Introduction to Cisco Prime Network Registrar

Cisco Prime Network Registrar is a full featured, scalable Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), and Trivial File Transfer Protocol (TFTP) implementation for medium to large IP networks. It provides the key benefits of stabilizing the IP infrastructure and automating networking services, such as configuring clients and provisioning cable modems. This provides a foundation for policy-based networking.

Service provider and enterprise users can better manage their networks to integrate with other network infrastructure software and business applications.

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Target Users

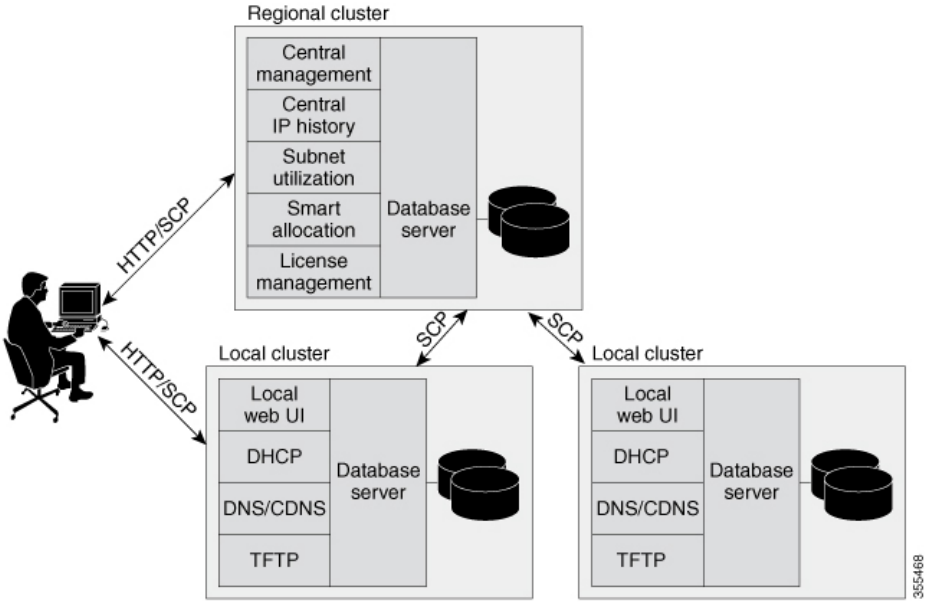
Cisco Prime Network Registrar is designed for these users:

- **Internet service providers (ISPs)**—Helps ISPs drive the cost of operating networks that provide leased line, dialup, and DSL (Point-to-Point over Ethernet and DHCP) access to customers.
- **Multiple service operators (MSOs)**—Helps MSOs provide subscribers with internet access using cable or wireless technologies. MSOs can benefit from services and tools providing reliable and manageable DHCP and DNS services that meet the Data Over Cable Service Interface Specification (DOCSIS). Cisco Prime Network Registrar provides policy-based, robust, and scalable DNS and DHCP services that form the basis for a complete cable modem provisioning system.
- **Enterprises**—Helps meet the needs of single- and multisite enterprises (small-to-large businesses) to administer and control network functions. Cisco Prime Network Registrar automates the tasks of assigning IP addresses and configuring the Transport Control Protocol/Internet Protocol (TCP/IP) software for individual network devices. Forward-looking enterprise users can benefit from class-of-service and other features that help integrate with new or existing network management applications, such as user registration.

Regional and Local Clusters

The regional cluster acts as an aggregate management system for up to a hundred local clusters. Address and server administrators interact at the regional and local clusters through the regional and local web-based user interface (web UI), and local cluster administrators can continue to use the command line interface (CLI) at the local cluster. The regional cluster consists of a Central Configuration Management (CCM) server, Tomcat web server, servlet engine, and server agent (see Management Components). The license management is now done at the regional cluster and hence the local server has to be registered to a regional server to avail the necessary services. See the *"Overview" chapter in Cisco Prime Network Registrar 11.2 Installation Guide* for more details.

