Chapter 2

Product Architecture

The JUNOS software provides IP routing protocol software as well as software for interface, network, and chassis management. The JUNOS software runs on all Juniper Networks J-series, M-series, and T-series routing platforms.

J-series Services Routers (J2300, J4300, and J6300) are deployed at the remote edge of distributed networks.

Most M-series routers are deployed in small and medium cores, in peering, route reflector, data center applications, or at the IP or Multiprotocol Label Switching (MPLS) edge to support high-performance Layer 2 and Layer 3 services. All M-series routers have redundant power and cooling and the M10i, M20, M40e, M160, and M320 routers have fully redundant hardware including Routing Engines and Switching, Forwarding Engine Boards, or Switch Interface Boards.

T-series routing platforms (T320 router, T640 router, and TX Matrix platform) are deployed at the core of provider networks. These routing platforms have fully redundant hardware, including power and cooling, Routing Engines, and Switch Interface Boards.

A routing matrix is a multichassis architecture composed of one TX Matrix platform, and from one to four T640 routing nodes. From the perspective of the user interface, the routing matrix appears as a single router. The TX Matrix platform controls all the T640 routing nodes on the routing matrix.

For more information about the architecture in your routing platform, see the hardware guide for your routing platform.

This chapter provides an overview of the router hardware for routing platforms and discusses the relationships between the hardware and software:

Hardware Overview

The JUNOS software runs on three types of Juniper Networks routing platforms: J-series, M-series, and T-series. The routing platforms consist of the following major hardware components:

- Routing Engine
- Control Board
- Chassis
- Switch interface boards
- Physical Interface Card (PIC)
- Flexible PIC Concentrators (FPCs), each populated by PICs for various interface types. On some routing platforms, the PICs are installed directly in the chassis.
- Power supplies
- Cooling system

For information about specific components in your routing platform, see the hardware guide for your routing platform.

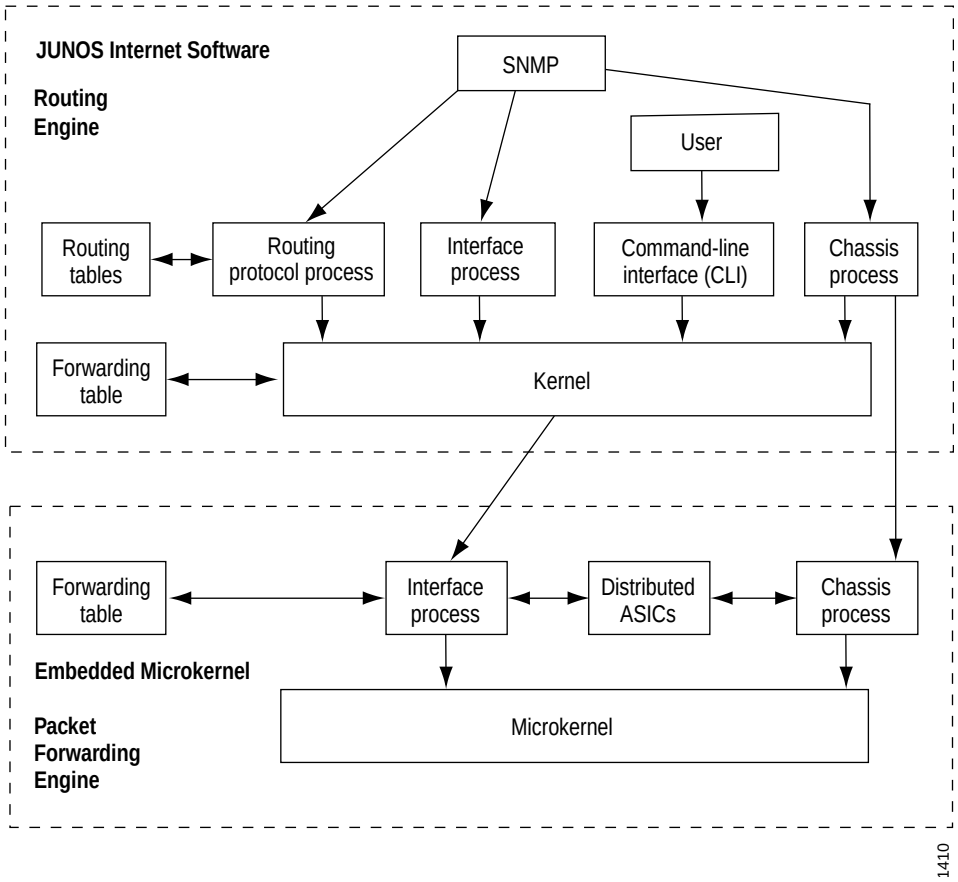
Product Architecture

The routing platforms are made up of two components (see Figure 1 on page 41):

- Packet Forwarding Engine—The Packet Forwarding Engine uses application-specific integrated circuits (ASICs) to perform Layer 2 and Layer 3 packet switching, route lookups, and packet forwarding.
- Routing Engine—The Routing Engine controls the routing updates and system management. The Routing Engine consists of routing protocol software processes running inside a protected memory environment on a general purpose computer platform.

Because this architecture dedicates separate control operations such as routing updates and system management from packet forwarding, the router can deliver superior performance and highly reliable Internet operation.

Figure 1: Product Architecture



Packet Forwarding Engine

The Packet Forwarding Engine forwards packets between input and output interfaces. The M-series routers (except the M320 router) have a single Packet Forwarding Engine. The J-series Services routers have a software-base Packet Forwarding Engine. The M320 router, and T-series routing platforms have multiple Packet Forwarding Engines. For more information about the Packet Forwarding Engine, see the hardware guide for your routing platform.

Routing Engine

The Routing Engine handles all the routing protocol processes and other software processes that control the routing platform's interfaces, some of the chassis components, system management, and user access to the routing platform. These routing platform and software processes run on top of a kernel that interacts with the Packet Forwarding Engine. The M320 router and T-series routing platforms have redundant Routing Engines. For more information about routers with redundant routing engines, see the hardware guide for your routing platform.

The Routing Engine has these features:

Routing protocol packets processing—All routing protocol packets from the network are directed to the Routing Engine, and therefore do not delay the Packet Forwarding Engine unnecessarily.

Software modularity—By dividing software functions into separate processes, a failure of one process has little or no effect on other software processes.

In-depth IP functionality—Each routing protocol is implemented with a complete set of IP features and provides full flexibility for advertising, filtering, and modifying routes. Routing policies are set according to route parameters, such as prefix, prefix lengths, and Border Gateway Protocol (BGP) attributes.

Scalability—The JUNOS routing tables are designed to hold all the routes in current and near-future networks. Additionally, the JUNOS software can efficiently support large numbers of interfaces and virtual circuits.

Management interfaces—System management is possible with a command-line interface (CLI), a craft interface, and Simple Network Management Protocol (SNMP).

Storage and change management—Configuration files, system images, and microcode can be held and maintained in one primary and two secondary storage systems, permitting local or remote upgrades.

Monitoring efficiency and flexibility—Alarms can be generated and packets can be counted without adversely affecting packet forwarding performance.

The Routing Engine constructs and maintains one or more routing tables. From the routing tables, the Routing Engine derives a table of active routes, called the *forwarding table*, which is then copied into the Packet Forwarding Engine. The forwarding table in the Packet Forwarding Engine can be updated without interrupting the routing platform's forwarding.