SBR Carrier

Product Overview

Product Overview. In order to succeed in today's hypercompetitive markets, service providers must offer a wide range of wired and wireless services and efficiently unify their service layer into a single infrastructure that addresses the high volume and complexity of AAA requirements across all access services.

Juniper Networks SBR Carrier[1] is a comprehensive, reliable, scalable, and extensible AAA server that delivers the access control, fine-grained service authorization, service delivery, and accounting functions needed by wired, wireless, and unified service providers offering integrated access services.

[1]Formerly known as Steel-Belted Radius Carrier

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Product Description

Juniper Networks® SBR Carrier is a high-performance authentication, authorization, and accounting (AAA) server that enables access-independent differentiated services and efficient network resource management. SBR Carrier also enhances network security by centralizing subscriber authentication, controlling the level of subscriber access, authorizing service delivery, and ensuring compliance with security policies as well as delivering accounting data to billing systems.

SBR Carrier integrates with current subscriber management infrastructures and existing subscriber management systems such as Lightweight Directory Access Protocol (LDAP), SQL, Home Location Register (HLR), Home Subscriber Server (HSS), and public key infrastructure (PKI) databases, making it easy to deploy in new and existing networks. This integration ensures the delivery of all accounting data to billing systems, business support systems (BSS), and operations support systems (OSS) elements, guaranteeing proper authentication and billing for all subscribers.

SBR Carrier meets stringent uptime demands with state-of-the-art reliability features that include load balancing and redundancy across authentication and accounting systems. With an optional Session State Registrar (SSR) component, SBR Carrier can be deployed as an AAA cluster that enables true carrier-grade high availability (HA) and scales to handle thousands of RADIUS and DIAMETER requests per second.

SBR Carrier provides flexible interfaces that enable global deployment by allowing for easy customization of regional, specific BSS and OSS rules and regulations, regardless of network access technology, regulatory requirements, or changes in business intelligence.

SBR Carrier also offers innovative service creation through support of schema adaptation and both centralized and distributed subscriber data management. In addition, SBR Carrier speeds time to market for new network access technologies by deploying all new services from the same AAA server platform while leveraging prior integration with custom back-end OSS and BSS systems.

SBR Carrier's extensibility enables the convergence of multiple AAA server technologies onto a single AAA platform. SBR Carrier can be placed in front of existing AAA servers that are in either local or remote central offices. SBR Carrier can merge both existing and acquired AAA servers and their associated back-end infrastructure into a common, state-of-the-art, and redundant back-end infrastructure system.

SBR Carrier has been successfully deployed in more than 200 wired and wireless service provider networks in more than 60 countries. These include a public Wi-Fi deployment in the underground of one of Europe's largest cities; an in-flight Wi-Fi system for a large U.S. carrier; a connected car service for a major European brand; and a connected truck fleet service in North America.

