Cisco Prime Network Registrar 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 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, unnecessary costs and delayed service activation.

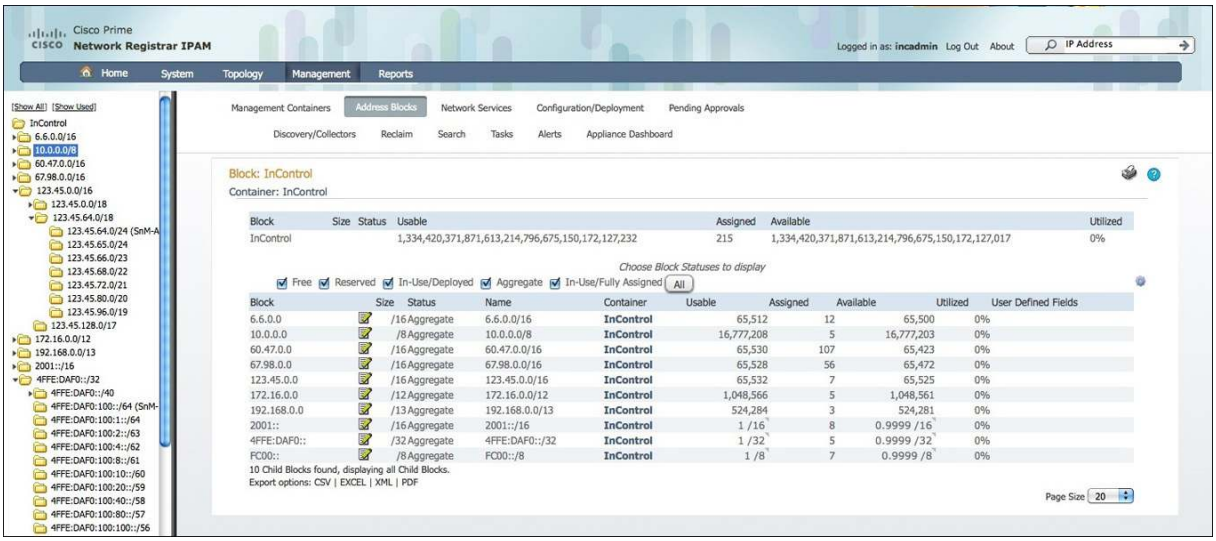
Migration to IPv6

The introduction of IPv6 into network environments presents significant challenges and added complexity in the realm of DDI. The Internet Assigned Numbers Authority (IANA) address pool was exhausted on February 3, 2011, and the Regional Internet Registry (RIR) address pools have already begun to run out of allocatable IPv4 addresses. Hence, most service provides and enterprises are focusing on IPv6, and because the migration to IPv6 will take many years, it is important to have support for both. These 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. 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, and prefix delegation 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 is an easy-to-use, reliable solution for centralized management of IP address space and multivendor DNS and DHCP servers. The solution 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 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	Automated discovery facilitates creation of a central IPAM repository of network IP addresses. The solution also accepts a wide variety of spreadsheet formats for automated population of the IPAM repository.
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. 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. 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.
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

