

JUNOS Software

JUNOS Software is the first routing operating system designed specifically for the Internet. It runs on all IP routers developed and optimized by Juniper Networks, Inc., and is currently deployed in the largest and fast-growing networks worldwide. Its full suite of industrial-strength routing protocols, flexible policy language, and leading MPLS implementation efficiently scale to large numbers of network interfaces and routes. As well, JUNOS software supports the industry's first production-ready GMPLS implementation.

Standards-based JUNOS software supports Internet routing protocols, controls both the router and its interfaces, and allows for system management of small to very large networks. Its easy-to-use interfaces enable you to configure the routing protocols and interface properties, monitor the router, and troubleshoot protocol and network connectivity problems.

Advantages

Features	Benefits
Industrial strength BGP4, IS-IS, OSPF, and IP multicast implementations	■ Efficient and scalable traffic routing through the infrastructure
JUNOS policy definition language	■ Supports flexible and scalable peering relationships ■ Supports tens of thousands of routes
Applications run in protected memory	■ Ensures system reliability by protecting against system crashes
Modularized	■ Enables you to start a specific module without rebooting the entire operating system ■ Protects against complete operating system failures ■ Increases scalability
User-friendly CLI	■ Multiple user access levels ■ Configuration change control ■ Support for ASCII files ■ Ability to return to previous configurations ■ Command completion

Features	Benefits
Standards-based JUNOScript API	<ul style="list-style-type: none"> ■ Simplifies configuration on the management station ■ Reduces maintenance costs and configuration errors ■ Increases security when using ssh for authentication and encryption ■ Facilitates third-party and in-house development
Purposely designed for service providers	<ul style="list-style-type: none"> ■ No monolithic code base ■ One build for all applications and all platforms

Interfaces

JUNOS software offers both a CLI and an API.

- The CLI is the primary method of monitoring and troubleshooting the software, routing protocols, network connectivity, and router hardware. You can access the router and issue simple commands from the console or through a remote network connection. These commands can apply to the chassis, an interface, or a route. Additionally, the JUNOS CLI offers numerous features that simplify network management.
- The JUNOScript API facilitates application and script development, enabling you to develop custom applications easily and quickly using the XML programming language.

Client applications can configure or request information from a Juniper Networks router by encoding the request with JUNOScript tags and sending it to the JUNOScript server, which runs on the router. The JUNOScript server directs the request to the appropriate software modules within the router, encodes the response in JUNOScript tags, and returns the results to the client application.

Another use of the JUNOScript API is to build custom end-user interfaces for configuration and information retrieval and display, for example, in a Web browser.

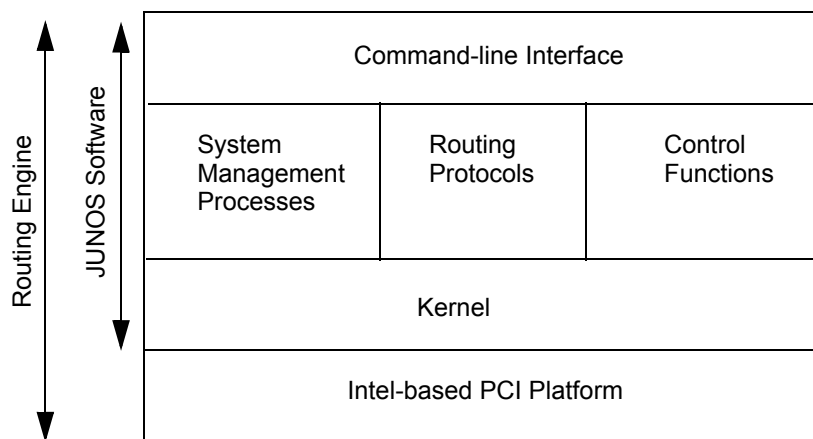
Architecture

The software consists of a series of system processes that handle the router’s management processes, routing protocols, and control functions. The JUNOS kernel, which is responsible for scheduling and device control, underlie and support these processes.

The JUNOS architecture is a multi-module design, with each process running in protected memory to guard against system crashes and to ensure runaway applications do not corrupt each other. This modular design makes it significantly easier to restart or upgrade a specific module since you do not have to reboot the entire chassis. Introducing services is highly reliable since the failure of one module does not adversely impact the entire operating system. Between these independent modules, there are clean, well-defined interfaces that provide interprocess communication, resulting in a highly reliable software architecture.

JUNOS software resides in the Routing Engine, which runs an Intel-based PCI platform. The Routing Engine has a dedicated 100-Mbps internal connection to the Packet Forwarding Engine, which is responsible for packet flow through the router.

Routing Engine and JUNOS Software Architecture



The Routing Engine connects directly to the Packet Forwarding Engine. This separation of routing and forwarding performance ensures that the Routing Engine never processes transit packets. Of the traffic that goes to the Routing Engine, link-level keepalives and routing protocol updates receive the highest priority to ensure that adjacencies never go down regardless of the load, thereby preventing failures from cascading through the network.

Additionally, the JUNOS software passes incremental changes in the forwarding tree to the Packet Forwarding Engine so that high rates of change are quickly and cleanly handled. Together, the nearly instantaneous routing updates and the JUNOS software ensure that the Packet Forwarding Engine continues to forward packets at wire rate during times of heavy route fluctuations.

Software Processes

JUNOS software consists of the following processes that control router functionality and a kernel that provides the communication among all the processes.

Routing Protocol Process	The JUNOS software implements full IP routing functionality, providing support for IPv4. The routing protocols are fully interoperable with existing IP routing protocols and provide the scale and control necessary for the backbone core and edge.
Interface Process	The JUNOS interface process enables you to configure and control the physical and logical interfaces. You can configure interfaces that are currently in the router, as well as those that you plan to add in the future. You can also configure interface properties, such as where the PIC is installed, the interface encapsulation, and interface-specific properties.
SNMP and MIB II Processes	The JUNOS software includes SNMP software, which helps with monitoring the state of a router. SNMP software consists of an SNMP master agent and a MIB II agent; it supports MIB II SNMP version 1 traps and version 2 notifications.
Management Process	The management process starts and monitors all other software processes, as well as starts the CLI, which is the primary tool for controlling and monitoring the software. This process automatically starts all other software processes and the CLI when the router boots. If a software process terminates, the management process attempts to restart it.
Routing Kernel Process	The Routing Engine kernel provides the underlying infrastructure for all the JUNOS software processes. In addition, it provides the link between the routing tables and the Routing Engine's forwarding table. It is also responsible for all communication with the Packet Forwarding Engine, which includes keeping the Packet Forwarding Engine's copy of the forwarding table synchronized with the master copy in the Routing Engine.

Specifications

For a list of supported RFCs, drafts, and standards, refer to the *JUNOS Internet Software Guide: Installation and System Management* manual.

- Internet RFCs and drafts
- ISO standards
- SONET/SDH standards
- Other standards

Acronyms

API	application programming interface
BGP	Border Gateway Protocol
CLI	command-line interface
GMPLS	Generalized Multiprotocol Label Switching
IP	Internet Protocol
IS-IS	Integrated Intermediate System to Intermediate System
ISO	International Organization for Standardization
MIB	Management Information Base
MPLS	Multiprotocol Label Switching
OSPF	Open Shortest Path First
PCI	Peripheral Component Interconnect
PIC	Physical Interface Card
RFC	Request for Comments
SDH	Synchronous Digital Hierarchy
SNMP	Simple Network Management Protocol
SONET	Synchronous Optical Network
XML	extensible markup language

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