EDT".

```
reg Timezones/NAME = OFFSET, DESC, ABBSTD [, ABBDST, STMON, STDAY,
                STDOW, STTIME, ENDMON, ENDDAY, ENDDOW, ENDTIME, DSTOFS]
```

NAME

The NAME portion of the key is arbitrary and serves only to differentiate the key from others.

OFFSET

The offset in minutes from UTC specified in military time in the format HHMM. For example -0500 subtracts 5 hours from UTC. The value 0630 adds six and a half hours to UTC.

DESC

Supplies a textual description of the timezone. For instance "Universal Coordinated" for UTC.

ABBSTD

Defines the standard abbreviation for the timezone. This is the identifier that is used with the date and time to specify the current timezone. It is used by the DATE command in setting the current timezone. If this matches an existing timezone the built-in definition will be overwritten. Otherwise a new timezone will be created.

The following parameters are required only when specifying a DST rule.

ABBDST

Defines an alternate abbreviation for the timezone. This is the identifier that is used with the date and time to specify the current timezone when Daylight Saving Time is in effect. It can be used by the DATE command in setting the current timezone.

STMON

Specifies the starting month for DST. A 3-character abbreviation is used: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC. This field is not case-sensitive although uppercase is recommended by convention.

STDAY

Specifies the starting day of the month. This is a numeric value where 1 specifies the first day of the month. If it is necessary to specify a certain number of days before the end of the month, a negative value can be entered. Since DST usually begins (and ends) on a specific day of the week, this value is used to select the correct part of the month for that day.

STDOW

Specifies the day of the week on which DST starts. A 3-character abbreviation is used: SUN, MON, TUE, WED, THU, FRI, or SAT. This field is not case-sensitive although uppercase is recommended by convention. This defines the day of the week on or after the starting day. If it is necessary to specify the day of the week on or before the starting day, a negative sign may be prepended to the string (e.g. "-SUN").

STTIME

Specifies the starting time for DST in military time using the format HHMM. For example 0200 indicates 2 o'clock in the morning. This is the point in time when the clocks are to be adjusted.

ENDMON

Specifies the ending month for DST. A 3-character abbreviation is used: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC. This field is not case-sensitive although uppercase is recommended by convention.

ENDDAY

Specifies the ending day of the month. This is a numeric value where 1 specifies the first day of the month. If it is necessary to specify a certain number of days before the end of the month, a negative value can be supplied.

ENDDOW

Specifies the day of the week on which DST ends. A 3-character abbreviation is used: SUN, MON, TUE, WED, THU, FRI, or SAT. This field is not case-sensitive although uppercase is recommended by convention. This is the day of the week on or after the ending day. If it is necessary to specify the day of the week on or before the ending day, a negative sign may be prepended to the string (e.g. "-SUN").

ENDTIME

Specifies the ending time for DST in military time in the format HHMM. For example 0200 indicates 2 o'clock in the morning. This is the point in time when the clocks are to be returned to standard time.

DSTOFS

This defines in minutes the adjustment that occurs when daylight saving time is in effect. Typically this value is 60 indicating that the clocks move ahead an hour for DST.

NOTES

There are two forms to the key. The simple form requires only the first 3 fields. This defines a timezone that does not use DST. The full format requires 13 fields where the additional entries outline the use of DST in that timezone. The DST definition provides an additional abbreviation, specifies start and end timing, and defines the time offset.

This Registry key is interpreted, and therefore take effect, on boot. The new or modified timezones will appear in the table produced by the DATE -T command. The JNIOR may then be switched to the new timezone which will remain in existence until the Registry key is removed or altered. Note that when time is reported to external systems, a custom timezone may not be recognized if its abbreviation is not common and known to the rest of the world.

A Timezone key will be ignored if it contains a syntax or value error. These errors will be reported to the system log (SYSLOG).

EXAMPLES

For example, the following Registry command makes an entry that redefines the Eastern Timezone in the United States with an ego-centric description for those of us in Pittsburgh Pennsylvania.

```
reg Timezones/YinzerTime = "-0500, America/Pittsburgh, EST"
```

This would not be exactly correct as the EST timezone observes Daylight Saving Time. We need to also include the rule.

```
reg Timezones/YinzerTime = "-0500, America/Pittsburgh, EST, EDT,
                            MAR, 8, SUN, 200, NOV, 1, SUN, 200, 60"
```

And perhaps instead of redefining EST we would prefer to create our own timezone, the entry would change as follows. Note that only the ABBSTD need be changed but we alter the ABBDST to be consistent.

```
        reg Timezones/YinzerTime = "-0500, America/Pittsburgh, YST, YDT,
                                    MAR, 8, SUN, 200, NOV, 1, SUN, 200, 60"
```

SEE ALSO

HELP Topics: DATE

LOGS **Reference**

LOGGING

JANOS creates a number of log files. These are text files where generally a single line represents some event. Each entry has a timestamp to the millisecond shown in the local timezone. The (Java date) format is as follows:

```
        MM/DD/yy HH:mm:ss.SSS, message...
        05/28/21 09:25:52.000, Clock synchronized via NTP (+6)
```

System log files are located in the root of the File System and are limited in size. When a log file reaches approximately 64KB in size it is aged. The .LOG file is then saved as a .LOG.BAK file overwriting any previous backup and a new .LOG file is started. A SYSLOG Server may be optionally defined which will receive notice of logged events.

/jniorsys.log

This is the main system log containing general log notices. Entries appear here when the unit boots, processes are started, Registry keys are altered, etc. Any issues with the system will be reported here.

/jniorboot.log

This is a record of the most recent boot. This includes diagnostic reports. Any issue in start-up will be reported in this log. Unlike other log files this file contains only the most recent start-up detail. On the next boot the content is appended to the associated .LOG.BAK file which remains constrained to a maximum length of 64KB.

/jniorio.log

This is generated by the IOLOG command. It will contain I/O logs for all recent Digital Input and Relay Output state changes.

/auxio.log

This is generated by the IOLOG -A command. It will contain a detailed record of serial communications over the AUX port.

/sensorio.log

Also generated by the IOLOG -S command, this contains details of Sensor Port communications.

/jmpserver.log

This contains log information pertaining to access and use of the JANOS Management Protocol (JMP). JMP is a JSON based protocol current recommended for JNIOR communications.

/protocol.log

This contains log information pertaining to access and use of the legacy JNIOR Protocol.

/access.log

Contains notices of failed login attempts.

/web.log

This is a detailed WebServer log.

/tls.log

This log reports issues with SSL/TLS secure communications.

/php.log

Logs errors and event pertaining the the JANOS PHP-like scripting language.

/errors.log

Errors encountered by applications are logged here. If you understand the reason for the logged error detail you should delete this LOG. It is important to recognize when errors occur and thus want to see when this log file appears. The presence of an errors.log file sets the unit's attention flag.

/dump.log

In an extreme situation the operating system may need to shutdown and restart. A dump is generated that can be used by INTEG to further debug the situation. If you have updated JANOS since the dump file was created you should delete it. The presence of a dump.log sets the unit's attention flag.

SEE ALSO

HELP Topics: CAT, IOLOG

ENVIRONMENT Reference

Unlike the Registry the Environment is local to and specific for each running process. This contains NAME-VALUE pairs and variables are case-dependent. When a process is started it inherits the Environment from its parent.

