



Hewlett-Packard and Cisco Systems Internet Usage Platform

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White Paper

Introduction

Today's Internet services market is extremely competitive with few barriers to entry. Customer churn is high and there are few ways to differentiate or build customer loyalty by merely offering basic access. A provider's success is dependent on its ability to understand its subscribers needs and demands and quickly deploy new services that meet those needs. Subscriber usage data is a critical resource in accomplishing these objectives, but practical ways to measure usage in an IP environment has not been readily available. Drawing on their respective strengths, Cisco and Hewlett-Packard have come together to provide a solution that will enable providers to more effectively utilize the information that already exists in their networks.

The HP/Cisco Internet Usage Platform enables network operators to efficiently measure and manage a comprehensive set of network services. Correlating users and data with services used is its guiding principle. This allows service providers to profitably deploy differentiating services resulting in higher customer loyalty, increased revenue and reduced churn.

Solution Overview

Cisco and HP have collaborated to develop the **HP/Cisco Internet Usage Platform**, the management platform that enables providers to transform new services into revenue. The HP/Cisco Internet Usage Platform solution capitalizes on **Cisco's NetFlow Switching** capabilities and **HP's Smart Internet Usage product** running on HP 9000 servers.

Cisco's NetFlow Switching combines network-layer switching with the connection-oriented application of network services providing security, Quality of Service (QoS), and traffic accounting information. NetFlow Switching enables providers to utilize their existing network to gather a rich set of traffic statistics that are exported as Usage Data Records (UDRs) to HP's Smart Internet Usage product.

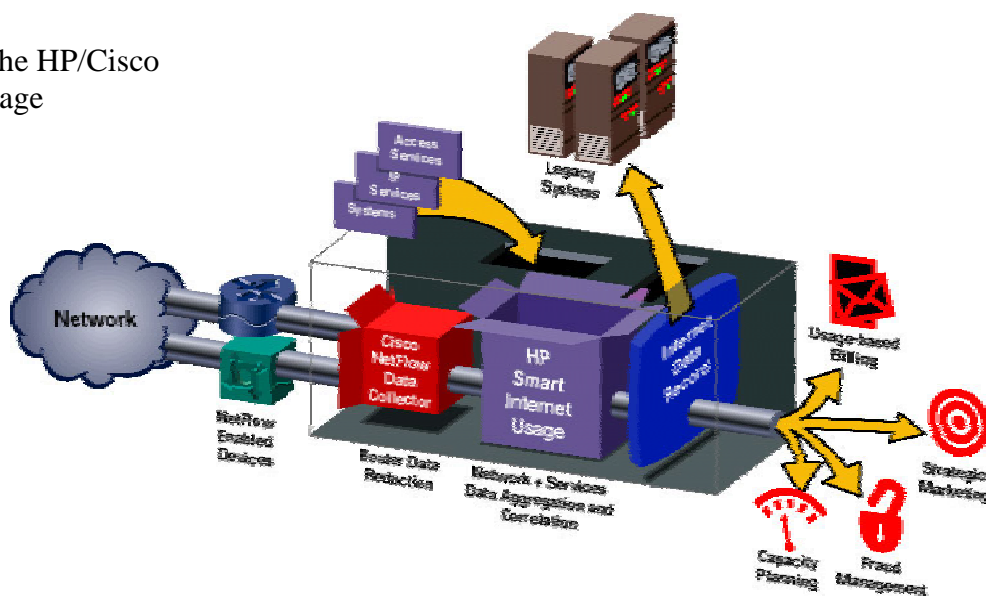
HP's Smart Internet Usage (SIU) aggregates these network UDRs along with data collected from access servers, such as RADIUS and TACACS; HTTP proxy logs, and logs from other Internet services such as news, e-mail, and Web hosting. HP's Smart Internet Usage correlates all of this data to arrive at detailed subscriber usage statistics. These usage statistics are then exported as Internet Data Records (IDRs) to customer management and billing systems.

Customer management and billing systems provide Internet businesses with all of the key functions needed to register, manage, track, and bill Internet customers. HP's Smart Internet Usage provides an open interface to customer management and billing systems and IDRs exported to these systems can be customizable to varying provider requirements.

Figure 1 shown below illustrates the HP/Cisco Internet Usage Platform solution framework:

- NetFlow data is exported from Cisco high-end routers (UDRs)
- NetFlow data is combined with other usage information by HP's SIU
- HP's SIU correlates this usage data with the appropriate users to create IDRs
- IDRs are used by the customer management and billing system for customer billing and service

Figure 1 The HP/Cisco Internet Usage Platform



The HP/Cisco Internet Usage Platform enables providers to increase revenues, manage costs, better understand subscriber demands, and more effectively manage network resources.

