

Cisco GSS 4492R Global Site Selector

The Cisco® GSS 4492R Global Site Selector is a critical component of any business resilience strategy to optimize multisite deployments that involve globally distributed data centers. The Cisco GSS 4492R networking product globally load balances distributed data centers, and is the cornerstone of multisite disaster recovery plans in deployments of market-leading Cisco content switches. The Cisco GSS 4492R is the fourth addition to the Cisco Global Site Selector Series.

Customers can benefit from the new levels of traffic management and centralized command and control provided by the Cisco GSS 4492R—whether they are deploying new Cisco content switches (such as the Cisco CSS 11500 Series Content Services Switch [CSS] and the Content Switching Module [CSM] for Cisco Catalyst® 6500 Series switches), IOS—SLB, Application Control Engine (ACE), or have legacy switches in place (such as the Cisco CSS 11000 Series and Cisco LocalDirector devices).

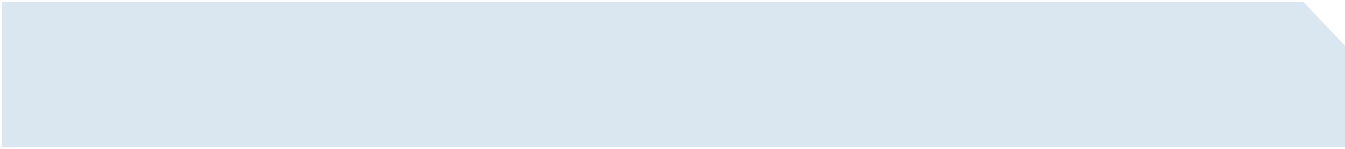
Figure 1. Cisco GSS 4492R Global Site Selector



The Cisco GSS 4492R delivers the following capabilities:

- Provides a scalable, dedicated hardware platform for industry-leading Cisco content switches to ensure Web-based applications are always available, by detecting site outages or site congestion and rerouting content requests
- Improves the global data center selection process by offering user-selectable global load-balancing algorithms
- Offloads Domain Name System (DNS) servers by taking over the domain resolution process, and transmits these requests at thousands of requests per second
- Scales to support hundreds of data centers or server load balancers (SLBs)
- Complements the existing DNS infrastructure by providing centralized domain management
- Tightly integrates with Cisco SLBs without sacrificing the ability to work in a heterogeneous environment of DNS-capable networking products

The Cisco GSS 4492R allows businesses to deploy global Internet and intranet applications with the confidence that Web application users will be quickly rerouted to a standby data center if a primary data center outage or overload occurs. The Cisco GSS 4492R traffic-management process continuously monitors the load and health of the SLBs within each data center. This information is used in conjunction with customer-controlled load-balancing algorithms to enable the Cisco GSS 4492R to select a data center that is available and not overloaded within user-definable load conditions—in real time.



By offloading the DNS server resolution process from traditional DNS servers, the Cisco GSS 4492R can optimize global site selection, boost DNS responsiveness, assure data center availability, and increase the scalability of Websites and data centers. The Cisco GSS 4492R is a critical component for enterprises and service providers deploying globally distributed data centers, or installing disaster recovery systems for Web-based applications.

FEATURES AND BENEFITS

The Cisco GSS 4492R:

- Provides a resilient architecture that is critical for disaster recovery and multisite Web application deployments
- Offers flexible heterogeneous support for all Cisco SLBs and DNS-capable networking products
- Provides centralized command and control of the DNS resolution process for direct and precise control of the global load-balancing process
- Augments and offloads any DNS Berkeley Internet Name Domain (BIND) infrastructure to optimize content requests and delivery for all types of static and dynamic Web content
- Provides dedicated processing of DNS requests for greater performance and scalability
- Offers site persistence for e-commerce applications
- Offers two unique network proximity features that leverage Cisco Systems, Inc. routers and Layer 4-7 content switches that allows the Cisco GSS 4492R in real time, to direct content consumers to the closest data center
- Supports a Web-based GUI and DNS wizard to simplify DNS command and control