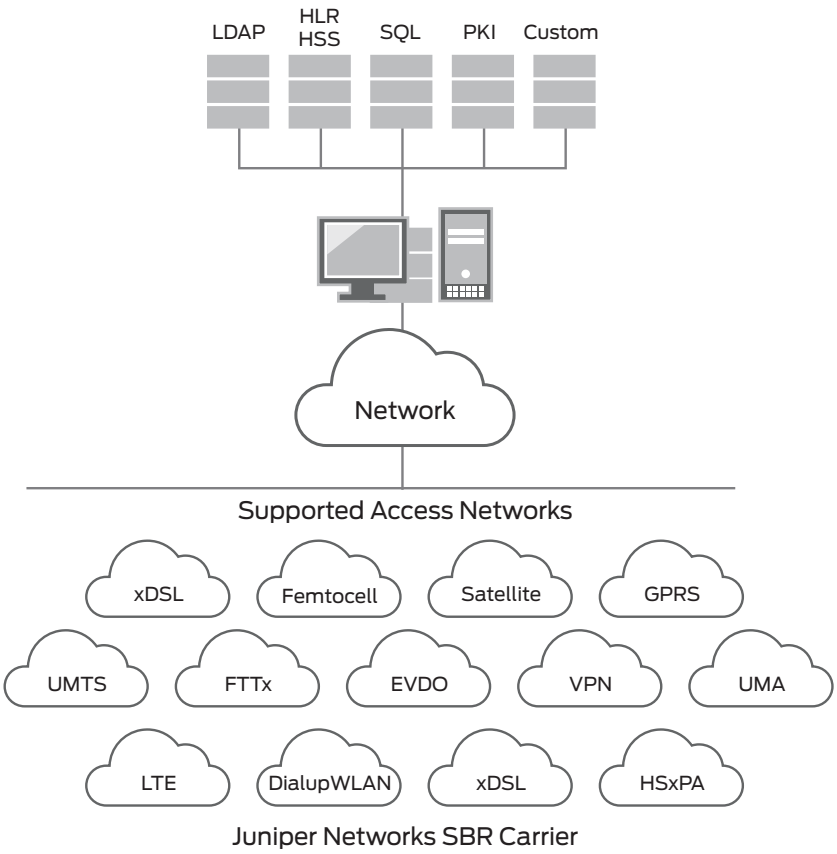

Figure 1: SBR Carrier supports a broad range of network access technologies and subscriber management data stores[2]

Architecture and Key Components

SBR Carrier is a standards-based AAA server that implements Internet Engineering Task Force (IETF) and Third-Generation Partnership Project (3GPP) standards.

SBR Carrier supports the broadest range of wireline (including xDSL [via Point-to-Point Protocol over Ethernet, or PPPoE, enhanced integration and lawful intercept], fiber to the home [FTTH] and VPN) and wireless (including 3GPP, UMA/femtocell, WLAN [802.1X], and LTE access types).

SBR Carrier provides a feature-rich AAA server platform that scales to meet the rigorous requirements of the largest network service providers, including:

- **Converged Carriers:** Support for wired and wireless networks enables AAA infrastructure consolidation onto a single AAA server platform that can be distributed or centralized at a few key sites.
- **Mobile Operators:** SBR Carrier verifies subscriber credentials for mobile services/Internet access, assigns IP addresses, manages service delivery, and integrates with billing and provisioning systems.
- **Broadband Providers:** SBR Carrier enables authentication and service delivery at per-user and per-device levels (e.g., network enhanced residential gateway, or NERG).
- **Carriers/Wholesale Service Providers:** With its market-leading transaction rate, SBR Carrier can handle even the busiest networks. Its robust RADIUS proxy support enables wholesale services to any customer regardless of network infrastructure. SBR Carrier also supports LTE 3GPP use cases such as voice over IP (VoIP) via a DIAMETER module.
- **Wholesale Service Customers/Mobile Virtual Network Operators (MVNOs):** Capacity can be sourced from user-selected carriers; accounting mechanisms support usage-based services.

Managed Services/Outsource Service Providers: Supports centralized management of all customer data and service delivery requirements or leverages RADIUS proxy authentication requests to a RADIUS or DIAMETER server at customer sites, enabling providers to maintain control of their own authentication databases at the lowest cost. Authenticated end users may be consumers, employees, fleet vehicles, connected cars or connected objects.

[2] Note: WiMAX, CDMA, and UMA/Femtocell support requires mobility modules.