Figure 1: Cisco Prime Network Registrar User Interfaces and Server Clusters



A typical deployment is one regional cluster at a customer network operation center (NOC), the central point of network operations for an organization. Each division of the organization includes a local address management server cluster responsible for managing a part of the network. The System Configuration Protocol (SCP) communicates the configuration changes between the servers.

Deployment Scenarios

The Cisco Prime Network Registrar regional cluster web UI provides a single point to manage any number of local clusters hosting DNS, CDNS, DHCP, or TFTP servers. The regional and local clusters also provide administrator management so that you can assign administrative roles to users logged in to the application.

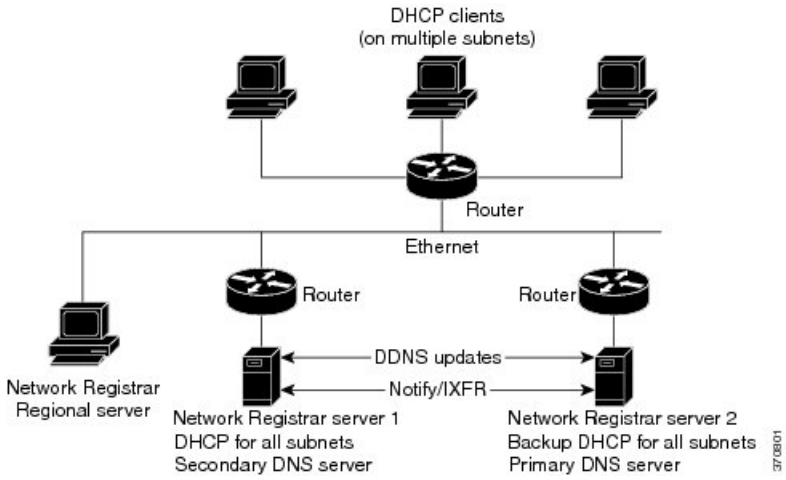
This section describes two basic administrative scenarios and the hardware and software deployments for two different types of installations—a small-to-medium local area network (LAN), and a large-enterprise or service-provider network with three geographic locations.

Small-to-Medium-Size LANs

In this scenario, low-end Linux servers are acceptable. The image below shows a configuration that would be adequate for this network.

Note Regional server is MUST in deployment for small and medium sized LANs.

