# Cisco Prime Network Registrar 8.1 Technical Data Sheet

## Product Overview

Cisco Prime™ Network Registrar is a scalable, high-performance, extensible solution that provides integrated Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), and IP address management (IPAM) (DDI) services. The solution consists of four components: an IP address management application, a DNS protocol service, a caching DNS service, and a DHCP service.

For cable providers, Cisco Prime Network Registrar provides reliable, scalable DNS and DHCP services for millions of devices and forms the basis of a DOCSIS® cable modem provisioning system. Additionally, Cisco Prime Network Registrar plays an important role in service activation for data, voice-over-IP (VoIP), and mobile services.

DNS and DHCP are core enabling IP services that are mission-critical in today's service provider and enterprise networks. Without a fast, reliable, and secure DNS service, subscribers' broadband Internet access will be compromised. If DNS fails, the Internet will fail. In addition, many service providers have created a dynamic service delivery infrastructure based on DNS, and service quality and delivery help build competitive advantage and new revenue-generating opportunities. High-performing, reliable, scalable, and secure DNS is a requirement.

DHCP is a core network access technology - every device must be assigned a unique address when connected to the network, a virtually impossible task to undertake manually. Given the increasing number of connected users and connected devices as well as the growth in demand for network services driven by rich-media applications, automating the tracking and controlling of users and devices with a high capacity DHCP server is imperative.

With the continual deployment of new IP services and technologies and, again, the increasing number of connected users and the explosive growth in connected devices, today's complex networks also require a full-featured, automated IPAM solution. Without a next-generation, scalable IPAM system to plan, track, and manage the full lifecycle of IP address space and ease the transition to IPv6, service providers and enterprises risk operating inefficiencies and unnecessary costs and delayed service activation.

## Migration to IPv6

The introduction of IPv6 into network environments presents significant challenges and has added complexity in the realm of DNS, DHCP, and IPAM (DDI). Because the migration to IPv6 will take many years, it is important to have DDI support for both IPv6 and IPv4. Network operators require DNS and DHCP systems that support IPv4 and IPv6 as well as a full-featured, automated IP address management solution to plan, track, and manage IP addresses and ease the transition to IPv6.

Cisco Prime Network Registrar supports the IPv4 to IPv6 transition and allows dual-stack deployments on a single server. See Figure 1. The solution includes the following integrated components and their respective services - all supporting both IPv4 and IPv6:

- A single DHCP server for device network access

- A single DNS server for IP address translation and service delivery
- A DNS caching server that supports DNS Security Extensions (DNSSEC) and is designed to prevent cache poisoning and other attacks
- A powerful, comprehensive IPAM system to automate and manage all IP address requirements

**Figure 1.** Cisco Prime Network Registrar IPv4 and IPv6 Management



## Features and Capabilities

Cisco Prime Network Registrar provides the following features:

- **Fast and scalable:** A blazingly fast DHCP server, Cisco Prime Network Registrar has the ability to assign more than 47,000 DHCP leases per second. The solution is also the industry's most scalable DHCP server - supporting 50 million-plus devices in a single customer deployment. The recursive, extremely fast, Cisco Prime Network Registrar DNS caching server offers significant acceleration of DNS query throughput.

- **Reliable:** Cisco Prime Network Registrar helps address unique challenges in large-scale deployments of DHCP and DNS by offering multiple levels of redundancy with DHCP safe failover, support for High-Availability DNS (HA-DNS), and IPAM database replication for backup of IPAM data. A patent-pending discriminating rate limiter provides unsurpassed DHCP avalanche prevention to reduce downtime after network outages.

- **Consolidated IPv4/IPv6 address management:** Cisco Prime Network Registrar includes integrated, full lifecycle management for IPv4 and IPv6 and allows dual-stack deployments on a single server. The full-featured DHCPv6 server provides support for address assignment, both stateless and stateful configuration, prefix delegation, and prefix stability for full IPv6 address management. DNS64 functionality allows access to the IPv4 Internet and servers for hosts that have only an IPv6 address. Cisco Prime Network Registrar IPAM helps ease the transition to IPv6 with the ability to discover and take inventory of IPv4 and IPv6 resources, plan and model the way an IPv6 network is deployed, and map a current IPv4 network and devices to an IPv6 space. By helping to automate the transition from IPv4 to IPv6, Cisco Prime Network Registrar mitigates IP address scarcity, facilitates deployment of new revenue-generating services, and lowers IP address management overhead.