CISCO GSS 4492R BUSINESS CONTINUANCE AND GLOBAL SERVICE LOAD-BALANCING DEPLOYMENTS

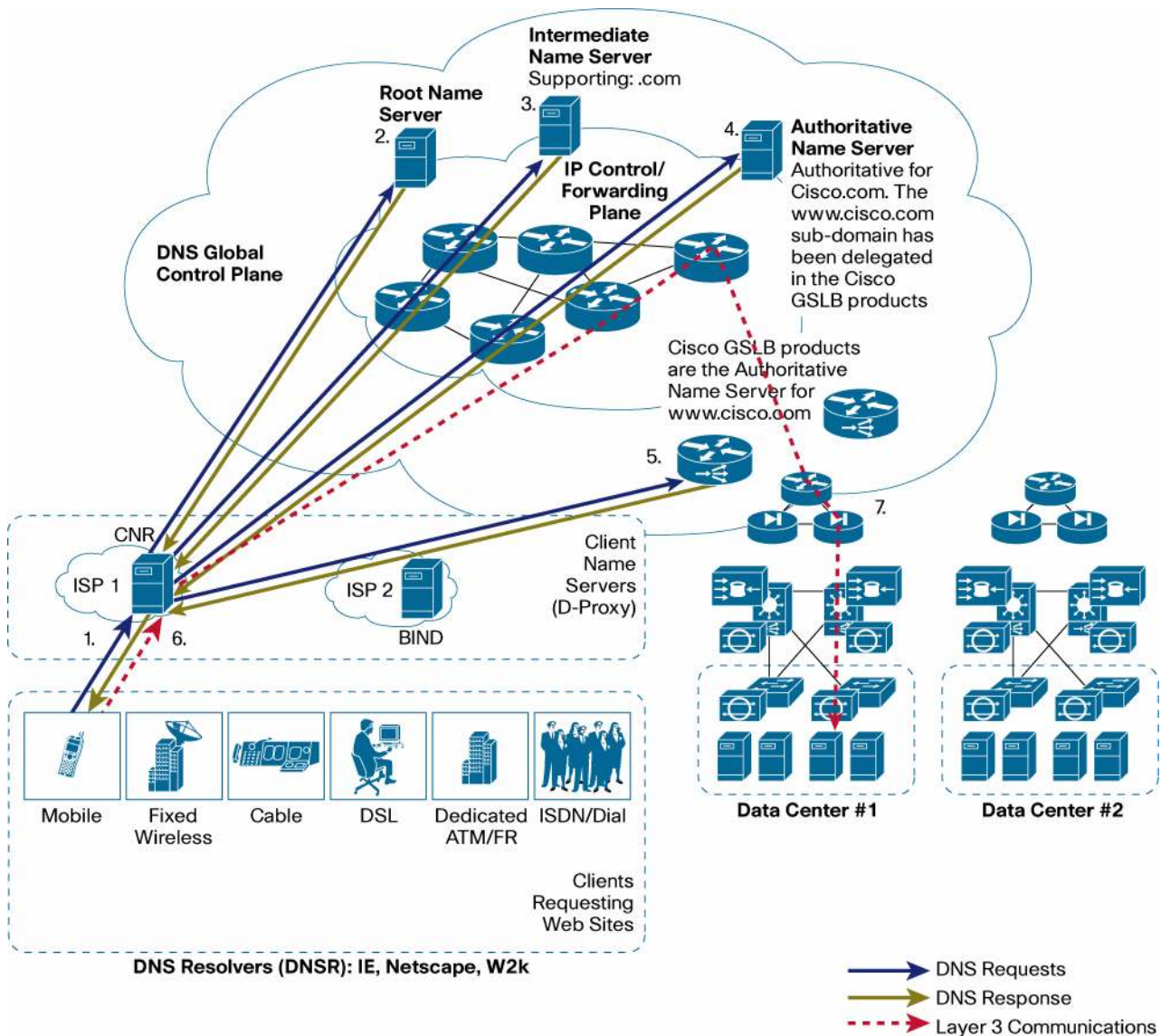
Cisco GSS 4492R and Market-Leading Cisco Content Switches—The Ultimate Combination for Business-Resiliency Solutions