Feature	Benefit
Single, comprehensive AAA server platform	• Improves operational efficiency by simplifying AAA server and subscriber management database infrastructure deployment and management. • Reduces OpEx and CapEx by using a common AAA server platform across wired and wireless networks, eliminating single function/silo AAA infrastructure, duplicate or low-performance platforms. • Resolves subscriber authentication issues associated with the unification of disparate networks with disparate subscriber management systems. • Provides the flexibility to leave existing subscriber management systems in place even as the authentication service layer is consolidated. • Permits user migration from one authentication method to another, allowing concurrent support for outdated databases while new systems are introduced. • Extends new services to subscribers without significant impact to current infrastructure. Some new service offerings might require considering new or additional user credentials or session service-level information as an element of the initial authentication or authorization of the user onto the network. With SBR Carrier, the authentication sequence can be adapted to locate information in new fields in existing records or new fields that are located in a completely new database, allowing maximum flexibility in managing network access. • Authenticates against one or more SQL or LDAP databases concurrently, even when they are from different vendors and regardless of back-end authentication requirements, which provides investment protection when maintaining legacy subscriber management systems during AAA migration. • Enables on-the-fly user profile changes (change of authorization), lawful intercept, or disconnect messages by sending dynamic authorization requests to the home NAS, either directly or through reverse proxy.
Carrier-grade scale and high availability	• Easily virtualized on Linux or Solaris platforms and fully aligned with major virtualization initiatives such as virtual EPC (vEPC). • Scales to handle thousands of RADIUS requests per second. • "Pay-as-you-grow" licensing model permits cost-effective AAA scale from 50,000 to millions of subscribers by increasing subscriber session licenses. • Improves reliability by forwarding or load-balancing RADIUS proxy requests made to multiple backup target servers in the service-layer infrastructure. • Optional SSR module can be used to build an AAA cluster that enables true carrier-grade high availability with N+1 redundancy and stateful resiliency.
Interoperability	• Can be flexibly deployed in place of—or in front of—existing AAA servers. • Widest range of back-end LDAP and SQL authentication database support (and optionally HLRs and HSSs) ensures compatibility with existing infrastructure and meets new authentication requirements such as LTE. • Compatibility with commonly used subscriber management and billing systems allows SBR Carrier to authenticate users against one or more existing user credential data stores, which is particularly useful when integrating acquired subscribers or transitioning between legacy and new subscriber management database systems.
Optional SSR module	• Captures and centralizes subscriber state from multiple AAA servers, which enables new revenue streams based on service personalization, enhanced video delivery, and targeted advertising. • Eliminates fraud in access networks via network-wide user concurrency checking and by eliminating the possibility of having out-of-sync user information on different RADIUS servers. • Increases fault tolerance and redundancy in the AAA infrastructure with the ability to store volatile subscriber session data in a back-end server cluster, which provides true stateful redundancy and mirroring. • Centralizing IP address pools in a single network location simplifies administration by eliminating the need to separate IP pools into multiple groupings per RADIUS server, Dynamic Host Configuration Protocol (DHCP) server, or NAS.
SDN-ready	• Extends the SDN domain to subscriber management by mapping subscriber sessions to service chains. For example, a service chain may offer a parental control network function; based on the subscriber profile, SBR can instruct elements to send specific subscriber traffic to the parental services chain.
Comprehensive logging and accounting	• Fully supports RADIUS accounting, seamlessly integrates with accounting and billing systems, and offers complete flexibility for session data management. • Logs all authentication transactions, so that the entire history of authentication requests and responses can be viewed; when used with access devices supporting RADIUS accounting, shows exactly who's connected anywhere, at any time, and how long each user was connected. • Authentication, accounting, proxy request, and other statistics can be viewed dynamically. • Generates fully searchable reports on Current Sessions, Successful/Failed Authentication Requests, Unknown Client Requests, and Invalid Shared Secret Requests. • RADIUS accounting log files can be easily exported to spreadsheets, databases, and custom billing software. Accounting data can also be logged directly to a single SQL database or specify multiple SQL target servers. • Can spool accounting data from distributed RADIUS servers to a central billing system, which guarantees delivery in the event of a system failure, eliminates lost accounting records and duplicate entries, removes the need for local data backup and batch processing, and facilitates real-time usage tracking for services such as prepaid Internet access cards. • Allows subscriber data and billing information to be separated between multiple organizations—especially useful for wholesale service providers who must ensure that accurate accounting and billing information is captured and shared in real time with wholesale and/or MVNO customers/partners.