The System uses certain Environment variables to convey information. Applications are free to use environment variables to pass parameters or to temporarily store state information.

The SET command is used to view and define environment content.

SYSTEM VARIABLES

BKSP

The backspace key has a different usage on Linux based systems. The command line process attempts to detect the intended use and when it does sets the BKSP variable. A value of '1' indicates that the connecting terminal is Windows based or otherwise uses the backspace similarly.

CD

This holds the Current Directory. The current working directory is also displayed as the command line prompt. File paths not beginning with the path separator '/' are relative to the current directory.

CMDLINE

Contains the command line used to execute an program. The parent process stores the command line here, executes the application and then removes it. A program can retrieve the command line used to start it.

COLUMNS

Defines the display width in characters. The default and minimum is 80. This is used in formatting output from commands such as HELP and DIR.

ERRORLEVEL

Programs generally return a numeric result. This is typically zero '0' upon successful completion. The returned value can be used as an error code or other purpose. The returned value is placed in the ERRORLEVEL variable.

RUNKEY
RUNCMD

These variables are set when an application has been started using a **Run/** Registry Key. Application programs can be started at boot using these keys. RUNKEY provides the key name. RUNCMD holds the key value which would be the command line command starting the program.

NOTES

Environment variables can be referenced by commands in batch files. A variable name surrounded by percent '%' signs in a batch command line are replaced with the value of the variable.

SEE ALSO

HELP Topics: SETENV, BATCH

DESCRIPTION

The content of a network capture can be filtered either on the incoming or outgoing side. Using the same filter syntax the remote clients allowed to interact with the JNIOR can be controlled. These filters can be quite simple or, if needed, much more sophisticated.

The IpConfig/CaptureFilter Registry key may optionally define a filter which is applied to incoming packet data prior to capture. There is limited storage for captured information and by filtering you can extend the capture period and the amount of pertinent information collected.

A filter may also be used in generating the /temp/network.pcap capture file from the capture buffer content using the NETSTAT -C command. Here the filter allows you to extract only pertinent information in order to keep the file size at a manageable level. The resulting file can be downloaded and opened directly using Wireshark https://wireshark.org .

The IpConfig/Allow Registry key may optionally define a filter which is applied to incoming connections. In this case the referenced IP addresses refer to the incoming source IP addresses, those of remote clients. Referenced port numbers refer only to destination ports, those available on the JNIOR.

SYNTAX

IP Addresses

To filter packets referencing a specific IP address you need only include the IP address in the format â€œnnn.nnn.nnn.nnnâ€� in the filter string. Any packet that references this IP address either as the source or the destination address will be selected for inclusion. All other packets will be excluded unless covered by some other part of the filter. When filtering remote client connections this specifies a specific IP address to allow. Note that this is a dangerously limiting restriction on remote clients.

To exclude packets referencing a certain IP address you can prepend a â€˜!â€™ exclamation point to the address like this â€œ!nnn.nnn.nnn.nnnâ€�. All packets that do reference the IP address as either a source or destination address will NOT be selected for inclusion. This can also be written as â€œNOT nnn.nnn.nnn.nnnâ€�. This may be especially helpful to filter your IP address while debugging communications with other devices. In filtering remote client connections, the NOT syntax is ideal for blocking the client based upon IP address.

Note that an IP address is identified by its format, four decimal values between 0 and 255 separated by the â€˜.â€™ period.

The domain syntax allows you to define a range of IP addresses as would be associated with a netmask. The format is â€œnnn.nnn.nnn.nnn/mmâ€� where â€˜mmâ€™ specifies the number of high order bits that would be in the netmask. For example, â€œ10.0.0.0/24â€� specifies any IP address in the domain that contains IP addresses 10.0.0.1 through 10.0.0.255 and uses a netmask of â€œ255.255.255.0â€�.Â This is useful in selecting only local traffic for instance. It would also be perfect for allowing only clients from a specific network to connect to the unit.

MAC Addresses

Although less often required you can filter on a specific MAC address. The MAC address is included in the filter string in the format â€œhh:hh:hh:hh:hh:hhâ€�. This is six hexadecimal values (0-9 a-f) not case-sensitive separated by the â€˜:â€™ colon. For instance most INTEG Series 4 JNIORs have MAC address formatted as â€œ9C:8D:1A:hh:hh:hhâ€� where the lower three bytes are assigned uniquely in some sequence.

As with IP addressing, packets with MAC addresses may be excluded by writing the filter as â€œ!hh:hh:hh:hh:hh:hhâ€� or â€œNOT hh:hh:hh:hh:hh:hhâ€�.Â Again a MAC address is identified by its format. A MAC address would rarely be appropriate in filtering a remote client however.

Ports

A port is specified in the filter string as a decimal value between 1 and 65535 inclusive. No punctuation is required. The capture filter does not distinguish between a TCP or UDP port number. A port may be excluded using the negation â€œ!nnnâ€� or â€œNOT nnnâ€�. When filtering remote client connections the filter logic can use this to block the client from accessing a specific function by port.

There are standard ports assigned for various functions. The capture filter knows some of them by name. Some may be reconfigured through the Registry. As a convenience the port may be specified using its protocol name. The capture will be filtered on the port as configured at the time the filter is compiled (at boot or upon NETSTAT command). JANOS recognizes these port names where the default values are shown in parentheses: SMTP (25), NTP (123), JNIOR (9200), JMP (9220), FTP (21), HTTP (80), HTTPS (443), TELNET (23), and BEACON (4444). These ports may be excluded using the same negation syntax as previously shown.

Boolean Constants

The capture filter will also recognize the terms TRUE and FALSE. TRUE indicates that the packet is to be included and FALSE otherwise.

Logical Operations

To filter on a single IP address, MAC address or port (or to exclude a single item) the filter need only specify the address or port in the proper format. The following would select the communications involved in an email transfer. If this is used as an incoming filter, only email transactions would be captured. If this is used with NETSTAT -C in generating the PCAPNG file, the file would only include email communications.

```
NETSTAT -C SMTP
netstat -c 25
```

Note that filters (and also commands) are not case-sensitive. The forms above will create a PCAPNG file with just outgoing email communications. This assumes that you have not reconfigured the SMTP port. If you have set Email/Port to another port (587 for instance) then the first line will extract your email communications and the second will not. Although the second filter might show an application trying to use the incorrect port.

Filters often need to be slightly more complex in order to include the collection of communications needed. The syntax allows you to specify any number of addresses or ports in any combination using AND, OR and XOR logic. As an alternative you may use the notation && and || for AND or OR respectively.

As an example perhaps you want to filter only email communications with the SERVER whose IP address is 10.0.0.4

```
netstat -c "10.0.0.4 && smtp"
```

If you want to also include BEACON communications you might write the filter as:

```
netstat -c "10.0.0.4 AND smtp OR beacon"
```

Here you might question the order of precedence of the logical operations. The capture filters do not support an order of precedence but perform the operations from left to right. So this would be calculated as follows:

```
netstat -c "(10.0.0.4 && SMTP) || BEACON"
```

And this would have done what we had said. If there is some question you can use the parentheses in the filter as shown. The following will create the same subset of packets but would not if we were to exclude the parentheses:

```
netstat -c "BEACON || (10.0.0.4 && SMTP)"
```

A parentheses grouping can be negated as you would expect. The following will create a capture of all activity EXCEPT email communications with the SERVER.

```
netstat -c "!(10.0.0.4 && smtp)"
```

Finally if we had wanted to mask these email communications from the overall capture buffer we can install this filter using the command:

```
netstat -f "!(10.0.0.4 && smtp)"
```

This would result in the following Registry setting and would filter out matching communications until such time as the filter is removed.

```
IpConfig/CaptureFilter = "!(10.0.0.4 && smtp)"
```

NOTES

Filters containing space characters and logical AND and OR operators need to be surrounded by quotes. This is to insure that the entire filter string is properly processed as a single parameter to the NETSTAT command.