Figure 2: Small-to-Medium LAN Configuration

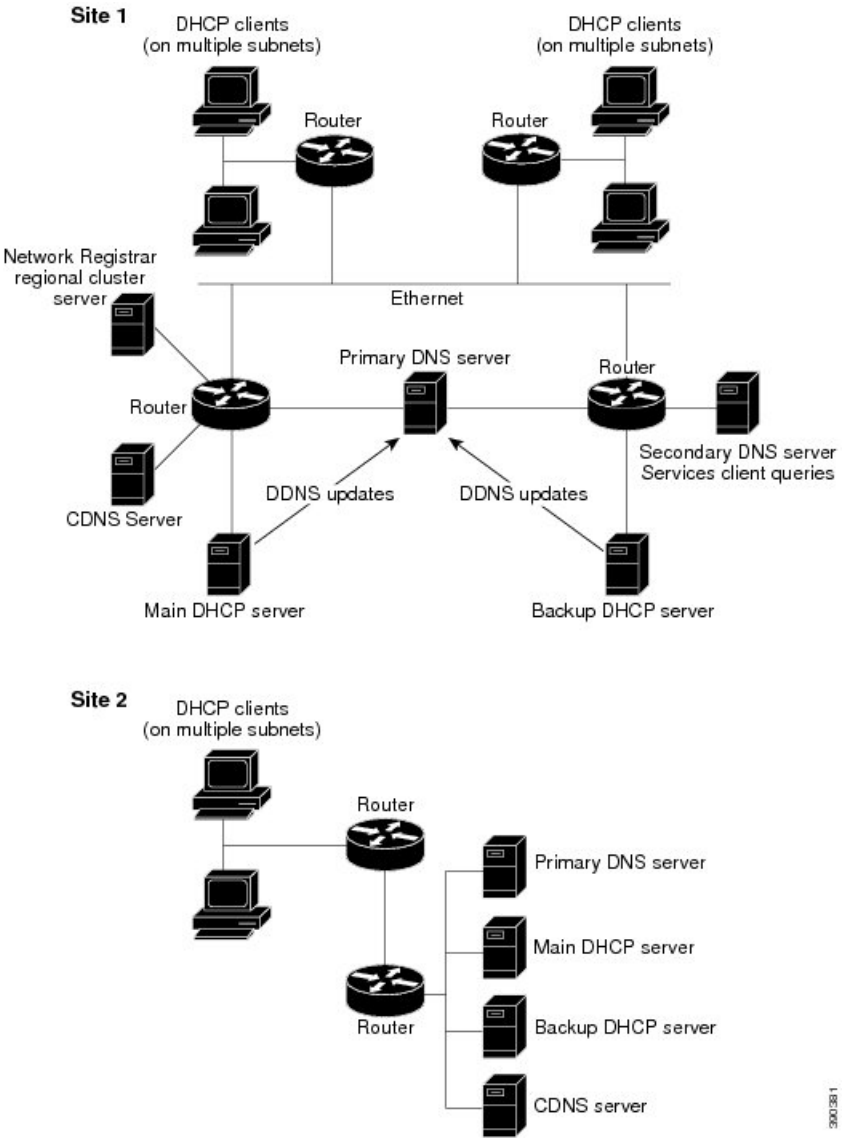


Large Enterprise and Service Provider Networks

In a large enterprise or service provider network serving over 500,000 DHCP clients, use mid-range Linux servers. Put DNS and DHCP servers on different systems. The image below shows the hardware that would be adequate for this network.

When supporting geographically dispersed clients, locate DHCP servers at remote locations to avoid disrupting local services if wide-area connections fail. Install the Cisco Prime Network Registrar regional cluster to centrally manage the distributed clusters.

Figure 3: Large Enterprise or Service Provider Network Configuration



Configuration and Performance Guidelines

Cisco Prime Network Registrar is an integrated DHCP, DNS, and TFTP server cluster capable of running on a Linux workstation or server.

Because of the wide range of network topologies for which you can deploy Cisco Prime Network Registrar, you should first consider the following guidelines. These guidelines are very general and cover most cases. Specific or challenging implementations could require additional hardware or servers.

Related Topics

General Configuration Guidelines, on page 5
Special Configuration Cases, on page 5
General Performance Guidelines, on page 6

General Configuration Guidelines

The following suggestions apply to most Cisco Prime Network Registrar deployments:

- Configure a separate DHCP server to run in remote segments of the wide area network (WAN).

  Ensure that the DHCP client can consistently send a packet to the server in under a second. The DHCP protocol dictates that the client receive a response to a DHCPDISCOVER or DHCPREQUEST packet within four seconds of transmission. Many clients (notably early releases of the Microsoft DHCP stack) actually implement a two-second timeout.

- In large deployments, separate the secondary DHCP server from the primary DNS server used for dynamic DNS updates.

  Because lease requests and dynamic DNS updates are persisted to disk, server performance is impacted when using a common disk system. So that the DNS server is not adversely affected, run it on a different cluster than the DHCP server.

- Include a time server in your configuration to deal with time differences between the local and regional clusters so that aggregated data at the regional server appears in a consistent way. See the Polling Utilization and Lease History Data.
- Set DHCP lease times in policies to four to ten days.

  To prevent leases from expiring when the DHCP client is turned off (overnight or over long weekends), set the DHCP lease time longer than the longest period of expected downtime, such as seven days. See the *"Managing Leases" section in Cisco Prime Network Registrar 11.2 DHCP User Guide*.

- Locate backup DNS servers on separate network segments.

  DNS servers are redundant by nature. However, to minimize client impact during a network failure, ensure that primary and secondary DNS servers are on separate network segments.