The Cisco GSS 4492R, in combination with a local Cisco content switch, is critical for large enterprises and service providers planning to deploy highly reliable distributed data centers. The Cisco GSS 4492R selects the best site, based on the load and availability information supplied by the Cisco content switch. This allows the Cisco content switch to select the best local server within the data center based on availability and local load. The Cisco GSS 4492R simplifies this network deployment architecture with its centralized command and control features. An example of the complete control is the fact the Cisco GSS 4492R can gracefully take a Cisco content switch out of rotation without affecting ongoing operations.

The Cisco GSS 4492R performs two major functions as part of the global site selection process:

- Takes an active role in the DNS infrastructure to connect the client to the SLB that supports the requested Website
- Continuously monitors the load and availability of these SLBs to select the SLB that is most capable of supporting the new client

Figure 2. GSS 4492R Site Selection Process



In Figure 2, the Cisco GSS 4492R offloads the Website selection process from the DNS infrastructure. The Cisco GSS 4492R continuously monitors the load and health of up to 128 SLBs or 4000 virtual IP addresses (VIPs). These SLBs can be colocated, or located at remote and disparate data centers.

How the Cisco GSS 4492R interacts with the client in the Website selection process (see Figure 2) is summarized in the following six steps:

- Step 1. A client wants to access an application at www.cisco.com. The resolver (client) sends a query for www.cisco.com to the local client DNS name server (D-proxy). In this case, the Cisco Network Registrar is acting as the D-proxy.
- Step 2. The local D-proxy does not have an IP address for www.cisco.com, so it sends a query to a root name server. The root name server can respond to the request in two different ways; the most common way is to send the D-proxy directly to the authoritative name server for www.cisco.com. Another method, called “iterated query,” (shown in Figure2) is when the root name server sends the D-proxy to an intermediate name server that knows the address of the authoritative name server Cisco.com.

- Step 3. The local D-proxy sends a query to the intermediate name server, which responds, referring the D-proxy to the authoritative name server for Cisco.com.
- Step 4. When the local D-proxy sends a query to Authoritative name server for Cisco.com it responds with the IP addresses of the two GSS 4492Rs which tells the D-proxy to ask the Cisco GSS 4492R for the IP address for www.cisco.com.
- Step 5. The local D-proxy sends it final request directly to one of the two GSS 4492Rs. The GSS 4492R is authoritative for the www.cisco.com subdomain, so it sends the IP address to the D-proxy. Before this IP address is sent the D-proxy the GSS 4492R applies intelligence to its response. Following are examples of this intelligence, which is not supported by a generic DNS name server. The GSS 4492R:
- Will not send an IP address to the D-proxy if the device is unavailable.
 - Will not send an IP address to the D-proxy if the device is overloaded.
 - Can send the users to the most closet data center.
 - Can intelligently manage client traffic flow to each data center.
 - Will issue a virtual IP address, *not* a real IP address of a back-end server.
 - Can automatically reroute users to an alternative data center if the primary data center becomes unavailable.
- The Cisco GSS 4492R sends the intelligent IP address of the “best” server load balancer at a specific data center—in this case, the SLB at Data Center 1.
- Step 6. The DNS global load balancing process is complete; the client is directed to the SLB at Data Center 1 by the IP control/forwarding plane.

Breakthrough Concept—DNS Rules

At the core of the Cisco GSS 4492R is the “DNS rule,” which provides centralized command and control of how the Cisco GSS 4492R globally load balances a given hosted domain, what IP addresses are sent to the client’s name server (D-proxy), and what recovery method should be used if the preferred choice is unavailable. The Cisco GSS 4492R allows a DNS administrator to control how Web-based applications are globally load-balanced across multiple sites and under what condition clients should be directed to a backup site. This combination is ideal for DNS administrators seeking a centralized tool that gives them complete control of the DNS resolution process. The Cisco GSS 4492R provides the features needed by e-businesses looking for a real-time business continuance solution.