This same Filter syntax is used by the IpConfig/Allow Registry key the purpose of which is to limit access to the JNIOR. Care needs to be exercised in setting this key as you may end up preventing your own access to the JNIOR. If this occurs you must reset the filter through the COM RS-232 serial port.

SEE ALSO

HELP Topics: NETSTAT, SAFEMODE

SAFEMODE Reference

DESCRIPTION

A JNIOR may be booted into SAFEMODE using the small jumper located between the LAN and COM RS-232 ports. A switch may be wired to the jumper and if activated briefly would reset/reboot the JNIOR. A well-behaved reboot occurs. If the switch is held through the reboot SAFEMODE is activated. This mode is noted in the command line banner.

NOTES

SAFEMODE temporarily enables the default administrator login credentials. This is to assist those who have changed and subsequently forgotten the passwords.

SAFEMODE does not automatically start application programs (RUN keys). If an application program somehow causes an issue whereby the JNIOR enters a tight reboot loop, this will regain access to the unit letting you remove or correct the faulty application.

SAFEMODE disables authentication requirements and allows configuration through the Beacon Protocol.

SAFEMODE also insures that the Telnet port is enabled. This allows you to access the command line console for further configuration.

The IpConfig/Allow Registry key is ignored in SAFEMODE. This will temporarily allow access to network services when a faulty access Filter has been set. The faulty Registry key can be removed.

JANOS registers applications during boot. SAFEMODE skips this procedure.

SEE ALSO

HELP Topics: FILTER

REGEX **Regular Expressions**

REFERENCE

Searches and replacements can be performed using Regular Expressions or REGEX.

Supported metacharacters:

.	dot	matching any character (except CR or LF)
?	question mark	previous zero or one time
+	plus sign	previous one or more times
*	asterisk	previous zero or more times
|	alternation (OR)	match either expression
[ ]	character class	any character listed
[^]	negated character class	any character not listed
[-]	character range	define inclusive range of characters
^	caret	matches position at the start of a line
$	dollar	matches position at the end of the line
( )	parentheses	limits scope for alternation and provides grouping for quantifiers
??	question mark	previous zero or one time - lazy
+?	plus sign	previous one or more times - lazy
*?	asterisk	previous zero or more times - lazy

A *lazy* operation is satisfied with the shortest match for the quantified portion of the expression. Normally the Regex engine will continue to search for a better (longer) match. That is a slower process and not always necessary.

Escaping

The backslash '\' character is used to escape a number of characters that otherwise have REGEX function. This also allows you to use non-printable characters such as tabs, backspaces, carriage returns, etc. There are macros defined that each expand into a set of characters which can be convenient.

escaped non-printable:

\a	0x07 BEL (bell)
\b	0x08 BS (backspace)
\t	0x09 TAB (tab)
\n	0x0A LF (line feed)
\v	0x0B VT (vertical tab)
\f	0x0C FF (form feed)
\r	0x0D CR (carriage return)
\e	0x1B ESC (escape)

hexadecimal entry:

\xHH	where HH represents two hexadecimal digits

meta characters (macros):

\w	[a-zA-Z0-9]	word characters
\W	[^a-zA-Z0-9]	not word characters
\d	[0-9]	decimal digits
\D	[^0-9]	not decimal digits
\s	[\f\n\r\t\v]	match whitespace
\S	[^ \f\n\r\t\v]	not whitespace

NOTES

When including a REGEX on the command line or in a string you will need to again escape the escape character. So to include a tab the escape sequence would be "\\t".

SEE ALSO

HELP Topics: EGREP, GREP, REG, HIST

Printf Format Specifiers Reference

printf is a C Standard Library function that formats text and writes it to the standard output. Versions of the function can write to other destinations or be used simply to format to another string/buffer. JANOS provides this handy function for use in Java programming and in PHP rendering/scripting.

This function uses a *format specification* string defining how any number of variable values and types may be combined into string form. For example here we use the function in scripting from the command line:

```
!printf( "Pi is %.10f", pi());
Pi is 3.1415926536
```

The function call is unique in that is accepts one or more arguments or parameters following the format string. The syntax is:

printf(*format* , *parameter list* ...)

The format string includes text to be copied to the output or buffer as well as one or more *format specifiers* relating in order to the supplied parameter values/strings.

FORMAT SPECIFIERS

The *format* string is the string that contains text to be written. It can optionally contain one or more format specifiers or embedded tags that are replaced with values taken one at a time from the remaining parameters. The format tag syntax is as follows:

%[flags][width][.precision][length]specifier

The **specifier** must be one of the following:

c	character
d or i	signed decimal integer
e	scientific notation using lower case
E	scientific notation using upper case
f	decimal floating point
g	uses the shorter of %e or %f
G	uses the shorter of %E or %f
o	signed octal
p	hexadecimal pointer using lowercase alpha
s	ASCIIZ (nul terminated) string
u	unsigned decimal integer
x	hexadecimal using lowercase alpha
X	hexadecimal using uppercase alpha

The **flags** includes special characters that indicate handling of the formatted value. These are:

- Indicates that the result is to be left-justified within the given field **width**.

+ Causes the sign to always be included when formatting values even when the value is positive.

(space) Reserves a character spot for the sign (uses a space instead of '+' for a positive value).

# When used with %o, %x or %X specifiers the resulting value is preceded with '0', '0x' or '0X' respectively for values that are different than zero. When used with %e, %E and %f, the written output will contain a decimal point even if no digits would follow. By default, if no digits follow, no decimal point is written. When used with %g or %G the result is the same as with %e or %E but trailing zeros are not removed.

0 The '0' flag causes numbers to be left-padded with zeroes '0' instead of spaces when some form of padding is specified (see **width** sub-specifier).

The **width** specification defines the length of the rendered test field. This can be dynamically set.

(number) Defines the minimum number of characters to be printed. If the value to be printed is shorter than this number, the result is padded appropriately with blank spaces. The value is not truncated if the formatted result is longer. In that case the rendered text will be wider than specified.

* An asterisk is used when the **width** is specified by the next parameter in the parameter list of the function call. In this manner the width can be dynamically controlled.

The **precision** specifier follows a decimal point in the format string.

.number When used with integer specifiers (%d, %i, %o, %u, %x, %X) this specifies the minimum number of digits to be written. If the value to be written is shorter than this number, the result is padded with leading zeros. The value is not truncated if the result is longer. A precision of '0' means that no character is written for the value 0. For %e, %E and %f specifiers this is the number of digits to be printed after the decimal point. For %g and %G specifiers this is the maximum number of significant digits to be printed. For %s this is the maximum number of characters to be printed. By default all characters are printed until the ending nul character is encountered. For %c type it has no effect. When no **precision** is specified, the default is 1. If the period is specified without an explicit value for precision 0 is assumed.

.* The **precision** is defined by the next parameter in the function parameter list.