- If there are high dynamic DNS update rates in the network, configure separate DNS servers for forward and reverse zones.
- Use NOTIFY/IXFR.

  Secondary DNS servers can receive their data from the primary DNS server in two ways: through a full zone transfer (AXFR) or an incremental zone transfer (NOTIFY/IXFR, as described in RFCs 1995 and 1996). Use NOTIFY/IXFR in environments where the name space is relatively dynamic. This reduces the number of records transferred from the primary to the secondary server. See the *"Enabling Incremental Zone Transfers (IXFR)" section in Cisco Prime Network Registrar 11.2 Authoritative and Caching DNS User Guide*.

Special Configuration Cases

The following suggestions apply to some special configurations:

- When using dynamic DNS updates for large deployments or very dynamic networks, divide primary and secondary DNS and DHCP servers across multiple clusters.

  Dynamic DNS updates generate an additional load on all Cisco Prime Network Registrar servers as new DHCP lease requests trigger dynamic DNS updates to primary servers that update secondary servers through zone transfers.

- During network reconfiguration, set DHCP lease renewal times to a small value.

  Do this several days before making changes in network infrastructure (such as to gateway router and DNS server addresses). A renewal time of eight hours ensures that all DHCP clients receive a changed DHCP option parameter within one working day. See the *"Managing Leases" section in Cisco Prime Network Registrar 11.2 DHCP User Guide*

General Performance Guidelines

For Cisco Prime Network Registrar, the general guideline is to invest in the highest performance disk I/O subsystem available, then memory, and finally the processors. DHCP and Authoritative DNS (especially if using DNS updates) will be most impacted by disk latency, then memory and network performance, and finally CPU (these applications are not CPU intensive).

- The best way to reduce latency and improve performance is to provide high performance disks (SSD are recommended over traditional hard disks). High performance disk controllers are also recommended. This is especially important for DHCP and Authoritative DNS servers that handle Dynamic Updates.
- Providing lots of memory is also important as it reduces disk read requirements if the file system cache can be used. The recommendation here is to assure that a system has sufficient free memory that is twice the size of the Cisco Prime Network Registrar databases. It is difficult to give exact requirements here as it depends on many variables.
- Network performance is also an important consideration and 1 GB or better Ethernet controllers are recommended.
- As most Cisco Prime Network Registrar uses are not CPU intensive, the CPU performance tends to be least important.

Interoperability with Earlier Releases

The following table shows the interoperability of Cisco Prime Network Registrar features on the regional CCM server with versions of the local cluster.

Table 1: CCM Regional Feature Interoperability with Server Versions

Feature	Local Cluster Version						
	9.0	9.1	10.0	10.1	11.0	11.1	11.2
Push and pull:							
Address space	x	x	x	x	x	x	x
IPv6 address space	x	x	x	x	x	x	x

Feature	Local Cluster Version						
	9.0	9.1	10.0	10.1	11.0	11.1	11.2
Scope templates, policies, client-classes	x	x	x	x	x	x	x
IPv6 prefix and link templates	x	x	x	x	x	x	x
Zone data and templates	x	x	x	x	x	x	x
Groups, owners, regions	x	x	x	x	x	x	x
Resource records (RRs)	x	x	x	x	x	x	x
Local cluster restoration	x	x	x	x	x	x	x
Host administration	x	x	x	x	x	x	x
Extended host administration	x	x	x	x	x	x	x
Administrators and roles	x	x	x	x	x	x	x
Zone Views	x	x	x	x	x	x	x
Administrator:							
Single sign-on	x	x	x	x	x	x	x
Password change	x	x	x	x	x	x	x
IP history reporting:							
Lease history	x	x	x	x	x	x	x
Detailed lease history	x	x	x	x	x	x	x
Utilization reporting:							
DHCP utilization history (v4 History)	x	x	x	x	x	x	x
DHCP utilization history (v6 History)		x	x	x	x	x	x
Subnet and scope utilization	x	x	x	x	x	x	x
IPv6 prefix utilization	x	x	x	x	x	x	x