- **Management complexity minimized with centralization and automation:** Cisco Prime Network Registrar IPAM provides simplified, centralized management and control of IP address space and multivendor DNS and DHCP servers. Disparate DNS and DHCP servers can be difficult to manage cohesively, but with Cisco Prime Network Registrar IPAM, administrators can control and monitor DNS and DHCP servers from a centralized location. This allows for a single point of data aggregation and delegation to synchronize information, eliminate many manual, time-consuming, and error-prone tasks, and reduce complexity and operating costs. In addition, with the ability to discover, track, allocate, assign, and reclaim IP addresses automatically and tools to model IP data, network operators can easily achieve significant efficiencies. Automation also helps eliminate IP conflicts and configuration errors, reducing downtime of DHCP and DNS services and lowering network operating costs.
- **Extensibility:** Powerful, industry-leading extension support for both IPv4 and IPv6 allows network operators to alter and customize DHCP server operations for IPv4 and IPv6, improving network security, network performance, and third-party application integration. Extensions easily create new solutions such as billing, security, and lawful interception. In addition, extensive APIs/command-line interfaces (CLIs) allow integration points between the IPAM component and external systems for advanced automation of IPAM processes.

Table 1 lists additional detailed features and benefits of Cisco Prime Network Registrar.

**Table 1.**     Features and Benefits

| Feature | Benefit |
|---|---|
| **Rapid Time to Value** | |
| **DNS and DHCP setup wizards** | Using the basic configuration mode with setup wizards for the DHCP and DNS components, users can easily perform DHCP and DNS configuration by entering the parameters that are essential for the configuration. An advanced configuration mode is available for users with more in-depth experience with DHCP and DNS configuration. Users can quickly set up and configure Cisco Prime Network Registrar DHCP and DNS properly to facilitate IP-based services such as VoIP, LAN, and so on. |
| **IPAM ease and speed of setup** | • IPAM accepts XLS or comma-separated value (CSV) files to import preexisting license data.<br>• The Import Wizard allows users to import address space and resource records.<br>• Automated discovery facilitates creation of a central IPAM repository of network IP addresses. |
| **Standards and Regulatory Compliance** | |
| **CableLabs® DOCSIS 3.0 support** | With support for DOCSIS 3.0, Cisco Prime Network Registrar DHCP provides cable multiple system operators (MSOs) the capability to roll out new revenue-generating services. |
| **Full visibility into lease history for IPv4 and IPv6** | Cisco Prime Network Registrar DHCP provides the ability to query DHCP lease history for IPv4 and IPv6. Searching of lease history is possible both at the local and regional cluster level and is compliant with European Union privacy regulations. Lease history maintains client identifier and DOCSIS 3.0 cable modem MAC addresses to expedite client lookups.<br><br>This feature is used in lawful intercept solutions and for long-term storage of customer data for regulatory compliance and operational efficiency. |
| **DNSSEC government mandate compliance** | For some U.S. government agencies, DNSSEC is an operational mandate. On 22 August 2008, the Office of Management and Budget (OMB) released a memorandum requiring U.S. federal agencies to deploy DNSSEC across .gov sites. In addition, in July 2011, several additional zones were signed using DNSSEC, including .net and .com.<br><br>The Cisco Prime Network Registrar caching server offers DNSSEC support that helps to provide authenticated data to the end user, providing validation that DNS data has been signed. |
| **IPAM Rich Graphical User Interface** | |
| **Intuitive GUI** | • A web-based interface allows administrators to quickly visualize the network and allocate addresses based on current and future requirements. The GUI allows users to associate address blocks easily with geography, topology, or other user-defined hierarchies through the use of a container model.<br>• The GUI provides administrators with a real time snapshot of the network that reduces the amount of time it takes a user to perform certain tasks, including key strokes, mouse clicks, pointing, selecting an item from a list, and more.<br>• Two-dimensional mega menus provide for easy navigation and greater visibility of available command options. |