Using the Cisco GSS 4492R GUI, the user defines the domain that will be globally load-balanced, and can include the IP addresses of specific, client-named servers (D-proxy). This allows the user to “hard-wire” a single D-proxy or a group of D-proxies to a particular site, which is useful when the DNS administrator needs to specify a certain set of SLBs to support all the traffic coming from a specific Internet service provider (ISP) D-proxy.

On the same GUI screen, the DNS administrator defines what SLBs should support this domain. The DNS administrator has the option to assign multiple IP addresses (up to eight) and a time-to-live (TTL) value that will be used by the client D-proxy. The final configuration option is the recovery method that is used if the first method fails (in the GUI, these are called “DNS rules”). Each DNS rule can support up to three load-balance clauses. These clauses are used to establish the primary load-balancing method, the secondary load-balancing method, and the tertiary method, which could involve hard-wiring a global “sorry server.”

The mechanism that is used to extract this load and health information is a specially designed keepalive (KAL). The Cisco GSS 4492R supports the following KALs:

- **KAL-AP**—This KAL was developed specifically to extract both load and availability from the Cisco CSS 11000/11500 and the Cisco CSM. When this detailed query is sent to the CSS or CSM, these SLBs respond with information about a hosted domain name or hosted virtual IP address of the SLB.
- **HTTP**—An HTTP “head request” method to a given origin server sends a request to an origin server and checks for a “200 OK. If the Cisco GSS 4492R receives a 200 OK, then it directs traffic to the virtual IP address supporting that server. The user can configure the host tag, the remote host IP, and the URL (including a path).
- **TCP**—This KAL is used when global SLB (GSLB) devices may be something other than a CSS or CSM. These GSLB remote devices include Web servers, LocalDirectors, Wireless Application Protocol (WAP) gateways, and other devices that can be checked using a TCP KAL. The TCP KAL initiates a TCP connection to the remote device by performing a three-way handshake.
- **Internet Control Message Protocol (ICMP)**—ICMP is a Layer 3 “ping” that indicates the status of a device based on connectivity to the network. This KAL is used with any device that responds to a ping request. Pings are sent once every 45 seconds. If there is no response, the ping is sent once every 5 seconds, up to three times. If there is still no response, the device (virtual IP or real server) is considered offline.
- **Name server query**—A simple DNS request is sent to a host (name or mail server, for example) to receive a resolved domain name to prove the system is “alive.” In this case, the Cisco GSS 4492R sends an unused domain name, probing for a failure response, which proves that the DNS server is “alive.” This is used in conjunction with the name server forwarding feature.
- **Content routing agent (CRA)**—This User Datagram Protocol (UDP)-based KAL is used with the DNS race feature; the GSS sends KAL requests to port 1304 to retrieve round-trip times between the GSS and agent (CSS or content engine).

GLOBAL LOAD-BALANCING ALGORITHMS—COMPLETE CONTROL OF SITE SELECTION

The Cisco GSS 4492R supports ten global load-balancing algorithms and gives administrators full flexibility in selecting the global load-balancing algorithm that matches their needs:

- **Ordered list**—This user-definable list specifies one or a group of IP addresses (corresponding to a virtual IP address or the IP address of a back-end sever) that the Cisco GSS 4492R uses to respond to a DNS request for a specific domain. The Cisco GSS 4492R uses the first address in the list until it becomes unavailable or overloaded, and then moves to the next address in the list. This process is repeated for every subsequent entry in the list.
- **Static based on client’s DNS address**—This algorithm is a variation of the order list that allows the administrator to map the IP address of the client’s DNS name server to an available virtual IP address on a specific content switch. This feature is used when the administrator wants to allocate a specific community of users to a specific set of SLBs or back-end servers.
- **Round robin**—This algorithm cycles through available virtual IP addresses in order. The round-robin balance method is useful when balancing requests among multiple, active data centers that are hosting identical content—for example, between SLBs at a primary and “active standby” site that serves requests.
- **Weighted Round Robin (WRR)**—The Cisco GSS 4492R cycles through the list of virtual IP addresses that are available as requests are received, but sends requests to a favored virtual IP address based on a user-assigned weighting value.
- **Least loaded**—The Cisco GSS 4492R can receive load values from either the CSS or CSM. The Cisco GSS 4492R monitors these load values to see if they exceed a threshold that is assigned by the administrator. If the load is above the specified threshold, the virtual IP on the CSS or CSM is considered offline and unavailable to serve further requests. If the load falls below the threshold, the GSS automatically starts sending requests to the virtual IP address.

