PRODUCT OVERVIEW

The CiscoWorks Internetwork Performance Monitor (IPM) is a network response-time and availability troubleshooting application. Included as part of the CiscoWorks LAN Management Solution (LMS), this tool empowers network engineers to proactively troubleshoot network performance using real-time and historical reports. This provides valuable input to the network administrator for capacity planning. This also provides valuable insight into the availability and response times of network services such as Dynamic Host Control Protocol (DHCP), Domain Name System (DNS), HTTP sever, etc.

As enterprise networks continue to grow in size, scope, and strategic importance, network managers face numerous challenges in maintaining the performance and availability of their network. Furthermore, as customers deploy new network applications and services such as IP Communications and streaming video, measurements of network performance must recognize different levels of performance based on these different types of network traffic.

To maintain network performance, network managers often spend too much time trying to identify the source of performance problems, and too little time solving them. This reactive approach to network-performance management has become increasingly unwieldy. The network manager needs performance-troubleshooting tools that can identify potential performance problems before they seriously impact users, and quickly identify the network devices that caused the performance problems after they have occurred. The ability to measure network-response time, determine device availability, analyze response-time patterns, and provide performance reports—both real-time and historical—are high-priority requirements in today’s enterprise networks.

CiscoWorks IPM satisfies these requirements by performing proactive measurement of network-response time and availability, including both real-time and historical analysis.

CiscoWorks IPM measures network performance based on the “synthetic traffic-generation” technology within Cisco IOS® Software, which is known as Cisco IOS IP Service Level Agreement (IP SLA). The use of synthetic traffic by CiscoWorks IPM gives the network manager a high degree of flexibility in selecting the endpoints in a network between which network performance will be measured. This flexibility makes CiscoWorks IPM a highly effective performance-troubleshooting tool.

CiscoWorks IPM takes advantage of Cisco IOS IP SLA technology by configuring network-performance agents, called “collectors,” in the router. These “collectors,” as part of their configuration, include a “source” router, a “target” device, and an “operation” type. Figure 1 depicts how the Cisco® router, acting as a CiscoWorks IPM source device, measures network performance to a target device across the network.
The definition of a CiscoWorks IPM operation includes the protocol type, the measurement interval, the packet size, and the IP Precedence value. CiscoWorks IPM can measure performance based on a variety of network protocols, including Internet Control Message Protocol (ICMP) Echo, IP Path Echo, 3270 Ping, Systems Network Architecture (SNA), User Datagram Protocol (UDP) Echo, UDP Jitter, TCP Connect, DNS, HTTP (for static URLs), DHCP, and data-link switching (DLSw). Furthermore, for networks that have deployed quality of service (QoS) based on IP Precedence, CiscoWorks IPM can measure performance for any of these protocols across any of the six values of IP Precedence. As a result, CiscoWorks IPM provides an accurate representation of network performance by measuring the performance of “synthetic” traffic that closely resembles “real user” traffic. Therefore, CiscoWorks IPM facilitates performance measurement of differentiated services (for example, voice, video, and data) in an enterprise network.

After a CiscoWorks IPM collector is configured and deployed in the source router, IPM will continuously collect performance information, based on the parameters of the collector that has been defined, for the following performance metrics:

- Latency
- Jitter (for UDP jitter operation type only)
- Availability
- Errors
- Packet loss

KEY FEATURES AND BENEFITS

Troubleshooting Network-Performance Problems
CiscoWorks IPM helps the network engineer to proactively monitor network response time for problems. CiscoWorks IPM notifies the network engineer when response time degrades or a monitored link becomes unavailable, and helps pinpoint the link causing the problem.

Rapid problem diagnosis leads to higher network availability and allows network managers to alleviate performance bottlenecks quickly. CiscoWorks IPM shows all paths between source and target, and the response time associated with each path. This feature helps network designers analyze how often each path is used and the response time that end users are seeing when their sessions are being routed over a particular path. Performance measurements can be taken for an entire path or for each hop within a path. These features allow network managers to diagnose the source of a performance problem to a specific hop in the network (Figure 2).
Troubleshooting Network Servers—Is It a Problem with the Server or the Network?

Today’s business applications rely on several technical components to function properly. The two basic components are the network and a computer workstation, or server, which provides applications to network users. When problems with networked applications arise, network managers may spend much of their time determining if the problem is with the network or the server. In enterprises with different groups administering the network and servers, this diagnosis must be made quickly to expedite resolution to the problem.

CiscoWorks IPM measures response time between a Cisco router and any endpoint with an IP address. This endpoint may be a server, a user’s workstation, another router—any device on the network with an IP address. With the ability to monitor network performance between end users and the servers, CiscoWorks IPM aids in diagnosing whether a problem is due to a server or the network.

Baseline Network Performance

The key to managing response time for a given network and its critical paths is to be able to quickly determine performance variances from the norm, which is called the baseline performance. This baseline helps the network engineer to determine acceptable response-time values for critical paths. Future measurement results that vary significantly from the baseline would indicate network problems.