| Feature | Benefit |
|---|---|
| **Context-aware menus and context-sensitive help** | • Context-aware menus display relevant commands only for expedited operations and faster decision making.<br>• Context-sensitive help offers information specific to the task for greater user productivity. |
| **Simplified Dashboard, Tracking, and Reporting Capabilities** | |
| **Real-time server status dashboards** | The DNS, DNS caching, and DHCP component dashboards provide at-a-glance, real-time indicators of the server health, system metrics, alarms and alerts, and inventories of the respective Cisco Prime Network Registrar servers. The dashboards display graphs for monitoring DHCP and DNS general information, throughput, and error data that can affect network operations. To measure address usage over time, the DHCP component dashboard can collect DHCP utilization information for a time period and present graphs showing trends that are useful for capacity planning. Benefits include improved network maintenance and increased uptime. |
| **IPAM historic reporting, tracking, and trending** | • Address utilization data is tracked and trended for reporting purposes.<br>• Multiple graphical reports provide information at any level in the container or address block hierarchy to manage IP address space capacity from both an address pool perspective and a network/subnet perspective. |
| **IPv4 and IPv6 audit, reporting and alert capabilities** | • Audit reporting promotes accountability and provides history tracking for administrators, subnets, devices, IP addresses, and containers.<br>• Utilization tracking, analysis, and reporting, (with threshold alerting for notification of pending address depletions) help preempt potential service-affecting outages and prevent:<br>  ◦ Lost productivity<br>  ◦ Calls to the help desk or customer care<br>  ◦ Lost revenue<br>  ◦ Expensive troubleshooting time<br>These capabilities also assist in compliance initiatives such as:<br>  ◦ Proactive and preventative management and maintenance<br>  ◦ Inventory reporting<br>  ◦ Graphical reports |
| **IP Address Planning** | |
| **Planning for hierarchical IPv4 and IPv6 address space with a continual feedback loop** | • Planning tools facilitate development of a disciplined IPv4 and IPv6 address plan that can be deployed, monitored, and tracked automatically - for a continuous feedback loop to assure accuracy and provide an overall management view.<br>• Users can plan and stage the following interrelated entities for immediate or future deployment to DHCP and DNS servers: IP block or subnet allocation, IP address assignment, IPv6 prefixes and links, addition of a new DHCP pool and associated parameters, or DNS domain, server configuration, or resource records.<br>• Discovery-to-database reconciliation and exception reporting help enable operators to view plan discrepancies and potential errors or rogue users |
| **Creation and management of IPv6 prefixes and links** | Using IPv6 prefixes or links, operators can easily perform IPv6 address allocation, assignment, tracking, and search - for significant operational efficiencies compared to manual processes. |
| **Definition of DHCPv6 options and client classes** | • Client classes may be used to associate classes of devices with policies and options. For instance, user can easily create a VoIP client class or a cable modem client class with a policy set to provide an address out of a given scope or prefix with associated options.<br>• Users can create a client class configuration where specific client detail is stored. |
| **Creation and management of IPv4 and IPv6 client reservations** | Cisco Prime Network Registrar IPAM allows users to easily select and assign an IP address or prefix. |
| **User definability/flexibility and management of IP address space** | The easy-to-use container architecture allows the user to define and manage topology, address space (including block allocations and subnets), device and block types, and associated attributes (through user-defined fields). This helps administrators to organize address space in a manner that best matches an organization's structure. |
| **Address allocation: user-defined policies and automation** | • Cisco Prime Network Registrar IPAM allows users to allocate space in a hierarchical, logical manner in accordance with the topology as defined in their IP address plan.<br>• Automated allocation prevents requiring the operator to manually enter IP addresses, improving worker productivity and network uptime, decreasing costs, and allowing service providers and enterprises to scale seamlessly.<br>• Optimal "best fit" address allocation maximizes address utilization efficiency.<br>• Customization through multiple block types provides multiple address subspaces for various applications or IP types such as data, VoIP, higher quality of service (QoS), and more.<br>• Simplified address renumbering allows movement of address space where it is needed. |
| **Automated and manual IP address and subnet reclaim** | IPAM provides the ability to reclaim or free up IP addresses or entire subnets - a task that is crucial to assuring the IP inventory database is accurate. |
| **Address utilization trending and forecasting** | IPAM allows trending and forecasting of address pools, helping to prevent network access failure through proactive management of available addresses and utilization trends. |