Increasing Revenues and Managing Costs

The platform data (UDRs and IDRs) provides the fine-grained metering for highly flexible and detailed resource utilization accounting. Accurate accounting enables service providers to *increase revenues* by charging back consumers for the use of network resources. Subscribers can be billed for actual bytes transmitted and received and share the costs of transmitting data to and from costly overseas sites. *Advertiser billing* can be facilitated based on subscriber usage and hit rates. Transit traffic from other carriers through the network can also be accurately tracked and billed.

Resource utilization information can also be used to migrate away from single fee, flat rate billing to more flexible charging mechanisms such as time-of-day, bandwidth usage, application usage, or quality of service. NetFlow data also provides the basis for billing advanced QoS-enabled, IP services, such as Class-of-Service traffic and billing based on service level agreements.

Understanding Subscriber Demands

Based on data collected from the platform, providers can gain a better understanding of their customers and their changing demands. Data can be warehoused and later retrieved (i.e., data mining) in support of subscriber behavioral analysis.

From this analyses, service providers can develop *proactive, focused marketing and customer service programs*. Analyzed data can be used to provide insights for precisely targeting value-added services and *differentiating offered services* from other carrier offerings to gain a competitive advantage.

Managing Network Resources

HP/Cisco Internet Usage Platform data supplies the information needed for network managers to more effectively manage network resources through the following activities:

- Network planning and analysis
- Network monitoring
- Application monitoring and profiling
- User monitoring and profiling

Managers can optimize *network planning and analysis* decisions supported by data supplied by the Internet Usage Platform. This minimizes total network operations costs while maximizing network performance, capacity, and reliability. With this data, managers are equipped to make strategic network planning decisions, such as who to peer with, backbone upgrade planning,

and routing policy planning, in addition to tactical network engineering decisions such as adding additional interface processors to routers or upgrading link capacity.

Platform data also enables extensive, near real-time *network monitoring* capabilities. Analysis of network flows can be used to visualize traffic patterns associated with individual routers or on a network-wide basis (by providing aggregate traffic or application-based views). Careful examination of this data can gain *fault management benefits* through proactive problem detection, efficient troubleshooting, and rapid problem resolution.

Application monitoring and profiling can be achieved by using platform data to gain a detailed, time-based, view of application usage over the network. Content and service providers may utilize this information to plan and allocate network application resources, such as web server sizing and location, to responsively meet customer demands. Traffic mix on expensive wide-area network links can be analyzed to determine bandwidth utilization between mission-critical and non-mission-critical applications.

User monitoring and profiling can be achieved by examining the data on customer/user utilization of network and application resources provided by the HP/Cisco Internet Usage Platform. This information can provide a mechanism for *fraud management* by helping to uncover and resolve potential security and policy violations.

Cisco NetFlow Switching

Cisco's NetFlow Switching is a Cisco Internetwork Operating System (IOS) software switching mechanism that allows Cisco routers to combine high-performance, network-layer switching with the connection-oriented application of network services providing security, Quality of Service (QoS), and traffic accounting information.

A network flow is a unidirectional stream of packets between given source and destination endpoints. Network flows are highly granular and are uniquely identified as a combination of the following fields:

- Source IP address
- Destination IP address
- Source port number
- Destination port number
- Protocol type
- Type of Service (TOS)
- Input interface

Conventional network layer switching handles incoming packets independently, with separate serial tasks for switching, security, services, and traffic measurements applied to each packet. In contrast, NetFlow switching applies this process only to the first packet of a flow.

Information from the first packet is used to build an entry in the NetFlow cache. Subsequent packets in the flow are handled via a single streamlined task that handles switching, services,