Feature	Benefit
Broad and flexible authentication	• SBR Carrier runs any LDAP filter or SQL query for the greatest flexibility in retrieving information, enabling simple subscriber data management even when information is spread across multiple subscriber databases. The authentication sequence is also extended to include new information fields required for creating service offerings stored in new or existing databases. • Retrieves stored RADIUS attributes and profiles from back-end databases that can be returned to the network access equipment, often combining data from several locations to build a comprehensive authorization profile before sending it back to the network. • Flexibly adapts to existing BSS environments through various accounting methods. SBR Carrier can authenticate roaming users via RADIUS proxy requests to RADIUS servers at other sites that have the necessary user credential database against which to authenticate.
Optional Java scripting module	• Easily modified to support custom business logic even when heavily customized data schemas and formats are already in place, or to inject customized business intelligence into the network.
Advanced RADIUS proxy capabilities	• Enables redundancy and supports roaming, wholesale services, and managed services. • Enables wholesale service providers to open up their network and provide managed authentication services, or map their AAA server infrastructure to their customers' own sparse-dense mode (SDM) infrastructure, which is beneficial to MVNOs that want to manage and control their subscribers' identity and authentication credentials within their own SDM systems. • Allows service providers delivering managed services to send service authentication requests to RADIUS servers at customer sites, letting end customers manage their own SDM system. • Flexibly supports multiple ways to set up RADIUS proxy users: – User name decorations can be specified to indicate a proxy target—for example, a user would connect using george@myisp rather than simply george. – Allows proxies to be configured based on any attribute or combination of attributes, or based on scripted logic. – Provides proxy packet filtering and setup rules that govern how SBR Carrier handles packets that are forwarded to or received from target servers. For example, packet filters can add information to the packet, possibly from a database, to provide the downstream network with additional information. Or, they can remove attributes from the packets to hide information about the network's characteristics from the downstream partner. Additionally, when a reply comes back from the downstream partner, attributes can be added or removed in a similar way, making sure that the response is appropriate for the network or the service level offered. These RADIUS proxy capabilities are essential for service providers that offer roaming services; are part of an ISP consortium; or have smaller, special-purpose RADIUS servers in place. – Detects the health of downstream proxies—aka farm proxies—and can adapt forwarding based on proxy health, which ensures customer satisfaction. • Translates 3GPP RADIUS requests to DIAMETER 3GPP AAA requests, enabling legacy clients to take advantage of newer LTE infrastructure.
Simple to configure and maintain	• Web GUI enables server administration from any machine, not just the one on which SBR Carrier is installed. • Significantly reduces the time required to bring new devices and users online: simply cut and paste existing configuration settings for users, RADIUS clients, profiles, and RADIUS proxy targets; only update specific information required for new settings. • Centralized configuration management (CCM) feature allows a master copy of SBR Carrier to be replicated to all valid registered SBR Carrier replicas, saving time and eliminating human error. Configuration data on replicas can only be modified by pushing changes from the master server, preventing unanticipated configuration issues at a local level. • Allows customers to monitor their SBR Carrier server infrastructure through their existing network management solutions via SNMP. SBR Carrier reports activity and all critical system functions to centralized SNMP management agents in accordance with the IETF and proprietary MIBs.
Enhanced security	• Offers password access protocol support: – Password Authentication Protocol (PAP), Challenge Handshake Authentication Protocol (CHAP), MS-CHAP v2, Extensible Authentication Protocol (EAP), EAP Subscriber Identity Module (SIM), EAP Authentication and Key Agreement (AKA), EAP Tunneled Transport Layer Security, (TTLS), EAP Transport Layer Security (TLS)

Product Options

Juniper offers a number of optional SBR Carrier modules under separate license that enable additional functions:

- SCM
- SIM
- HLR Gateway
- Session State Registrar (SSR)
- Diameter
- Scripting
- Concurrency

Session State Registrar Module

The Session State Registrar (SSR) module removes session information from individual front-end AAA servers and consolidates it into a single, common session data store cluster that leverages cluster technology. Separating the SBR Carrier front-end processes from back-end data functions that take place on two or four SSR data servers, the SSR module implements a reliable and highly available AAA platform.

This innovative AAA network architecture provides true stateful redundancy through server cluster mirroring; provides greater scale and throughput on the front end through the addition of AAA servers where they are needed, and on the back end

by adding cluster nodes; and allows the mapping of business logic associated with network and application services with the subscriber profiles of the active subscribers on the network.

The SBR Carrier SSR module implements a scalable, reliable, high availability AAA platform. Multiple servers of different types (data, management, and SBR Carrier) perform certain aspects of SBR Carrier operation. The servers collaborate to share a common session database and a common IP address pool, and to provide a high level of redundancy. The common shared resources can be accessed simultaneously by up to 20 SBR Carrier servers.