| Feature | Benefit |
|---|---|
| **Centralized DNS/DHCP Server Configuration** | |
| **Automated configuration** | Operators can significantly reduce downtime with more accurate DNS/DHCP configurations. |
| **Advanced configuration support** | Support for DHCPv4 failover, multi-tiered addressing, multihomed hosts (to model multiple IP addresses on a given device), DHCP client classes, MAC address processing, client ID, dynamic DNS, and more - all helping to meet complex network operator needs. |
| **DHCP configuration verification and preview** | Verification and preview capabilities help limit network outages and IP conflicts. |
| **IP Address Management** | |
| **Discovery** | <ul><li>Cisco Prime Network Registrar IPAM performs host discovery using a variety of methods including ping, TCP port 80 connections, DNS lookups, Address Resolution Protocol (ARP) cache data, and device OS mapping.</li><li>The IPAM component performs integrated switch port mapping through Simple Network Management Protocol (SNMP) Bridge-MIB polling, facilitating support of a broad variety of switches, and mapping of a subnet's VLAN.</li><li>Router subnet discovery identifies which IPv4 and IPv6 subnets are provisioned on given router interfaces.</li><li>IPAM collects rich network data from a broad variety of multivendor Layer 3 routers, Layer 2 switches, and DNS/DHCP servers.</li><li>IPAM allows comparison of implemented network address data to the database to highlight discrepancies and reconcile conflicts.</li></ul> |
| **User-defined thresholds and alerts** | Users can set up thresholds and alerts - for example, for notification if an address space is over a designated utilization percentile or if an address pool is forecasted to deplete within a designated time frame - for proactive management. These capabilities help to facilitate planning and minimize network outages and IP conflicts. |
| **Granular administrator policies and tiered administration capabilities** | Granular administrator policies within Cisco Prime Network Registrar IPAM dictate access to and visibility and control of given functions, geographies, domains, subnets, and blocks. For service providers and enterprises with multiple operations personnel responsible for different portions of the network and/or different DHCP or DNS servers, administrators are empowered to delineate and partition responsibilities. |
| **Static IP Address Management** | |
| **Carrier-class lease reservation performance** | For users with needs for static IP address assignment, Cisco Prime Network Registrar DHCP can handle up to 500,000 lease reservations. Because Cisco Prime Network Registrar supports failover deployment, the enhanced lease reservation synchronizes the lease reservation between the main and the backup server to ensure that any update to the configuration will be populated between these servers. Modification to the reserved lease configuration can be done through the web UI, a CLI, and the Java Software Development Kit (SDK). |
| **Full-Featured DHCP Server** | |
| **Dynamic lease notification** | With dynamic lease notification, network operators can request external system notification whenever Cisco Prime Network Registrar DHCP issues a lease. |
| **Client reservations** | Cisco Prime Network Registrar DHCP provides client reservations for IPv4 and IPv6 addresses as well as IPv6 prefix delegation. This capability allows the DHCP server to reserve a permanent IP address assignment. These reservations can be stored internal to Cisco Prime Network Registrar (through the Cisco Prime Network Registrar client entries) or external to Cisco Prime Network Registrar - either in Lightweight Directory Access Protocol (LDAP) or supplied through the DHCP server's extension interface from other external sources. This avoids the need to synchronize data with Cisco Prime Network Registrar's internal databases and provides for a much more dynamic and scalable reservation-based service. |
| **Client class support** | Cisco Prime Network Registrar DHCP can classify incoming client packets in three ways for greater flexibility:<ul><li>Look up clients in a database (internal or external)</li><li>Apply a customer-defined algorithm or algorithms based on incoming packet content</li><li>Call customers or use third-party extensions written in C/C++ or Tool Command Language (Tcl)</li></ul>The client class can specify the options supplied to the client - which subnet or prefix to use for address allocation, which DNS server to update, and how to generate the host name, and more - as required for the various device types and service classes in the network.<br><br>For example, device types could include cable modems, customer premises equipment (CPE), and MTAs (media terminal adapters) in a cable network, and service types could include the various classes of Internet service offered. In an enterprise, device types might be phones, printers, and desktop computers. |
| **Extensions** | Cisco Prime Network Registrar DHCP provides powerful extension support to allow for DHCP server processing customization. Extensions can be used to classify client types, add/remove/modify options in packets, query or update an external database, and much more. Extensions are flexible enough to be written in the service provider or enterprise development environment - they are written in either Tcl or C/C++ and support all operating platforms and all devices. |