The **length** specifies the size of the supplied parameter.

h The argument is interpreted as a 16-bit (2 byte) short int or unsigned short int. This applies to integer specifiers %i, %d, %o, %u, %x, and %X.

l (lowercase L) Interprets the argument as a long int or unsigned long int 32-bit (4 bytes) as it applies to integer specifiers %i, %d, %o, %u, %x, and %X. When used with %c or %s specifiers it indicates the use of wide characters (16-bit Unicode).

ll (two lowercase Ls) Interprets the argument as a long long int or unsigned long long int 64-bit (8 bytes) as it applies to integer specifiers %i, %d, %o, %u, %x, and %X.

L The argument is interpreted as long double 64-bit (8 byte). This applies to floating point specifiers %e, %E, %f, %g and %G.

Note that Java applications and PHP scripts have access to the underlying C Standard Library **printf()** function. In both cases the supplied parameters are cast to best match the defined format specifier. This may or may not provide expected results. It is helpful to use the command line scripting as shown above to test formatting strings if you have any question as to the outcome.

SEE ALSO

HELP Topics: OUTPUT, SPRINTF

ASCII Table

Dec	Hex	Chr		Dec	Hex	Chr	Dec	Hex	Chr	Dec	Hex	Chr
0	00	NUL	(null)	32	20	(space)	64	40	@	96	60	`
1	01	SOH	(start of header)	33	21	!	65	41	A	97	61	a
2	02	STX	(start of text)	34	22	"	66	42	B	98	62	b
3	03	ETX	(end of text)	35	23	#	67	43	C	99	63	c
4	04	EOT	(end of transmission)	36	24	$	68	44	D	100	64	d
5	05	ENQ	(enquiry)	37	25	%	69	45	E	101	65	e
6	06	ACK	(acknowledge)	38	26	&	70	46	F	102	66	f
7	07	BEL	(bell)	39	27	'	71	47	G	103	67	g
8	08	BS	(backspace)	40	28	(	72	48	H	104	68	h
9	09	TAB	(horizontal tab)	41	29	)	73	49	I	105	69	i
10	0A	LF	(new line)	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	(vertical tab)	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	(new page)	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	(carriage return)	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	(shift out)	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	(shift in)	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	(data link escape)	48	30	0	80	50	P	112	70	p
17	11	DC1	(device control 1)	49	31	1	81	51	Q	113	71	q
18	12	DC2	(device control 2)	50	32	2	82	52	R	114	72	r
19	13	DC3	(device control 3)	51	33	3	83	53	S	115	73	s
20	14	DC4	(device control 4)	52	34	4	84	54	T	116	74	t
21	15	NAK	(negative acknowledge)	53	35	5	85	55	U	117	75	u
22	16	SYN	(synchronous idle)	54	36	6	86	56	V	118	76	v
23	17	ETB	(end of block)	55	37	7	87	57	W	119	77	w
24	18	CAN	(cancel)	56	38	8	88	58	X	120	78	x
25	19	EM	(end of medium)	57	39	9	89	59	Y	121	79	y
26	1A	SUB	(substitute)	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	(escape)	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	(file separator)	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	(group separator)	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	(record separator)	62	3E	>	94	5E	^	126	7E	~
31	1F	US	(unit separator)	63	3F	?	95	5F	_	127	7F	DEL

UTF-8 Encoding Reference

UTF-8 is a variable-length character encoding standard used for electronic communication. Defined by the Unicode Standard, the name is derived from Unicode Transformation Format 8-bit. UTF-8 is capable of encoding all 1,000,000+ valid Unicode code points using one to four bytes.

Code point - UTF-8 conversion

First code	Last code	Byte1	Byte2	Byte3	Byte4
U+0000	U+007F	0xxxxxxx			
U+0080	U+07FF	110xxxxx	10xxxxxx		
U+0800	U+FFFF	1110xxxx	10xxxxxx	10xxxxxx	
U+010000	U+10FFFF	11110xxx	10xxxxxx	10xxxxxx	10xxxxxx

The bits encoding the binary value of the Unicode point replace the xxx from the most significant bit on the left (in Byte1) to the least on the right in the last byte as needed.

ASCII characters of the range 0x00 to 0x7F are not encoded. If Byte1 is larger than 0x7F the first bit is 1. This indicates that additional bytes will be used in the encoding. As you may see in the table above the initial bits in Byte1 define how many bytes will be used in the encoding. Each additional byte will begin with 10 and provide 6 more bits of the final binary value.

UTF-8 encodings used in the context of JNIOR are rarely more than two bytes.

Note that JANOS offers a shortcut for selecting the appropriate Unicode character for common accenting. For instance by typing the *base character* 'e' followed by typing Ctrl-U twice you can toggle to the correct letter used in the word rÃ©sumÃ©.

Morse Code Reference

STATUS LED CODES

The orange Status LED can at times be used to convey information using Morse Code. Most notably, after disconnecting the Ethernet LAN connection the JNIOR will convey the last octet of its assigned IP address flashing each digit in Morse Code.

An application can use the Java JANOS.morseStatusLED() method to output and repeat any message in Morse Code. This potentially can convey a complex error message in the absence of any display and remote access.

MORSE CODE

The following is the International Morse Code implemented by JNIOR. A dot is indicated by the asterisk '*' and a dash by a series of dashes '---'. The spaces between dots and dashes in the same letter are the same length as a dot; The spaces between letters are equal to 3 dots; And, the space between two words is equal to 7 dots. Phrases are repeated with a space equal to 15 dots after the last.

Digits

1	* --- --- --- ---	6	--- * * * *
2	* * --- --- ---	7	--- --- * * *
3	* * * --- ---	8	--- --- --- * *
4	* * * * ---	9	--- --- --- --- *
5	* * * * *	0	--- --- --- --- ---

Letters

A	* ---	N	--- *
B	--- * * *	O	--- --- ---
C	--- * --- *	P	* --- --- *
D	--- * *	Q	--- --- * ---
E	*	R	* --- *
F	* * --- *	S	* * *
G	--- --- *	T	---
H	* * * *	U	* * ---
I	* *	V	* * * ---
J	* --- --- ---	W	* --- ---
K	--- * ---	X	--- * * ---
L	* --- * *	Y	--- * --- ---
M	--- ---	Z	--- --- * *

NOTES

Note the pattern used with digits. This is easily remembered and can help make the IP octet decoding useful.

The length of code to represent letters is based roughly on the frequency of the occurrence of letters in English text. As such the E is a single dot and the letter T a single dash.

The status LED on the back of the Control Panel PCB also uses Morse Code.

SEE ALSO

HELP Topics: NETWORK_ACCESS

JSON Data Format

DESCRIPTION

JSON (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.

JSON is used by MANIFEST to save file information for use in later file verification. It is also used by JMP (JANOS Management Protocol).

Go to https://json.org for more information.

SEE ALSO

HELP Topics: CAT, MANIFEST, JMP

JNIOR Protocol

DESCRIPTION

The JNIOR Protocol is a legacy binary protocol developed to support the Series 3 JNIOR. This is a deprecated protocol and not recommended for new development. The binary protocol supports the JNIOR internal I/O and not much beyond that.

This has been replaced with the JANOS Management Protocol (JMP) which uses the much more easily understood JSON message format. In addition the JMP Protocol is designed to provide tools for the complete management of the JNIOR.

NOTES

This protocol NOT RECOMMENDED for new development.