- Source address and domain hash—When the Cisco GSS 4492R is using this balance method, the IP address of the client’s DNS proxy and the requesting client’s domain are used to create a unique “hash” value that is then “stuck” to the virtual IP that is chosen to serve the DNS query. This means every time that user requests that domain, the user will go to the virtual IP unless it is unavailable, and then the user is sent to an alternate virtual IP assigned by the administrator through configuration.
- Global DNS Sticky Data Base — this is an option that can be applied to a global load-balancing algorithm. That after the global load balancing decision has been made and a specific data center has been selected, the GSS remembers the DNS response returned to a client D-proxy and to later return that same answer when the client D-proxy makes the same request. This method can be used with any networking device that uses the DNS resolution process.
- Network Proximity using Director Response Protocol (DRP) — the Cisco GSS 4492R uses active probing to determine the network distance between a client DNS name server and the closest data center. Based on the collected round-trip-times (RTT) the GSS 4492R directs client requests to an available data center with the lowest RTT value.
- DNS race—This algorithm initiates a race of A-record responses to the client’s named server. It can achieve proximity without probing.
- Drop—This algorithm silently discards requests.

The administrator can configure up to three load-balancing clauses per DNS rule. Each clause can have a different answer group assigned to it. The multiple load-balancing clauses per DNS rule allow the user to control how the Cisco GSS 4492R responds if one of the load-balancing methods fails. Using the multiple clauses per DNS rule allows the network engineering staff to create a solution that ensures that a client always gets directed to the proper data center, based on the client’s unique requirements.

For example, the preferred global load-balance method may be WRR as defined in the first load-balancing clause. If that method fails because of the loss of a local SLB or back-end server, the Cisco GSS 4492R tries the second method (for instance, ordered list as defined in the second load-balance clause). If that fails, the Cisco GSS 4492R tries the third method, which may be a static entry to a global “sorry server.” Users can customize the clauses based on what is most advantageous to their own environments and global load-balancing objectives.

GLOBAL DNS STICKY DATA BASE—ESSENTIAL FOR E-COMMERCE

The Cisco GSS 4492R provides unique capabilities that optimize e-business. The Cisco GSS 4492R ensures reliable transactions with a “sticky” DNS feature that guarantees site persistence, ensuring “sticky” connections between users and applications during secure and nonsecure portions of the transaction. With global DNS sticky enabled, each GSS device in the network shares answers with the other GSS devices in the network, operating as a fully connected peer-to-peer mesh. Each GSS device in the mesh stores the requests and responses from client D-proxies in its own local database, as well as shares this information with the other GSS devices in the network.

When used with a Cisco content switch, these sticky connections can eliminate dropped shopping carts and allow e-businesses to prioritize users and transactions, thereby providing premium service for high-priority customers.