Feature	Benefit
	uptime.
IPAM historic reporting, tracking, and trending	• Address utilization data is tracked and trended for reporting purposes. • User-defined thresholds and alerts provide notification of impending address depletion - helping to prevent lost productivity, calls to the help desk or customer care, lost revenue, and expensive troubleshooting time. • 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.
Audit reporting	• Users are able to track IP address assignment history for auditing and troubleshooting purposes. • The system allows users to view administrator activity for accountability tracking.
IP Address Planning	
Intuitive GUI	The IPAM component provides a web-based interface that 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.
Planning for hierarchical IPv4 and IPv6 address space with a continual feedback loop	• IPAM tools facilitate development of a disciplined IP address plan that can be deployed, monitored, and tracked automatically - for a continuous feedback loop to assure accuracy and provide an overall management view. • WIth the IPAM component, users can plan and stage the following interrelated entities for immediate or future deployment to DHCP servers: IP block or subnet allocation, IP address assignment, addition of a new DHCP pool and associated parameters. • Discovery-to-database reconciliation and exception reporting help enable operators to view plan discrepancies and potential errors or rogue users.
User definability/flexibility and management of IP address space	Within the IPAM component, a patented 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 container structure allows the user to define a hierarchy or block allocation to conform to policies and procedures specific to that IP network—helping 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. • 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. • Optimal "best fit" address allocation maximizes address utilization efficiency. • 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. • Simplified address renumbering allows movement of address space where it is needed.
Automated and manual IP address and subnet reclaim	The IPAM component 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. When adding a subnet or IP address, automated reclaim provides accuracy assurance of what the database indicates is "free." The reconciliation action then feeds back to the plan in terms of adding or changing the database based on discovered information or freeing up devices or subnets through reclaim.
Address utilization trending and forecasting	The IPAM component allows trending and forecasting of address pools, helping to prevent network access failure through proactive management of available addresses and utilization trends.
Centralized DNS/DHCP Server Configuration	
Automated configuration	Operators can significantly reduce downtime with more accurate DNS/DHCP configurations.
Advanced configuration support	Support for DHCP failover, multitiered 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	• The IPAM component performs host discovery using a variety of methods including ping, TCP port 80 connections, Address Resolution Protocol (ARP) cache data, and device OS mapping. • 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. • Router subnet discovery identifies which IPv4 and IPv6 subnets are provisioned on given router interfaces. • Cisco Network Registrar IPAM collects rich network data from a broad variety of multivendor Layer 3 routers, Layer 2 switches, and DHCP servers. • Collection of network actual data enable comparison and reconciliation with the database for a feedback

Feature	Benefit
	loop (to the system and into the IP planning process) as well as resolution of these conflicts. Upon completion of discovery, administrators also are able to easily add new devices to the database, identify unauthorized devices on the network, and reclaim unused IP addresses.
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, administrators are empowered to delineate and partition responsibilities.
Audit, reporting, and alert capabilities	• Audit reporting promotes accountability and provides history tracking for administrators, subnets, devices, IP addresses, and containers. For example, workflow approval for resource record updates can be viewed and reported. • Automated utilization tracking, analysis, and reporting, along with threshold alerting for notification of pending address depletions, can help preempt potential service-affecting outages and prevent lost productivity, calls to the help desk or customer care, lost revenue, and expensive troubleshooting time. • These capabilities promote internal and external compliance. For example, automated Integrated Internet Registry reporting facilitates future address allocation requests to supplement capacity as needed. • Inventory reporting shows which device is assigned to which IP address within the network at any time. • Multiple graphical reports provide the information at any level in the container or address block hierarchy to manage IP address space.
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 the solution 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: • Lookup clients in a database (internal or external) • Apply a customer-defined algorithm or algorithms based on incoming packet content • Call customers or use third-party extensions written in C/C++ or Tool Command Language (Tcl) 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. For example, device types could include cable modems, CPEs, and MTAs 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 Tclor C/C++ and support all operating platforms and all devices.
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 re-enable 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.

Feature	Benefit
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, protecting resource records against DNS vulnerabilities such as DNS cache poisoning. 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.
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. Within the IPAM module, 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.
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. The IPAM component is not available on Solaris.
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 8.0 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 8.0 DHCP, DNS, and the DNS Caching Servers

Component	Recommendation		
Operating system	Solaris 10	Red Hat Enterprise Linux ES 5.0 Red Hat Enterprise Linux ES 6.0	Windows Server 2008
Memory (RAM)	16 GB	Small networks - 4 GB; Average networks - 8 GB; Large networks - 16 GB	
Disk space	two 73/146 SAS drives	With basic DHCP and optimal hardware configuration: • For expected peak load between 500 and 1000 DHCP leases per second, 7500 RPM SATA6 drives are recommended. • For expected peak load above 1000 DHCP leases per second, 15,000 RPM SAS drives are recommended. Recommended hard drive - 146 GB	
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	RedHat Enterprise Linux 5 (32-bit)	Windows 2008 Server (32-bit or 64-bit English versions) Windows 2008R2 Server (64-bit)
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 8.0 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.

Cisco Services

Cisco offers a wide range of services programs to accelerate customer success. Cisco services help you to protect your network investment, optimize network operations, and prepare the network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, see Cisco Technical Support Services or Cisco Advanced Services.

For More Information

For more information about Cisco Prime Network Registrar, visit http://www.cisco.com/go/networkregistrar, contact your local account representative, or send an email to ask-networkregistrar@cisco.com.

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