SEE ALSO

HELP Topics: JMP, JSON

Terminal Compatibility

CONSOLE TERMINAL

Most operating systems, and JANOS is no exception, utilize some form of Command Line Interface. With the JNIOR, the command line can be accessed serially through the RS-232 (COM) port at 115,200 baud, 8 data bits, 1 stop bit and no parity. Typically these days this is accomplished with a USB-To-Serial adapter and a terminal program. When the JNIOR is properly configured for the network, any number of Telnet client programs can be used to access the command line. With the Series 4 JNIOR one can also open the default Dynamic Configuration Pages (WebUI) using a standard browser. In this case the command line is referred to as a Console Session and you can login via the Console tab.

The command line interface uses the standard ASCII character set and is not graphical. Telnet client programs and terminal emulators communicate on a character by character basis allowing you to utilize the features of the JANOS command line. In general a program supporting the ANSI or VT-100 escape sequences is required. While you can interact successfully with only a basic terminal passing keystrokes and displaying characters, the experience is greatly improved when the correct emulation is in place.

JANOS utilizes only a basic subset of the VT-100 codes. These will be outlined below. It is recommended that any custom terminal emulation program be written to support these sequences.

KEYBOARD EMULATION

Keystrokes are sent to the JNIOR for processing. If appropriate they are echoed for display by the JNIOR. ASCII characters fall into the range 0 to 127 which encompasses the standard character set with punctuation and a series of control characters (values less than 32). There are a number of special keys on the standard computer keyboard that do not translate into individual ASCII codes.

Fortunately the JNIOR utilizes only a few special keys. With VT-100 emulation these keys are automatically translated into an escape sequence. The custom terminal emulator must enable these translations. The following are used by the command line interface:

Cursor Emulation, Positioning and Editing

Up Arrow	ESC[A
Down Arrow	ESC[B
Right Arrow	ESC[C
Left Arrow	ESC[D
Home Key	ESC[1~
End Key	ESC[4~
Page Up Key	ESC[5~
Page Down Key	ESC[6~
Ins Key	ESC[2~

Note that the Backspace Key is assumed to translate to an ASCII 0x08. The Delete Key (Del) should translate to an ASCII 0x7F (127) code. In terminal programs (e.g. PuTTY) this behavior can be customized.

CONTROL CODES

Control codes are ASCII values between 0 and 0x1F (31 decimal) inclusive. They have various meanings. In particular the following are used by the JNIOR.

Ctrl-A 0x01 (1 decimal)
toggles anchor used in text selection [2]

Ctrl-C 0x03 (3 decimal)
cancels current actions, displays the banner, editor selection copy [2]

Ctrl-F 0x06 (6 decimal)
Editor search [2]

Ctrl-H 0x08 (8 decimal)
backspace - Backspace Key

Ctrl-I 0x09 (9 decimal)
tab toggles filename auto-fill [1], advances to tab stops in editing [2] - Tab Key

Ctrl-M 0x0D (13 decimal)
Carriage return Enter Key

Ctrl-Q 0x11 (17 decimal)
Exits editor [2]

Crtl-U 0x15 (21 decimal)
Toggles Unicode accent on the prior base character [2]

Ctrl-V 0x16 (22 decimal)
Editor selection paste [2]

Ctrl-X 0x18 (24 decimal)
Editor selection cut [2]

Ctrl-Y 0x19 (25 decimal)
Editor Redo [2]

Ctrl-Z 0x1A (26 decimal)
Editor Undo [2]

Ctrl-[0x1B (27 decimal)
Editor Escape [2] - Esc Key

[1] JNIOR Series 4 feature
[2] JANOS v2 feature.

SCREEN EDITOR

The JNIOR Series 3 and Series 4 with JANOS v1 operating code do not utilize escape sequences to manipulate displayed character data. The following are required by JANOS v2 specifically to support the the screen editor EDIT . Where shown the '#' is replaced by a numeric value represented by ASCII digits. This indicates the number of times that the action is to be repeated. If the decimal value is omitted it is assumed to be one (1).

Move cursor Up	ESC[#A
Move cursor Down	ESC[#B
Move cursor Right	ESC[#C
Move cursor Left	ESC[#D
Erase from cursor to end of line	ESC[K
Format character normal	ESC[0m
Format character reverse video (selected)	ESC[7m
Disable Line Wrap	ESC[?l

Note that the UP and DOWN arrow movements move to the same column in the line above or below on the display respectively. If the destination line is shorter and does not extend to the target column the cursor is moved to the after the last position on the new line. A RIGHT arrow is ignored once the cursor reaches the end of the line. A LEFT arrow is ignored if the cursor is positioned at the beginning of the line. In other words there is no wrap. The logic for this is handled by JANOS. So if your terminal emulation handles movements differently the result should still be as described here.

The Disable Line Wrap escape sequence is sent when the screen editor is started. Lines that wrap would cause confusion with page oriented editing. This wrapping feature is to be disabled. The character formatting is used in highlighting characters when being selected for Copy, Cut and Paste operations. The editor cannot detect the state of the Shift key and relies on dropping the Ctrl-A anchor to start highlighting. Characters are then highlighted as the cursor is moved. Terminal emulation that does not support the formatting of individual characters (e.g. HTML textarea) can accomplish the selection highlighting by some other means. The formatting escape sequences should be ignored in that case. The cursor movement and line erasure escape sequences are critical in enabling a functional screen oriented editor.

JBakup **Log Archiving Service**

DESCRIPTION

The JBakup service accumulates system LOG file data as it ages. Periodically new .LOG.BAK file content is concatenated to any existing LOG.BAK data located in the LOG.ZIP from the /flash/baks folder. The ZIP is updated.

These accumulations are limited in size but generally cover a long period of time.

NOTES

System LOG files age to a corresponding LOG.BAK file when they reach a maximum size (currently 64KB). JBakup generally sleeps and awakes on the quarter hour to look for new LOG.BAK files. These have a date newer than the related LOG.ZIP file located in the flash/baks folder. When found a new LOG.BAK file is appended to the content of the ZIP.

SEE ALSO

HELP Topics: LOGS, ZIP

NAME

ftp

SYNOPSIS

```
ftp [OPTIONS] [SERVER]
```

DESCRIPTION

Files can be transferred on and off of a JNIOR using the File Transfer Protocol (FTP). This typically is performed by a program on a remote computer which works with the JANOS built-in FTP Server. This application allows you to work from the JNIOR Command Line with a remote FTP Server. With this tool you can transfer files to and from a remote machine.

The FTP Client has two modes of operation. In an interactive mode you can query available remote files and make transfers as needed. From the command line you can specify a command file which allows the FTP Client to perform transfers without intervention.

SERVER

If specified the FTP Client will establish the connection with the remote FTP Server. The format is as follows:

```
username:password@server
```

Where 'server' may be given as an IP address or a Domain name. If 'password' is omitted it will be securely requested. If 'username' is omitted both the username and password will be requested. You can use the OPEN command in the interactive session to specify the server.

OPTIONS

-P

Use secure connections.

-V

Verbose mode. The progress of any transfer will be displayed with additional detail.

-C FILE

Specifies a command file which will be used instead of the interactive session.

-H

Or any faulty option will display the legacy built-in Help text for the command.

NOTES

This application program was written as a command line extension and operates as if it were a built-in command.