| Feature | Benefit |
|---|---|
| Gracefully handles difficult client situations | The DHCP server will handle an avalanche of DHCP client requests by prioritizing and processing the most important requests using a patent-pending discriminating rate limiter. The DHCP server will not collapse under any load, no matter how extreme - it will rapidly work through any backlog and get the network back up as quickly as possible. Also, through the use of an extension, the Chatty Client Filter, the DHCP component handles misbehaving clients. For clients that do not have multiple packets outstanding but still frequently send requests to the DHCP server, the extension will automatically disable such clients and then, if their behavior improves, automatically reenable them. In customer situations this has been shown to decrease packet traffic by more than 50 percent. |
| Bulk lease query support for DHCPv6 | The DHCP server will respond to lease query requests for a large number of DHCPv6 leases using standards-compliant bulk lease query functionality. |
| Prefix stability for IPv6 | Prefix stability allows a client to retain a delegated IPv6 address prefix when the client changes location - for example, during network maintenance, when an operator performs node splits, or during load-balancing events.<br>• Cable Modem Termination System (CMTS) prefix stability supports the DOCSIS 3.0 requirements for prefix stability and allows a subscriber to retain his or her delegated prefix when an operator performs a load-balancing or reconfiguration event within a CMTS group. CMTS prefix stability must be deployed on a single DHCP server.<br>• Universal prefix stability allows subscribers to retain a delegated prefix anywhere in the network. Use of this feature requires administrative assignment of the delegated prefixes and use of a client or lease reservation. It can be deployed across multiple DHCP servers. |
| Prefix allocation groups | Prefix allocation groups allow users to define multiple prefixes that do not result in multiple lease assignments to clients and to control the order in which the prefixes are used. |
| **DNS Features** | |
| Standards-compliant DNS authoritative server | Cisco Prime Network Registrar DNS is a standards-compliant authoritative DNS server that offers an advanced feature set, with support for incremental zone transfers, dynamic updates, and notifications. To secure DNS services, the DNS component supports transactional signature (TSIG) to authenticate DNS zone transfer and update requests. |
| DNS caching server | The DNS caching server is optimized for its specific role, performing the actual recursion to resolve a given name, resulting in greater simplicity and better performance overall. The server improves speed/performance of high volume recursive queries, and operators can expect increased performance in end-user applications. The server stores DNS query results locally, which helps to improve efficiency and reduce DNS traffic across the Internet. |
| DNSSEC support | The Cisco Prime Network Registrar DNS caching server performs DNSSEC validation and authenticates DNS data as being published by zone administrators. This helps to ensure the authenticity and integrity of DNS records and servers being accessed. Specifically, DNSSEC validation provides assurance to end-user resolvers that DNS query responses are accurate for signed zones. The DNSSEC server validates signatures of each resource record ultimately to the root zone in accordance with standard DNSSEC protocol.<br>DNSSEC also protects resource records against DNS vulnerabilities such as DNS cache poisoning. |
| DNS64 functionality | The Cisco Prime Network Registrar DNS caching server supports DNS64, synthesizing AAAA (IPv6) records from A (IPv4) records in order to provide an IPv6-only client access to an IPv4-only resource. This capability helps facilitate the migration of IPv4 to IPv6. |
| **External Systems Integration and Support** | |
| Integration with external systems | Users are able to streamline intersystem workflow using robust API/CLIs for communication between related asset inventory and network management systems.<br>The IPAM API is available for integration with third party applications such as provisioning systems and change management systems. A callout manager service can trigger downstream flows (for example, to a router provisioning system), helping to automate the workflow process, improving accuracy, speeding up the provisioning process, and lowering operating expenses (OpEx). |
| Multivendor DHCP/DNS support | The IPAM component cohesively supports the following additional DNS and DHCP servers: Internet Systems Consortium (ISC DHCP and BIND 9 DNS) and Microsoft, allowing support of existing infrastructure.<br>Microsoft LDAP versions 1, 2 and 3 are supported for external authentication. |
| **Deployment Environments: Virtual, Physical, and Cloud** | |
| Virtual appliance deployment option | Cisco Prime Network Registrar DHCP, DNS, and the DNS caching server can be deployed as a preconfigured virtual appliance and will run on any VMware ESXi 4.1-capable server running Linux or Windows. Deployment of a virtual appliance helps simplify installation, lower deployment risks, and reduce startup costs. |
| Software deployment option | Physical deployment of Cisco Prime Network Registrar offers choice of hardware and three operating systems: Solaris, Linux, and Windows or VMware with Linux/Windows. |
| Cloud support and multitenant capabilities | Multitenant capabilities help enable cloud-based DHCP and DNS services by providing subscribers with secure IP address management and self-service control. Additionally, the multitenant management feature provides the capability to segment data stored on regional and local clusters by tenant and is intended for use by managed service providers to consolidate many small customers on a limited number of local clusters. |