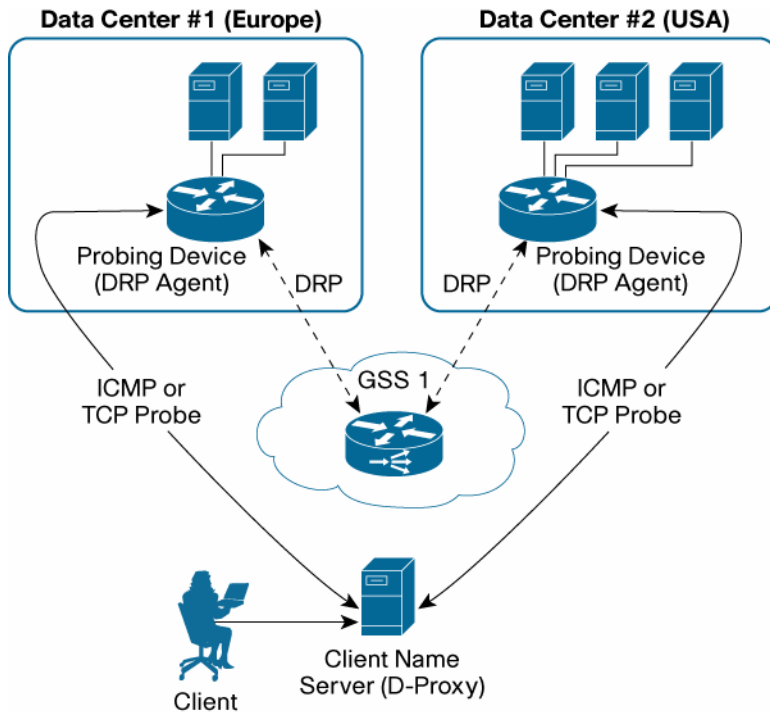
NETWORK PROXIMITY USING DIRECTOR RESPONSE PROTOCOL (DRP)—PROXIMITY PROBING USING EXISTING CISCO ROUTERS

This new global load balancing method leverages the existing technology that resides in Cisco routers running IOS version 12.1 or higher. The Cisco GSS 4492R responds to DNS requests with the IP address of the most proximate resource (Cisco content switches and Content Engines, or any types of server that use the DNS resolution process) relative to the requesting client DNS name server. In this context, proximity refers to the distance or delay in terms of network topology, not geographical distance, between the requesting client’s client DNS name server and the globally load balanced resource.

To determine the most proximate resource, the Cisco GSS 4492R communicates with a probing agent, a Cisco IOS-based router, located in each data center to gather round-trip time (RTT) metric information measured between the requesting client’s DNS name server and

the data center. The DRP protocol was first introduced on Cisco's DistributedDirector and is now available on the Cisco GSS 4492R. Each Cisco GSS 4492R within the GSS network directs client requests to an available resource with the lowest measured RTT value.

Figure 3. Network Proximity using Cisco Routers



For more detail information on DRP reference this white paper:

http://www.cisco.com/en/US/products/hw/contnetw/ps813/products_white_paper09186a0080091e1c.shtml

DNS RACE—PROXIMITY WITHOUT PROBING

The Cisco GSS 4492R supports the DNS race method of proximity. This feature allows for proximity to be achieved without probing the client name server (D-proxy). It is based on a simple concept—that instantaneous proximity can be found if a device within each data center sends an A-record (IP address), at the exact same time, to the client's named server. Whichever A-record is received first is the most proximate.

The DNS race method of DNS resolution is initiated by the Cisco GSS 4492R and is designed to load balance up to 20 sites. For the Cisco GSS 4492R to initiate a race, it needs to establish two pieces of information per CRA:

- The delay between the Cisco GSS 4492R and each of the CRAs in each data center. With this data, the Cisco GSS 4492R computes how much time to delay the race from each data center so that each CRA will start the race simultaneously.
- The “aliveness” of the CRAs. With this data, the Cisco GSS 4492R knows not to forward a request to any CRAs that are not responding. The Cisco GSS 4492R gathers this information by sending KAL messages at predetermined intervals. This data, along with the IP addresses of the CRA, is used to request the start of the race. When the Cisco GSS 4492R receives a DNS request, a race request is sent to each CRA at a predetermined time and the race is initiated from each data center. The first A-record received by the client's D-proxy is the winner and is the most proximate. The DNS race method on the Cisco GSS 4492R is what a DNS administrator wants as a way to reduce the time involved in the DNS resolution process.