SEE ALSO

HELP Topics: FTP_COMMANDS

```
COMMANDS
    help (or ?)
        Displays legacy help information.

    open SERVER
        If SERVER is not specified by the command line this can be used to start
        a session with the remove FTP server. The format is as follows:

        username:password@server

        Where 'server' may be given as an IP address or a Domain name. If
        'password' is omitted it will be securely requested. If 'username' is
        omitted both the username and password will be requested.

    close
        Disconnects from the remote FTP server. The OPEN command can then be
        used to establish a new connection.

    ascii
        Operate in ASCII data mode.

    binary
        Operate in BINARY data mode (Default).

    passive
        Operate in passive mode. Data is transferred by a separate data
        connection. In this mode the JNIOR waits for the remote FTP Server
        to establish the connection.

    active
        Operate in active mode (Default). In this mode when data is to be
        transferred the JNIOR works to establish a separate data connection
        with the remote FTP Server.

    secure
        Use secure data communications.

    plain
        Data is transferred in the clear. This is the default.

    dir (or ls)
        List files available in the remote directory.

    cd DIR
        Change the remote working directory to DIR.

    pwd
        Display the current remote directory.

    get REMFILE LOCFILE
        Copy the remote file REMFILE to the JNIOR as LOCFILE.
```

```
put LOCFILE REMFILE
    Copy the local file LOCFILE to the remote server as REMFILE.

delete FILE
    Remove the file FILE from the remote server.

mkdir DIR
    Create the directory DIR on the remote server.

rmdir DIR
    Remove the directory DIR from the remote server.

cat FILE
    Requests the remote FILE and displays the content.

verbode
    Show progress and additional status.

bye, exit, quite
    End Session. Either will exit the interactive session and close the
    connection with the remote server.
```

SEE ALSO

HELP Topics: FTPCLIENT

INDEX

$BootTime, 112
$BuildTag, 113
$HdwStrapping, 114
$HOURMETER, *170*, *182*
$LastNtpSuccess, 113
$Model, 112
$SerialNumber, 113
$Version, 113
/WebServer/
   Path, *156*, *233*
   Root, *156*
410, 268
412, 268
412DMX, 268
414, 268

-- A --
acos(), 254
ALARMING, 171, *143-144*, *176-177*
app, 76
applications, 229
arc, 59, *231*
archive, 59
ARP, 103, *23*, *50*
array_remove, 252
array_remove(), 252
ARRAYS, 252
ASCII, 290, *64*, *86*, *100*, *189*, *193*
asin(), 254
atan(), 254
atan2(), 254
Auth_Digest, 228
Authentication, 132
auto indent, 71
AUX, 272, *187*
AUX_FLOW, 189, *190*
AUX_PORT, 272, *188-190*, *271*
AUX_RS485, 190, *189*
AUX_serial, 187
AUX_settings, 188
AUXSerial/
   Baudrate, 188
   Databits, 188
   Flow, 189
   Parity, 188
   RS485, 190
   Stopbits, 188
AUXSerialPort Class, 273

-- B --
base64_decode(), 256
base64_encode(), 256
BATCH, *53*, *66*, *74*, *78*, *281*
BEACON, 164, *18*
Beacon/
   Announce, 165, *164*
   AutoAnnounce, 165
   Enabled, 164, *165*
bin2hex, 250
bin2hex(), 251
Blacklist, 130
blacklisting, 36
BLOCK_EMAIL, *147*
bye, 46

-- C --
CAT, 63, *43*, *60*, *267*, *280*, *292*
cd, 45
ceil(), 253
Certificate
   Common Name, 138
   Contact Email, 139
   Country, 137
   Expiration, 140
   Locality, 137
   Organization, 138
   Organizational Unit, 138
   SHA1 Use, 140
   State, 137
   Subject Alternate Name, 139
certificates, 136
certmgr, 100, *132*, *136-140*, *150*
CHDIR, 45, *44*
chdir(), 258
CHGRP, 94, *53*, *62*, *93*
CHMOD, 61, *53*, *153*
CHOWN, 62, *53*
chr, 250
chr(), 250
chrlen, 250
chrlen(), 250
CKSUMS, 264, *27*, *78-80*, *234*, *249*
clipboard, 71
COM, 271, *163-164*, *187*
com.integpg.comm.COMSerialPort
   Class, 191
COM_FLOW, 192
COM_PORT, 271, *190-193*, *273*
COM_SERIAL, 190, *18*
COM_setting, 191
command line, 16
comment, 79

INDEX (cont'd)

Compiling, 230, *5*
Compression, 193, *194*
COMSerial/
   Baudrate, 191
   BootDialog, 191
   Databits, 191
   Flow, 192
   Parity, 191
   Stopbits, 191
COMSerialPort.setBootDialog()
   Method, 191
conditioning, 173, *176*
configuration, 111
connectivity, 30, *34*
console, 164
control, 203
CONVERSIONS, 255
copy, 56, *57*
cos(), 254
count, 252
count(), 252
count trigger, 179
counting, 170, *177-181*
counts, 170
cp, 56
crc, 250
crc(), 252
Ctrl-U, 40

-- D --
DATE, 46, *23*, *50*, *113-114*, *121*, *279*
date(), 256
debounce, 168, *169*, *174*
DEFAULT_ACCOUNTS, 134, *91-93*,
   133-135
defenses, 33
del, 55
delete, 55
Device/
   Desc, 114
   ResetAction, 115
   Timezone, 114
Devices, 223
DHCP, *116*
diagnostic_port, 190
DIN, 166, *170-177*
DIR, 53, *27*, *58-59*, *76*, *107*
docs, 276
doubleval(), 255

-- E --
echo, 80, *267*
ed, 67
edit, 67
editor, 67
editor clipboard, 71
editor mouse, *70*
EGREP, 65, *43*, *287*
Email/
   Attachments, 148
   BccAddress, 147, *146*
   CcAddress, 146
   HTML, 148
   Message, 147, *148*
   MessageFile, 148, *147*
   Port, 149, *150*
   RetryCount, 150, *151*
   RetryDelay, 151
   Signature, 151
   SMTPS, 150, *149*
   StartTLS, 150, *149*
   Subject, 147
   ToAddress, 146, *149*
EMAIL_BLOCK, 146, *142*, *145-151*, *177*,
   181
empty(), 260
endian(), 256
endswith, 250
endsWith(), 251
ENVIRONMENT, 280, *79*
ereg(), 261
ereg_replace(), 261
eregi(), 261
eregi_replace(), 261
errors, 262
etc, 274
etc/
   JanosClasses.jar, 274
events, 141
Events/
   OnAlarm, 143, *144*, *171*
   OnAlarm1, 143
   OnAlarm2, 144, *171*
   OnBoot, 141
   OnConfig, 145
   OnUsage, 144, *171*
   Services, 141
Events/OnBoot/
   Email, 142, *141*
   EmailBlock, 142
   RunEnable, 143

INDEX (cont'd)

Events/OnConfig/
   Email, 145
   EmailBlock, 145
EventsOnAlarm1, *171*
EXEC, 77, *43*
exit, 46, *75*
exp(), 255
expansion_bus, 273
EXPRESSIONS, 241
extern, 85