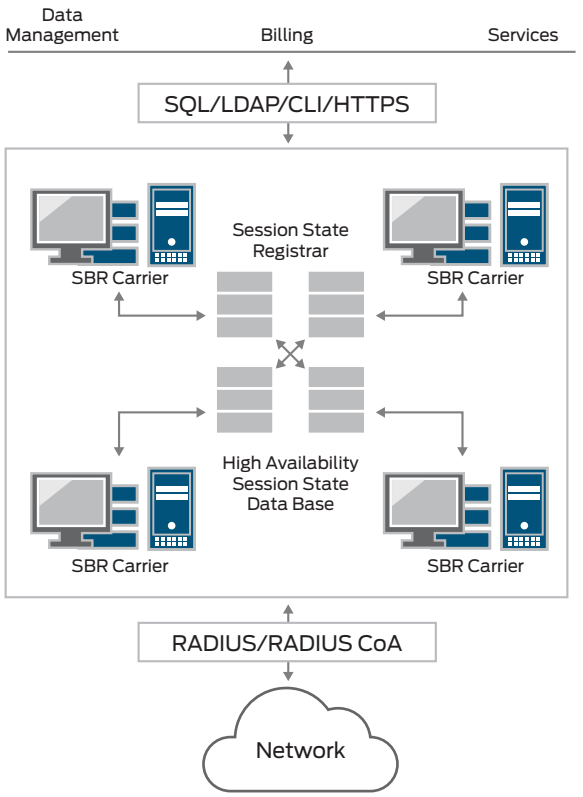

Figure 2: SBR Carrier with its SSR module deployed in a cluster configuration

SBR Carrier front-end servers and SSR back-end servers collaborate to create a virtual AAA server that provides:

- High availability (HA)
- State preservation during failover between front-end SBR Carrier nodes
- Application session awareness
- Centralized IP address management
- Centralized concurrency management (if optional Concurrency and Wholesale Module is installed on all SBR Carrier servers)

DIAMETER Module

The DIAMETER module supports 3GPP AAA LTE interoperability through the SWa, SWd, SWm, SWx, and S6b interfaces. Use cases include voice over IP (VoIP), voice over LTE (VoLTE), and voice over Wi-Fi (VoWiFi).

SIM Module

The SBR Carrier optional SIM authentication module enables Global System for Mobile Communications (GSM) and universal mobile telecommunications system (UMTS) service providers to provide wireless data access to subscribers, based on the authentication of their SIM credentials against the existing HLR infrastructure and a leveraging of their existing customer care, roaming, and billing infrastructures.

The SBR Carrier SIM module allows service providers to deploy IP-based service access while leveraging their SS7-based authentication systems. It leverages existing HLR, billing interface support, and the SS7 or SIGTRAN networks already in place through the optional SIGTRAN software module. The SIM authentication module retrieves security information from an HLR to authenticate users or devices that use a provider's SIM (GSM) or USIM (UMTS) cards. It enables all applications that use the authentication protocols EAP-SIM or EAP-AKA. Among those applications are:

- Femtocell
- Unlicensed Mobile Access (UMA)/Generic Access Network (GAN)
- WLAN
- Secured public hotspot

JavaScript Module

The scripting module enables SBR Carrier "fine-tuning" and can implement custom request processing logic. Scripts can be used to configure SBR Carrier to evaluate complex decision logic and manipulate RADIUS requests in ways that cannot be expressed through settings in the standard SBR Carrier initialization files.

SBR Carrier scripts are written in JavaScript, an easy-to-use, industry standard scripting language with a powerful, object-based syntax. Scripts can supplement or override specific functional modules within the SBR Carrier by implementing custom processing logic written in JavaScript. JavaScript APIs allow scripts to perform tasks such as the following:

- Manipulate RADIUS request and response attributes as they come into the server, passing through the server (including proxy), and/or leaving the server
- Select the processing realm for a request
- Query external SQL and LDAP servers
- Print information and debug messages to the server log

Session Control Module

The Session Control module lets customers make changes to active subscriber sessions without requiring the network access server (NAS) to initiate the change. For example, a service provider might want to terminate an active user's session by issuing a Disconnect Message (DM) request to the NAS, or modify the authorization level of an active user's session by issuing a Change of Authorization (CoA) request to the NAS. Under a different scenario, a service provider may be compelled to provide legal organizations with voice and data intercept capabilities as mandated by law; these might include access to private communications between organizations or individuals such as phone calls, e-mail, VoIP, or instant messaging. These legal intercept capabilities can be performed by issuing a CoA request.

Using the Session Control module, service providers can customize the CoA/DM requests they want to support in their network. They can define actions that can be invoked on active sessions such as disconnecting an active session, increasing the bandwidth of an active session, or any other action they want to define.

Concurrency Module

The optional Concurrency and Wholesale module works in the Session State Register environment, providing tools that can limit the number of active connections on a per-user, per-cluster basis. SBR Carrier also supports concurrency enforcement on attributes other than user name.