## System Requirements

Table 2 lists server system requirements for Cisco Prime Network Registrar 8.1 DHCP, DNS, and DNS caching servers. Table 3 lists server system requirements for the Cisco Prime Network Registrar IPAM Executive Centralized Manager and the IPAM Agent.

**Table 2.** Server System Requirements for Cisco Prime Network Registrar 8.1 DHCP (Regional and Local), DNS, and the DNS Caching Servers

| Component | Recommendation | | | |
|---|---|---|---|---|
| **Operating system** | Solaris 10 (SPARC) | Red Hat Enterprise Linux ES 5.0 <br> Red Hat Enterprise Linux ES 6.0 | Windows Server 2008 | Centos Enterprise Linux 6.4 (64-bit) |
| **Memory (RAM)** | 16 GB | Small networks - 4 GB; Average networks - 8 GB; Large networks - 16 GB | | |
| **Disk space** | **Local Server:** Two 73/146 SAS drives <br><br> **Regional Server:** 300 GB and higher dependent on duration of lease history | With basic DHCP and optimal hardware configuration: <br> • For expected peak load between 500 and 1000 DHCP leases per second, 7500 RPM SATA6 drives are recommended. <br> • For expected peak load above 1000 DHCP leases per second, 15,000 RPM SAS drives are recommended. | | |
| **Hardware** | Sun T5220 | Intel Core Duo or equivalent | | |

**Table 3.** Server System Requirements for Cisco Prime Network Registrar IPAM Executive Centralized Manager and Cisco Prime Network Registrar IPAM Agent

| Component | Recommendation | | | |
|---|---|---|---|---|
| **Operating system** | Red Hat Enterprise Linux 5 (32-bit) | Windows 2008 Server (32-bit or 64-bit English versions) <br> Windows 2008 R2 Server (64-bit) | Centos Enterprise Linux 6.4 (64-bit) | Solaris 10 (SPARC) |
| **Memory (RAM)** | 2 GB RAM or higher | | | |
| **Disk space** | 2 GB disk space for base install | | | |
| **Hardware** | Xeon - 1.2 GHz or faster processor | | | |

## Ordering Information

To place an order, visit the Cisco® Ordering Homepage. See the Cisco Prime Network Registrar Ordering Guide for a list of Cisco Prime Network Registrar product numbers and upgrade product numbers as well as detailed licensing information. To download software, visit the Cisco Software Center.

## About Cisco Prime

The Cisco Prime portfolio of enterprise and service provider management offerings empowers IT organizations to more effectively manage their networks and the services they deliver. Built on a service-centered foundation, the Cisco Prime portfolio of products supports integrated lifecycle management through an intuitive workflow-oriented user experience. The portfolio of Cisco Prime solutions for service providers provides A-to-Z management for IP next-generation networks, mobility, video, and managed services.

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