NAME SERVER FORWARDING

Name server forwarding plays a vital role in providing increased flexibility for the Cisco GSS 4492R. This feature is used when errors in the DNS infrastructure send a request for a domain that cannot be processed by the Cisco GSS 4492R. The Cisco GSS 4492R does not drop the request; instead, it forwards the request to a designated name server capable of responding to the request. The response of that name server is passed through the Cisco GSS 4492R so that it appears to have come from the GSS. This helps to ensure that any critical DNS request will be processed and not lost.

The Cisco GSS 4492R can forward the requests using either round robin or the order list load-balancing method. As the Cisco GSS 4492R processes the DNS requests, it can use one of the load-balancing methods to distribute these forward requests. A user can employ this feature to globally load balance e-mail servers. The following global load-balance methods can be used with the name server forwarding feature—WRR, ordered list, and hashing. If the Cisco GSS 4492R receives a request for an MX (mail) record, although the Cisco GSS 4492R cannot respond directly, it can forward the request to one of many DNS name servers deployed in the enterprise or service provider network.

SCALABILITY

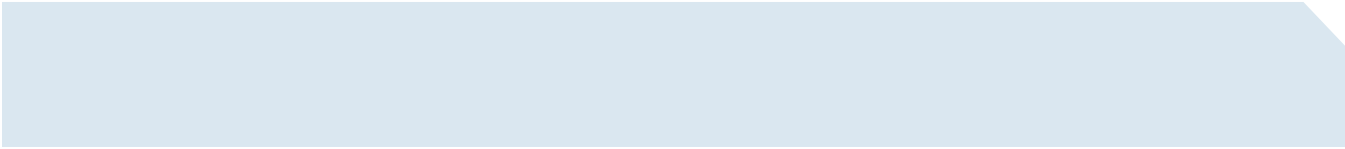
Highly scalable, the Cisco GSS 4492R meets the most demanding environments. Table 1 lists support information for the Cisco GSS 4492R.

Table 1. Cisco GSS 4492R Performance and Scalability Metrics

DNS requests per second	Up to 20,000		
DNS rules	4000		
Name server forwarding requests per second or DNS races per second	1500		
Active SLBs	256		
Hosted domains (maximum 1000 per SLB), 128 characters maximum per domain	2000		
Hosted domain lists (500 members maximum per list)	250		
Virtual IP addresses (no more than 500 with active ICMP keepalive)	2000 (4000 shared)		
Name server addresses for name server forwarding (30 maximum per answer group)	100		
CRA devices (20 maximum per race and answer group)	200		
Source IP addresses configurable for DNS rules	500		
Source address lists (30 members maximum per list)	60		
Answer groups (100 members maximum per group)	500		
KALs Limits	150 fast, 500 standard per KAL types		
	KAL Type	Standard	Fast
	TCP	1500	150
	HTTP-Head	500	100
	ICMP	750	150
	KAL-AP	128	40

MANAGE THROUGH SIMPLE GUI AND CLI

For configuration and control, administrators have a Cisco IOS® Software-like command-line interface (CLI) and an intuitive, embedded GUI. The CLI and the GUI is used for the configuration of all global load-balancing parameters and is supported directly by the Cisco GSS 4492R. In addition, the GSS 4492R support the export and import of the configuration files that improves the GSS's day-to-day manageability. Users have a choice of using either an expert mode on the GUI or a wizard to configure all global load-balancing



parameters at a single, centralized location. Configuration parameters are shared with up to eight Cisco GSS 4492R selectors in a single deployment. The CLI is accessed through Telnet or Secure Shell (SSH) Protocol; the GUI is accessed through Secure Sockets Layer (SSL). Network managers can restrict console, FTP, Simple Network Management Protocol (SNMP), Telnet, and Web management access.