Specifications

SBR Carrier supports Linux (RHEL 6.1 or better) and Oracle Solaris SPARC hardware (Solaris 10 or 11). Virtualization is also supported (KVM and VMware on Linux, Logical Domains on Solaris). Juniper does not recommend overprovisioning.

Hardware Requirements: Linux

Standalone

- Minimum: Xeon 4-core or 2x2-core at 2.0 GHz, 2 GB local HDD
- Recommended: Xeon 2x6-core at 3.6 GHz or higher, 2 GB local HDD, 8 GB RAM

Cluster

- Front-end and/or management nodes:
  - Minimum: Xeon 4-core or 2x2-core, 2 GB local HDD, 8 GB RAM (2 for management node only), 2 100 Base-T physical interfaces, multipath configuration
  - Recommended: Xeon 2x4-core at 3.6 GHz or higher, 2 GB HDD, 4 GB RAM, 2 100 Base-T physical interfaces, multipath configuration
- Data nodes:
  - Minimum: Xeon 4-core or 2x2-core at 2.4 GHz, 10 GB RAM, 2 100 Base-T physical interfaces, multipath configuration (see below for HDD requirements)
  - Recommended: Xeon 2x4-core at 3.6 GHz, more than 10 GB RAM, 2 100 Base-T physical interfaces, multipath configuration (see below for HDD requirements)

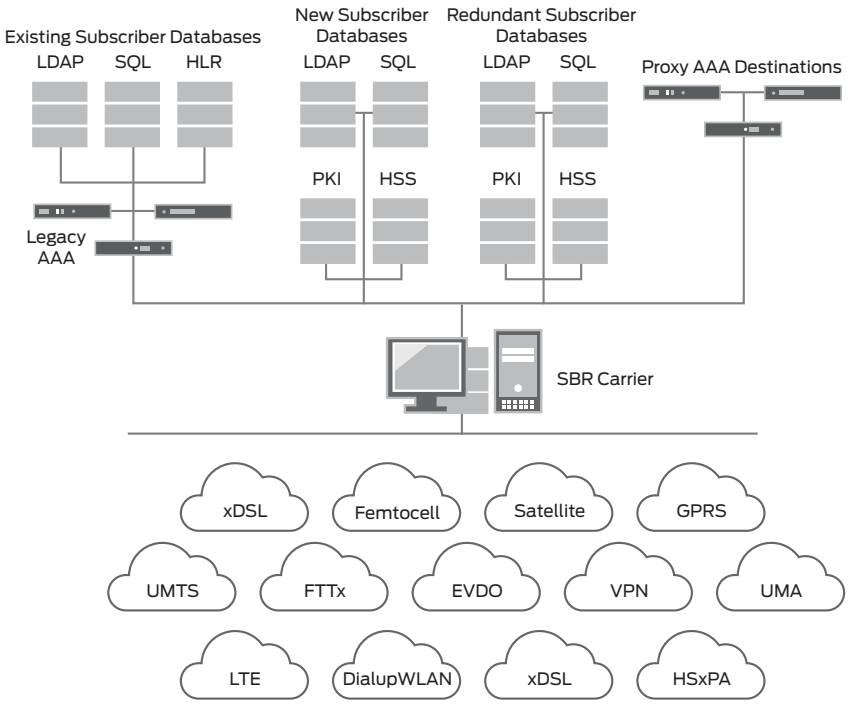

Figure 3: SBR Carrier readily supports integration into back-end infrastructure

Hardware Requirements: Solaris SPARC

Standalone

- Minimum: Two-CPU UltraSPARC IIIi processors or better, running at 1.5 GHz, 1 GB local HDD, 8 GB RAM
- Recommended: UltraSPARC T1 or better, SPARC64 VII or better, SPARC T3 or better, 1 GB local HDD, 8 GB RAM

Cluster

- Front-end and/or management nodes:
  - Minimum: UltraSPARC T1 or better, SPARC64 VII or better, SPARC T3 or better, 1 GB local HDD, 2 100 Base-T physical interfaces, multipath configuration
  - Recommended: UltraSPARC T1 or better, SPARC64 or better, SPARC T3 or better, 4 GB RAM or more, 2 100 Base-T physical interfaces, multipath configuration
- Data nodes:
  - Minimum: SPARC64 VII or better, 10 GB RAM, 2 100 Base-T physical interfaces, multipath configuration (see HDD requirements below)
  - Recommended: SPARC64 VII at 2.53 GHz or better, more than 10 GB RAM, 2 100 Base-T physical interfaces, multipath configuration (see HDD requirements below)
  - HDD requirements: for both Linux and Solaris, calculate the local disk space requirement based on the amount of RAM in the system; to calculate the minimum requirement for RAM, use the formula: (RAM - 4 G) * 12

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing cost and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services/services/technical-services/operate/#tab-advanced-services.