-- F --
fabs(), 253
factory, 23
factory_reset, 27, *30*
fclose(), 258
feof(), 258
file_crc(), 259
file_exists(), 257
file_md4(), 259
file_md5(), 259
file_sha1(), 259
file_sha2(), 259
filemtime(), 257
files, 53, *62*, *93-94*, *157*
filesize(), 257
FILTER, 282, *100*, *285*
FILTERING, 282, *125-128*
find, 53
FLASH, 274, *24*
flash/
   ftp.jar, 298
   JBakup.jar, 297
floatval(), 255
floor(), 253
flush(), 260
fmod(), 253
fopen(), 258
foreach, 239
formalities, 6
fread(), 258
FTP, 298, *75*
ftp.jar, 298
FTP/
   Port, 162
   Server, 162, *163*
   UnixStyle, 162
FTP_COMMANDS, 299, *298*
FTPCLIENT, 298, *162-163*, *231*, *300*
FUNCTIONS, 247, *236*, *239-241*
fwrite(), 258

-- G --
gc, 84
getcwd(), 258
getRegistryBoolean(), 260
getRegistryList(), 260
getRegistryString(), 260
Getting_Started, 14
getutc(), 256
gmtime(), 257
GREP, 65, *43*, *64*, *287*
greylisting, 129
GROUPADD, 93, *94*
GROUPDEL, 94, *93*
GROUPS, 93, *53-55*, *62*, *91*, *94*

-- H --
head, 63
header, 249
header(), 250
help, 11, *13*, *30*, *40*, *276*
hex2bin, 250
hex2bin(), 251
HIST, 45, *40*, *287*
HISTORY, 45, *40*
HOSTNAME, 50, *44*, *75*, *105*, *118*,
   127-128, *140*
HourMeter, 175, *184*

-- I --
if, 239
including, 262
INI, *53*
initial_files, 24
INITIALIZE, 198, *201*
INPUTS, 270, *167-168*, *172*, *268*
intval(), 255
inversion, 167, *173*, *176*
IO/
   Inputs, 166
   Outputs, 182
IO/Inputs/
   Log, 170, *169*, *175*
IO/Inputs/[DIN]/
   $HourMeter, 175
   Alarming, 176
   Conditioning, 173, *168*
   CountState, 177
   Debounce, 173, *168*
   Desc, 171, *167*
   Inversion, 172, *168*
   Latching, 174, *169*

  LatchState, 175, *174*
  LatchTime, 174
  Log, 175, *170*
  OffDesc, 171
  OnDesc, 171
  UsageState, 181
IO/Inputs/[DIN]/Alarm/
  Email, 176
  EmailBlock, 177, *176*
  HoldOff, 177
  Inversion, 176
IO/Inputs/[DIN]/Alarm[N]/
  Email, 180
  EmailBlock, 180
  HoldOff, 180
  OnAlarm, 180
IO/Inputs/[DIN]/Count/
  Alarm[N], 179
  Limit[N], 179
  Multiplier, 178
  SampleTime, 179, *178*
  Units, 178, *177*
IO/Inputs/[DIN]/Usage/
  Alarm, 181
  Email, 181
  EmailBlock, 181
  HoldOff, 181
  Limit, 181
  OnAlarm, 181
IO/Outputs/
  Log, 186
IO/Outputs/[ROUT]/
  $HourMeter, 184
  ClosedDesc, 183
  Desc, 183
  InitialState, 183
  Log, 186
  OpenDesc, 183
  UsageState, 184
IO/Outputs/[ROUT]/Usage/
  Alarm, 184
  Email, 184
  EmailBlock, 184
  HoldOff, 184
  Limit, 184
  OnAlarm, 184
iolog, 86, *89*, *169-170*, *175*, *186-187*, *190*, *271*
IPADDRESS, *116*
IPCONFIG, 48, *18*, *23*, *74*, *103-104*, *115-117*
IpConfig/
  Allow, 128
  Blacklist, 130, *129*
  CaptureBuffer, 124
  CaptureFilter, 126
  DHCP, 115
  DNSTimeout, 120
  Domain, 118
  EmailAddress, 119, *139*, *142*, *146*
  GatewayIP, 116
  Greylisting, 129, *130*
  HostName, 117, *50*
  IPAddress, 115
  LLMNR, 127
  MailHost, 118, *142*
  MTU, 121
  NetBIOS, 127
  NTPServer, 120
  NTPUpdate, 121
  Password, 119
  PingReply, 131
  PrimaryDNS, 117
  Promiscuous, 125
  SecondaryDNS, 117
  ShowPass, 126
  SubnetMask, 116
  SyslogServer, 122
  TTL, 122
  Username, 119
IpConfig/Keepalive/
  Interval, 123
  Retry, 124
  Time, 123
IpConfig/Socket/
  ConnectTimeout, 124
is_array(), 260
is_bool(), 259
is_dir(), 258
is_double(), 260
is_file(), 257
is_int(), 260
is_null(), 259
is_string(), 260
isset(), 260

-- J --

JanosClasses.jar, 274, *230-231*
jar, 59, *231*
Java, 76, *5*, *82*, *229-231*, *274*
JBAKUP, 297, *60*, *64*, *191*, *231*
JBakup.jar, 297

INDEX (cont'd)

JMP, 195, *156-159*, *171*, *175*, *184*, *197-198*
  Block Command, 205
  Close Command, 204
  Console
    Close, 220
    Open, 218
    Stdin, 218
    Stdout, 219
  Digest Calculation, 199
  Enumerate Devices, 222
  Expansion Modules, 224
  File
    List, 207
    Mkdir, 213
    Read, 208
    Remove, 211
    Rename, 212
    Write, 210
  Initial Connection, 198
  Message Structure, 200
  Meta Data, 201
  Montor Message, 201
  Open Command, 204
  Port Connection, 195
  Read Devices, 222
  Registry
    List, 214
    Read, 215
    Update, 213
    Write, 216
    Write Encrypted, 216
  Reset Counter, 206
  Reset Latch, 205
  Reset Usage, 206
  Secure Connection, 197
  Status Request, 202
  Toggle Command, 203
  Websocket Connection, 195
  Write, 223
JMP_Console, 217
JMP_Externals, 221
JMP_file, 207
JMP_Logging, 226
JMP_Registry, 213
JMP_RTC, 225
JMP_Shutdown, 226
JMPConnect, 195, *5*, *198-201*
JMPServer/
  Anonymous, 159
  Login, 158, *159*
  Port, 158
  Server, 158
JniorServer/
  Anonymous, 160
  Login, 160, *161*
  Port, 160, *159*
  RemoteIP, 161
  RemotePort, 161
  Server, 159
JProtocol, 293, *5*, *159-161*, *171*, *175*, *184*
JRFLASH, 110, *106*, *274*
JRMON, 87, *86*, *169-171*, *174-175*, *179*, *182*
JRUPDATE, 108, *24*, *105*, *275*
JSON, 292, *64*, *107*, *195-197*, *293*
json_decode(), 259
json_encode(), 259
json_load(), 259
json_save(), 259
JVM, 229, *60*, *231*, *274*

-- K --
KEYBOARD, *14*
keys, 51
KILL, 82, *81*, *143*

-- L --
LATCHING, 168, *175-176*
library, 249, *250-252*, *255*
Licensing, *7*
locators, 155
log(), 255
log10(), 255
LOGGER, *74*, *50*, *123*
logging, 169, *170*, *175*
LOGS, 279, *142*, *148*, *297*
LS, 53, *58-59*, *62*, *76*, *107*
ltrim, 250
ltrim(), 250