Monitoring the status of the Cisco GSS 4492R can be done using a GUI, SNMP, CLI, and log files. The information that can be accessed from the different methods includes:

- Displaying of configuration, software information, hardware information, system resources, user information, and current logins
- Booting configuration
- Configuring IP interfaces, IP routes, and host name
- The ability to see the operation status (active/inactive) of locally configured resources, with filtering by domain name or other parameters (GUI only)

Multiple User Roles Enforced by Terminal Access Controller Access Control System (TACACS+) Protocol

The GSS supports TACACS+ Authentication, Authorization and Accounting (AAA) security services, per user. The GSS offers a unique combination of custom GUI user views and TACACS+ enforcement. This way the GSS administrator can offer a different “Virtual” view of the GSS with complete control of what other users can see or configure. The following defines **User Privilege Roles** that can be assigned to each potential GSS user:

- Administrator—Full Access to the GUI and CLI
- Operator—Can only activate and suspend resources on the GSS, their view can be restricted. Example an Operator can manage the host name www.foo.com but cannot see or access configuration parameters for host name www.123.com. This same restriction could apply to the Operator assigned to support www.123.com and they cannot see or access configuration parameters for host name www.foo.com.
- Observer—The observer has read-only privileges to monitor statistics. Their view can also be restricted the same as the Operator.

Configuration State and File Management

- Show running configuration for all CLI-configured options
- Show startup configuration
- Archive and restore running configuration
- Archive and restore startup configuration
- Display archived configuration
- Copy running configuration to disk, FTP, or Trivial File Transfer Protocol (TFTP) server
- Clear running configuration
- Create startup configuration, including from text editor
- Copy startup-configuration to running-configuration

Logging

- Show logs, including real-time log
- Archive and restore log files

CISCO GSS 4492R FEATURES—QUICK LOOK

Table 2 gives features of the Cisco GSS 4492R.

Table 2. Cisco GSS 4492R Features

Ports	Two 10/100/1000 Fast Ethernet
DNS requests per second	Up to 20,000
Devices supported	<ul style="list-style-type: none"> • CSSs—Load and availability • CSMs—Load and availability • ACE—Load and availability • Cisco IOS SLB—Load and availability • Cisco LocalDirector—Availability using HTTP head or TCP KAL • DNS name servers—Availability using name server request KAL • Origin servers—Availability using HTTP head or TCP KAL • Content engines—Availability using ICMP ping or TCP KAL • CRAs—Availability using CRA KAL
Network management	<ul style="list-style-type: none"> • Console port—CLI • Access to system through Telnet • Secure copy (SCP) or FTP • GUI—Secure HTTP (HTTPS) for Internet Explorer and Netscape Navigator • Network management MIBs • Read-only monitoring of network and device status, including RFC 1213 (MIB-II) and RFC 1514 (HOST-RESOURCES-MIB)

ORDERING INFORMATION

The Cisco GSS 4492R supports only AC power; there are no options. Orderable part numbers are given in Table 3.

Table 3. Part Numbers for Cisco GSS 4492R

Product Number	Description
Cisco GSS 4492R-K9	Global Site Selector
SF-GSS-V1.2-K9	Global Site Selector Software

ENVIRONMENTAL SPECIFICATIONS

Table 4 gives specifications of the Cisco GSS 4492R.

Table 4. Specifications of Cisco GSS 4492R

Specification	Description
Rack units	One rack unit
Network management	Serial port
Ports	Two 10/100/1000 Fast Ethernet autosensing, one console port
Storage	<ul style="list-style-type: none"> • One 80-GB hard drive • Software image SF-GSS-V1.3-K9 • 2 GB RAM; Pentium CPU
Power	Integrated AC power (autosensing 110V/60 Hz)

Specification	Description
Mechanical and Environmental	
Dimensions (H x W x D)	1.67 x 16.9 x 20 in. (42.4 x 429 x 508 mm)
Weight	28 lb (12.7 kg)
Operational temperature	50 to 95°F (10 to 35°C)
Storage temperature	–40 to 140°F (–40 to 60°C)
Relative humidity	80 percent, nonoperational
Certification	<ul style="list-style-type: none"> • Safety UL 60950 • CAS –C22.2 No. 60950 • EN60950 • EMC FCC Part 15 Class A • ICES-003 Class A • EN55022 Class B with STP cables • EN50082-1 • VCCI Class 1



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