CiscoWorks IPM measures response time and availability for specific network paths. These measurements are presented graphically and show the average, minimum, and maximum response times for a specific period of time. These reports can be used to set response-time thresholds within CiscoWorks IPM. Threshold violations will then indicate when a network problem causes performance to vary from the baseline.

Monitor Response Time, Thresholds, and Availability

CiscoWorks IPM facilitates the continuous monitoring of response time between network-device pairs using Cisco IOS IP SLA technology. CiscoWorks IPM configures the IP SLA on a router to send notification using SNMP trap or network management vector transport (NMVT) alert whenever response-time thresholds are exceeded or network availability has been lost between the router and any other network device. The thresholds that CiscoWorks IPM configures on the router can be tuned to the appropriate level of sensitivity based on the following configuration parameters.
• Rising thresholds—Notification occurs when the response-time value rises above a specified level.
• Falling thresholds—Notification occurs when the response-time value falls below a specified level.
• Immediate thresholds—Notification occurs when one sample violates the threshold.
• Intermittent threshold—Notification occurs based on the threshold being satisfied a specified percentage of the time.
• Average threshold—Notification is based on the threshold being exceeded on average. In this case, notifications are not issued until a specified number of samples have been taken.

Report on Performance for Specific Network Paths
CiscoWorks IPM also provides graphical reports on response-time performance and availability for a specified time period for individual network paths. These reports contain:

• Response-time analysis
  – Average response time
  – Minimum response time
  – Maximum response time
• Availability analysis
  – Type of connectivity errors
  – Frequency of connectivity errors
  – When errors occurred
• Overall statistics
  – Percentage of sampled traffic complying with thresholds
  – Percentage of sampled traffic violating thresholds
  – Percentage of sampled traffic with errors

Troubleshooting Performance of IP-Based QoS
Measuring performance in an enterprise network has become increasingly complex as the variety of network applications, each with their own performance requirements, has grown. The evolution of such differentiated network services means that there is no longer a single level of performance expected between any two points in a network. Instead, there is likely to be a range of performance levels expected between any two points in a network, with a different expectation of performance for each category or class of network traffic. The capability of a network to deliver different levels of performance to different classes of traffic is referred to as network quality of service or QoS. Network-performance troubleshooting tools need to be capable of measuring network performance based on different classes of traffic.

CiscoWorks IPM provides the capability to measure network performance for different traffic classes. It achieves this by supporting user configuration of the IP Precedence value in the synthetic traffic that it generates to measure network performance. By configuring the IP Precedence value within CiscoWorks IPM, network managers can simulate the traffic classes that are assigned to the various IP Precedence values that travel through their network. As a result, CiscoWorks IPM is an essential tool for measuring end-to-end performance of the various traffic classes in a QoS-enabled network, and for troubleshooting such a network when QoS expectations are not achieved.

Troubleshooting Network Performance for IP Communications
Perhaps the best example of the kind of differentiated services that data networks will be expected to support is IP Communications including voice over IP (VoIP). Obviously, the performance characteristics of digitized voice traffic in a data network, with its requirement for low latency, are quite different from traditional data applications.
For IP Communications, CiscoWorks IPM can be used for performance troubleshooting to allow rapid identification and isolation of any performance problems and, thereby, help ensure continuous voice and communication services in the network. CiscoWorks IPM can identify and isolate specific network paths where the latency and jitter measurements of the network have risen above performance levels necessary to support high-quality telephony services.

CiscoWorks IPM is capable of providing detailed jitter analysis between the source and target devices in an IPM collector. This detailed analysis includes both positive and negative jitter, as well as forward and reverse jitter between the source and target (Figure 3).

**Figure 3. CiscoWorks IPM Jitter Analysis**

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**SNA and IP Networks**

CiscoWorks IPM also provides a solution for SNA and IP internetworks, particularly those in which SNA traffic is transported over IP through a router network to a front-end processor (FEP), or to a Cisco Channel Interface Processor (CIP) or Channel Port Adapter (CPA) in a router. In these environments, CiscoWorks IPM can measure the IP response time from a source workstation through the router network over which the SNA traffic is being routed.

In addition, CiscoWorks IPM can measure the path of native SNA traffic either from the last router in the network directly to the mainframe or from the last router in the network through the FEP to the mainframe. Using these features combined, network operators can obtain complete path-performance management. CiscoWorks IPM provides the following SNA features:

- Measures response time for network links between Cisco routers and the mainframe
- Supports multiple session types
  - System services control points (SSCP)
  - Logical unit (LU) 0
  - LU 2
- Notifies network managers of threshold violations through NMVT alerts
ORDERING INFORMATION
CiscoWorks Internetwork Performance Monitor is a component of the CiscoWorks LAN Management Solution. The CiscoWorks LAN Management Solution is available for purchase through regular Cisco sales and distribution channels worldwide.

To place an order, visit the Cisco Ordering Home Page.

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FOR MORE INFORMATION
For more information about the CiscoWorks Internetwork Performance (IPM) application, visit http://www.cisco.com/go/lms or contact your local Cisco account representative or send an e-mail to the Product Marketing group at ciscoworks@cisco.com.