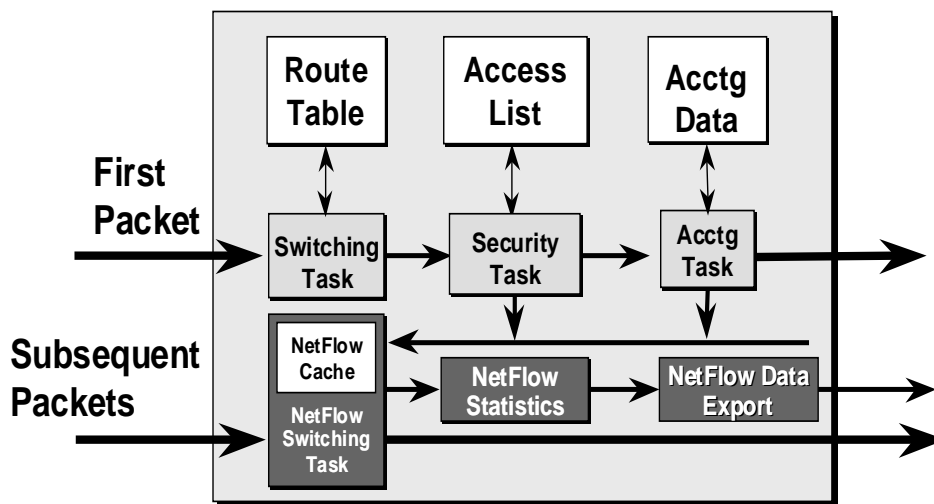
and data collection concurrently. NetFlow capitalizes on the flow nature of traffic in the network to accomplish the following:

- Provide detailed data collection with minimal impact on router performance
- Efficiently process access lists for packet filtering and security services

Unlike IP accounting, which has a substantial impact on router performance, NetFlow measurements are stored and updated in the NetFlow cache as an integral component of the switching process. In addition, only the first packet of the flow undergoes access list checking. Subsequent packets in the flow are switched without further access list checking.

Figure 2 shown below illustrates the NetFlow Switching process. Flows are expired within the router when they have aged or completed the byte stream. Expired flows that have expired are then grouped, as UDRs, together in a UDP datagram and exported at least once per second, or, as soon as a full datagram of expired flows is available.

Figure 2 NetFlow Switching



Exported NetFlow data differs from existing IP accounting features in that time durations and absolute time stamps are provided for each flow, where this information is not provided with IP accounting. The next release of NetFlow data export will include sequence numbers in each export datagram so that the receiver can detect when or if export datagrams are lost.

HP Smart Internet Usage

HP's SIU aggregates and correlates usage data from application, system, and network element log files to provide session, volume, event, and subscription-based billing. The SIU processes usage data from the network (UDRs) and service infrastructure for billing and reporting.

The usage data is collected from RADIUS, TACACS, Cisco routers, and Netscape proxy log files. It is then mediated and aggregated into an Internet Data Record (IDR), which, in turn, is transmitted to the ISP's rating and billing system.

The HP SIU is configured on servers scaling from a single HP 9000 D-class or Windows NT server to several HP 9000 K-class servers. The exact configuration depends on the number of subscribers, the number of Smart Internet Service Management products, and the high-availability requirements of the service provider.

Customer Management and Billing Systems

IDRs from HP's SIU can be transmitted to a service provider's billing and rating system for customized billing and management. One such system is Portal's Infranet.

Infranet integrates the functionality for each stage of customer interaction around a single, unified customer database. This database acts as a central repository for all user data collected during each stage of the customer lifecycle, eliminating the need for multiple databases.

Infranet provides a real-time, complete customer management and billing system for registering, tracking, managing, and billing customers. It provides an industrial-strength, scalable, open architecture that can support millions of subscribers; integrated management of basic and value-added services; and complete out-of-the-box functionality that can also be customized to any need.

The Cisco and HP Alliance

Cisco, the world leader in IP network systems, and Hewlett-Packard, the world leader in network and system management solutions have come together to offer Internet Service Providers a world-class platform for creating competitive solutions based on the most important parameter of your infrastructure: the measured and managed use of your valuable infrastructure resources.

The foundation of the ISP infrastructure is an industrial strength network. End-to-end Cisco networks bring unmatched contributions including the following:

- Unique Quality of Service capabilities (QoS)
- Advanced capabilities with IOS features set
- True end-to-end networking for lower cost of ownership
- Leadership in the integration of data/voice/video

Critical to your company's growth, success, and profitability is the ability to manage a heterogeneous infrastructure with powerful real-time tools. Hewlett-Packard brings unmatched contributions including the following:

- HP's Internet Service Management (ISM) solutions, a suite of ISP Service Management tools that cover the following critical areas:
 - ◆ Usage
 - ◆ Provisioning
 - ◆ Assurance
- HP's world-class HP 9000 family of servers
- HP's world-class Professional Services and Consulting
- HP's factory integration and testing
- HP's Global Support

HP and Cisco together offer customers the comprehensive end-to-end enterprise solutions they need to address critical business objectives. The alliance has enabled close collaboration in the areas of technology development, product integration, professional services, and customer service and support and ensures full internetworking compatibility and interoperability between products.