-- M --
man, 11
MANIFEST, 106, *27*, *64*, *292*
MANUAL, 276, *12-13*
MATH, 253, *252*
Math Functions, 253
MD, 58, *45*
md4, 250
md4(), 252
md5, 250

INDEX (cont'd)

md5(), 252
memory leak, 84
MESSAGING, 199
metering, 170, *175*
MKDIR, 58, *45*, *59*
mkdir(), 258
mode, 89, *187*, *190-191*
MODELS, 268, *167*, *187*, *269-274*
monitor, 201
MORE, 67, *12*
MORSE_CODE, 291, *18*
mouse, 70
MOVE, 57, *56-58*
mv, 57

-- N --
nbtstat, 105, *127-128*
NETSTAT, 95, *31-35*, *86*, *125-126*,
   129-130
NETWORK, 95, *18*
Network noise, 99
network scanner, 97
network_access, 14, *292*
network_basics, 19
NSLOOKUP, 104, *23*, *50*
NTP, 23
nv, 83

-- O --
operators, 241
OUTPUT, 249, *289*
overview, 1

-- P --
PASSWD, 91, *30*, *134*
password, 91
permissions, 53, *55*, *62*
phome, 109
PHP, 234, *78*
PHP Script
   Array Functions, 252
   array_remove, 252
   bin2hex, 250
   chr, 250
   chrlen, 250
   Conversions, 255
   count, 252
   crc, 250
   Date & Time, 256
   endsWith, 250
   expressions, 241
   File Functions, 257
   header, 249
   hex2bin, 250
   JSON Functions, 259
   Language Functions, 259
   ltrim, 250
   md4, 250
   md5, 250
   operators, 241
   Output Functions, 249
   print, 249
   printf, 249
   puts, 249
   Registry Functions, 260
   Regular Expressions, 261
   rtrim, 250
   sha1, 250
   sha2, 250
   sprintf, 250
   startsWith, 250
   strcmp, 250
   String Functions, 250
   stripos, 250
   strlen, 250
   strlev, 250
   strpos, 250
   strripos, 250
   strrpos, 250
   strtolower, 250
   strtoupper, 250
   strval, 250
   substr, 250
   System Functions, 260
   trim, 250
   ucfirst, 250
   ucwords, 250
   var_dump, 249
pi(), 254
PING, 102, *43*, *50*, *66*, *100*, *131*
PingReply, 131
piping, 41
plain_text, 31, *34*
pow(), 253
POWER_SUPPLY, 268, *14*
PRINT, 249
print(), 249
PRINTF, 287, *250*
printf(), 250
processes, 80
program, 76
PROGRAMMING, 229, *76*, *230*, *274*

INDEX (cont'd)

PROMPT, 44, *41*, *46*
PS, 80, *76*, *82-83*, *143*
puts, 249
puts(), 250
PWR, 268, *14*

-- Q --
quit, 46

-- R --
rd, 59
REBOOT, 105, *28*
reclaim, 110
RefPoint, 106
REG, 51, *28*, *41*, *111-112*, *167*, *287*
REGEX, 286, *43*, *46*, *66*
REGISTRY, 111, *27*
Registry_use, 111
RELAYS, 270, *268*, *271*
rem, *79*
remark, *79*
remove, 55
ren, 57
RENAME, 57
rm, 55
RMDIR, 59, *57-58*
rmdir(), 258
round(), 253
rounding, 253
ROUT, 182
rsa_keys, 135, *136*
rtrim, 250
rtrim(), 250
run, *77*, *234-236*, *267*
running, 80

-- S --
SAFEMODE, 285, *30*, *91*, *128*, *135*, *143*
scandir(), 258
scanner, 97
SCRIPT, 234, *80*, *239-241*, *249*, *262*
SCRIPTING, 234, *74*, *78*, *236*
Secure Shell, 16
security, 197, *34*, *199*
   Blacklist, 130
   Greylisting, 129
   PingReply, 131
SENDMAIL, 73, *50*, *118-119*, *142*
sensor_port, 273
serial, 187
serial_access, 14
serial_ports, 272
set, 79
setenv, 79, *281*
setRegistryString(), 260
settings, 51
sha1, 250
sha1(), 252
sha2, 250
sha2(), 252
sin(), 254
sleep(), 261
sniffer, 97
split(), 261
splitì(), 261
sprintf, 250, *289*
sprintf(), 252
sqrt(), 253
SSH, 16
SSH/
   Server, 164
SSL/
   Enabled, 132, *150*
   Required, 132
SSL/Cert/
   C, 137, *136*
   CN, 138, *139*
   Days, 140, *139*
   E, 139
   L, 137
   O, 138, *137*
   OU, 138
   SAN, 139
   SHA1, 140
   ST, 137
startswith, 250
startsWith(), 251
STATEMENTS, 239
stats, 105
status, 202
strcmp, 250
strcmp(), 251
string formatting, 287
STRINGS, 250, *249*
stripos, 250
stripos(), 251
strlen, 250
strlen(), 250
strlev, 250
strlev(), 252
strpos, 250
strpos(), 251

INDEX (cont'd)

strripos, 250
strripos(), 251
strrpos, 250
strrpos(), 251
strtolower, 250
strtolower(), 250
strtoupper, 250
strtoupper(), 251
strval, 250
strval(), 251
subnet mask, 48
SubnetMask, 116
substr, 250
substr(), 251
SUPPORT, 13, *12*, *110*, *276*
switch, 239
syslog(), 260

-- T --
tab, 40, *44*, *53*, *109*
tab stop, 71
TAIL, 63, *43*
tan(), 254
telnet, 75
Telnet/
   Port, 163
   Server, 163
TEMP, 275, *24*
terminal, 17
THD, 81, *76*, *83*
threads, 81
time(), 256
timezones, 276
touch, 75
trigger point, 179
trim, 250
trim(), 250
type, 63

-- U --
ucfirst, 250
ucfirst(), 251
ucwords, 250
ucwords(), 251
Unicode, 40
unlink(), 258
unpack(), 255
uptime, 105
urldecode(), 256
urlencode(), 256
usage, 170
USER, *92*
USERADD, 92, *30*, *91-93*
USERDEL, 93, *30*, *91-92*, *134*
USERMOD, 91, *30*, *92*, *134*
USERS, 90, *30*, *53-55*, *62*, *92-93*,
   134, *153*
Users/
   IgnoreDefault, 134
USERS_MANUAL, 276, *13*
UTF-8, 291

-- V --
var_dump, 249
var_dump(), 250
VARIABLES, 236, *241*, *249*
virtual folders, 63
visibility, 35
VT100, 293

-- W --
Warranty, 8
WEBSERVER, 231, *60*, *233-234*
WebServer/
   Anonymous, 153
   Index, 154
   Locator, 155
   Login, 153, *154*
   Path, 155, *154*
   Port, 152
   Public, 155
   Root, 154, *152*
   Server, 152, *232*
   SSLPort, 152
website, 231
websocket, 156, *5*, *158*, *232*
Websocket/
   Anonymous, 157, *156*
   Console, 157
   Files, 157
   Login, 156, *157*
WEBUI, 232, *112*
WebUI_Help, 12
while, 239
WHOAMI, 94, *30*

-- X --
XTERM, 17

-- Y --
yield(), 261

-- Z --
zip, 59, *154-155*, *193-194*, *232*, *297*
Zip/
Depth, 193
Window, 193