Model Number	Description
SBR Carrier	
SBR-CAR-AAA-LX	SBR Carrier Core AAA server license for Linux; includes 50,000 concurrent sessions (license key only)
SBR-CAR-AAA	SBR Carrier Core AAA server license for Solaris; includes 50,000 concurrent sessions (license key only)
SBR Carrier Optional Modules	
SBR-CAR-SIM	SBR Carrier AAA optional SIM Authentication module (license key only)
SBR-CAR-JSC	SBR Carrier AAA optional JavaScripting module (license key only)
SBR-CAR-CWM	SBR Carrier AAA optional Concurrency and Wholesale module (license key only)
SBR-CAR-SCM	SBR Carrier AAA optional Session Control module (license key only)
SBR-CAR-DIA	SBR Carrier AAA optional DIAMETER module
SBR Carrier Session State Registrar	
SBR-SSR-EXP	SBR Carrier Session State Registrar—Cluster expansion kit; consists of 2 cluster notes (license key only)
SBR-SSR-MNGMT	SBR Carrier Session State Registrar—Additional Management Node (license key only)
SBR-SSR-START	SBR Carrier Session State Registrar—Cluster starter kit; consists of 2 cluster nodes and 2 management nodes (license key only)
SBR-SSR-LIMITED	SBR Carrier Session State Registrar—Cluster limited kit; consists of 2 cluster nodes and 2 management nodes, limited to 100,000 subscriber sessions (license key only)
SBR Carrier HLR Access Options	
SBR-HLR-SIG-LX	SBR Carrier HLR Gateway—SIGTRAN stack for Linux (license key only)
SBR-HLR-SIG	SBR Carrier HLR Gateway—SIGTRAN stack for Solaris (license key only)
SBR-HLR-SIGADD-LX	SBR Carrier HLR Gateway—Add SIGTRAN stack to existing SS7 install (includes 2 SIGTRAN associations) for Linux
SBR-HLR-SIGADD	SBR Carrier HLR Gateway—Add SIGTRAN stack to existing SS7 install (includes 2 SIGTRAN associations for Solaris)
SBR-HLR-SIG-ADDASC-LX	SBR Carrier HLR Gateway—Upgrade SIGTRAN stack with 2 additional SIGTRAN associations for Linux
SBR-HLR-SIGADDASC	SBR Carrier HLR Gateway—Upgrade SIGTRAN stack with 2 additional SIGTRAN associations for Solaris
SBR Carrier Current Session Licenses	
SBR-CAR-ADD-50K	SBR Carrier—Add 50,000 concurrent sessions (license key only)
SBR-CAR-ADD-100K	SBR Carrier—Add 100,000 concurrent sessions (license key only)
SBR-CAR-ADD-250K	SBR Carrier—Add 250,000 concurrent sessions (license key only)
SBR-CAR-ADD-500K	SBR Carrier—Add 500,000 concurrent sessions (license key only)
SBR-CAR-ADD-1M	SBR Carrier—Add 1,000,000 concurrent sessions (license key only)
SBR-CAR-ADD-2M	SBR Carrier—Add 2,000,000 concurrent sessions (license key only)
SBR Carrier Current Session Licenses	
SBR-CAR-TPS-500	SBR Carrier—Support for up to 500 transactions/second/server (license only)
SBR-CAR-TPS-1000	SBR Carrier—Support for up to 1,000 transactions/second/server (license only)
SBR-CAR-TPS-2000	SBR Carrier—Support for up to 2,000 transactions/second/server (license only)
SBR-CAR-TPS-5000	SBR Carrier—Support for up to 5,000 transactions/second/server (license only)
SBR-CAR-TPS-10000	SBR Carrier—Support for up to 10,000 transactions/second/server (license only)
SBR-CAR-TPS-UNLIM	SBR Carrier—Support for unlimited proxy transactions per server (license only)

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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