CISCO SYSTEMS

BRIDGING THE INFRASTRUCTURE GAP: THE IMPORTANCE OF SERVICE CONTROL IN BROADBAND NETWORKS

INTRODUCTION

The opportunity provided by broadband services has driven cable and DSL providers around the world to launch aggressive architecture, marketing, and service strategies to gain market share and revenues. As they adopt new IP-based service models, operators also face the challenge of changing their networks from generic access pipelines into service delivery networks.

Service providers are looking for profitable ways to deliver value-added, bundled, or personalized IP services to greater numbers of broadband users. As cable operators and DSL providers capitalize on IP networks they need to create higher-margin, higher-value premium services such as interactive gaming, video on demand (VoD), or voice over IP (VoIP). The missing element of the current strategy is service differentiation—the ability to understand at a granular level how subscribers are using the network, identify what applications or services are being consumed, and then intelligently apply network resources to applications and cultivate subscribers that promise the highest return on investment.

Operators need to manage and control subscriber traffic. This can be accomplished by implementing service control technology, which enhances the transport network with application and subscriber awareness. Service control allows the network to identify, classify, guarantee performance, and charge for services based on unique application and subscriber criteria. Instead of underwriting the expenses associated with random and unconstrained data capacity, deployment and consumption, service control optimizes network performance and allows operators to overcome quality of service (QoS) constraints. Service control allows new possibilities for broadband service creation and new revenue-sharing opportunities with third-party service providers who may, in fact, be riding an operator's network undetected.

This paper outlines the applications and benefits of service-control technology in broadband networks.
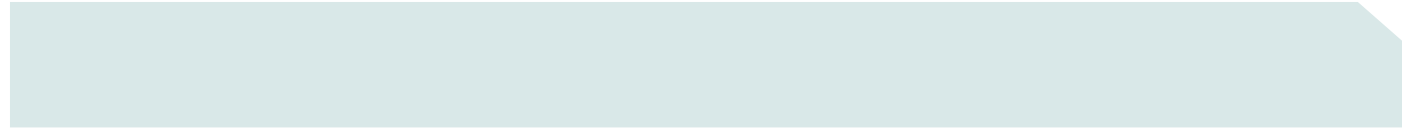
THE STATE OF BROADBAND

High-speed online access is now available in most parts of the world, with Japan and Korea offering affordable services that provide more than 40 Mbps at US$35 per month. Worldwide, the DSL market is experiencing double digit growth. Many countries now have more than 1 million DSL subscribers. While browser and e-mail applications used to account for virtually all Internet traffic, applications such as music downloads, news feeds, peer-to-peer (P2P) applications, online gaming, and VoIP are combining to dominate Internet traffic. Indeed, VoIP is moving into the mainstream. In a little more than a year, more than 17 million people have downloaded Skype, a VoIP application facilitating broadband voice communications.

Peer-to-Peer: Cost or Opportunity?

Traffic from P2P and other broadband-aware applications can be both a challenge and a new business opportunity for operators. P2P applications are increasing broadband demand as more subscribers use the Internet to download music, video, games, and other compelling content. The P2P revolution is rapidly penetrating mainstream applications ranging from business-collaboration tools to distributed computing, gaming, and voice services. P2P is by far the biggest consumer of network resources, with 70 percent and more of all broadband data throughput consumed by these applications.

But traffic patterns for P2P applications vary dramatically from their client-server counterparts, causing a significant change in upstream data requirements, time-of-day activity, and use of expensive international transit links. Service providers recognize that, left unmanaged, P2P can become a financial burden since network resources are consumed forcing constant investment in network capacity without any additional

revenue. Failure to accurately manage P2P traffic also leads to customer support load and subscriber churn as network congestion degrades the performance of other applications. Technology solutions must be able to deal with not only existing protocols but quickly adapt to new and emerging protocols to overcome the P2P threat.

Security Threats to Network Integrity

"Always-on" broadband connections subject subscribers to a growing number of malicious threats, degrading the overall user experience. Meanwhile, operators are impacted by support and network-management issues that result from denial-of-service (DoS) attacks, e-mail spam, viruses, and worms.

Gartner estimates that 7 percent of Internet service provider (ISP) churn is directly attributed to spam, 36 percent of Internet users would be willing to switch ISPs to reduce their volume of spam, and 75 percent of all Internet users believe that their ISPs should be responsible for fixing spam problems. Securing the broadband network from malicious attacks without compromising free and open access to the Internet is becoming mandatory for operators.

Information Is Power: New Business Models and Partnerships

Developing new revenue streams consists of "enhancing" services running over a common network pipeline by applying QoS parameters to different traffic streams. For example, VoIP, gaming, and other latency-sensitive applications and services could be vastly improved by dynamically applying QoS policies based on specific subscriber or application parameters, adding real value, offering performance guarantees and optimizing the availability of network resources. Such capabilities would benefit both the operator and subscribers who would otherwise receive "best-effort" network response time, which is insufficient as providers strive to build a critical-mass business around value-added services such as video, VoIP, or gaming.

THE INFRASTRUCTURE GAP

The old adage of "what you don't know won't hurt you" is definitely not true when it comes to IP traffic. What operators don't know is hurting them. Broadband networks were initially designed for access rather than for optimizing traffic such as P2P, or layering QoS policies on a common backbone to support the performance requirements of value-added services.

However, if existing networks could be augmented with inline traffic intelligence that allowed operators to identify subscribers, classify applications and traffic behavior, guarantee performance of latency-sensitive applications such as VoIP, and meter and charge for bundles or individual services by usage, then cost reduction, profitable delivery, new business models, and revenue sharing partnerships become possible.

Service-control technology offers new ways to create value, cut costs, and extend existing offerings. Providing performance guarantees for services such as VoIP, video, or interactive gaming improves a subscriber's experience and lowers churn rates. Alternatively, service providers could differentiate performance of their own branded VoIP service from "best-effort" offerings riding alongside on their network. Networks enabled with service control can provide operators with new ways to manage network capacity according to their business priorities, and increase the value of their network assets to better partner with content providers.

Service control uses a novel approach to traffic classification, accounting, and control. Its technology platform and complementary service applications offer problem identification and resolution as well as a means for providers to increase the profitability of their broadband network.
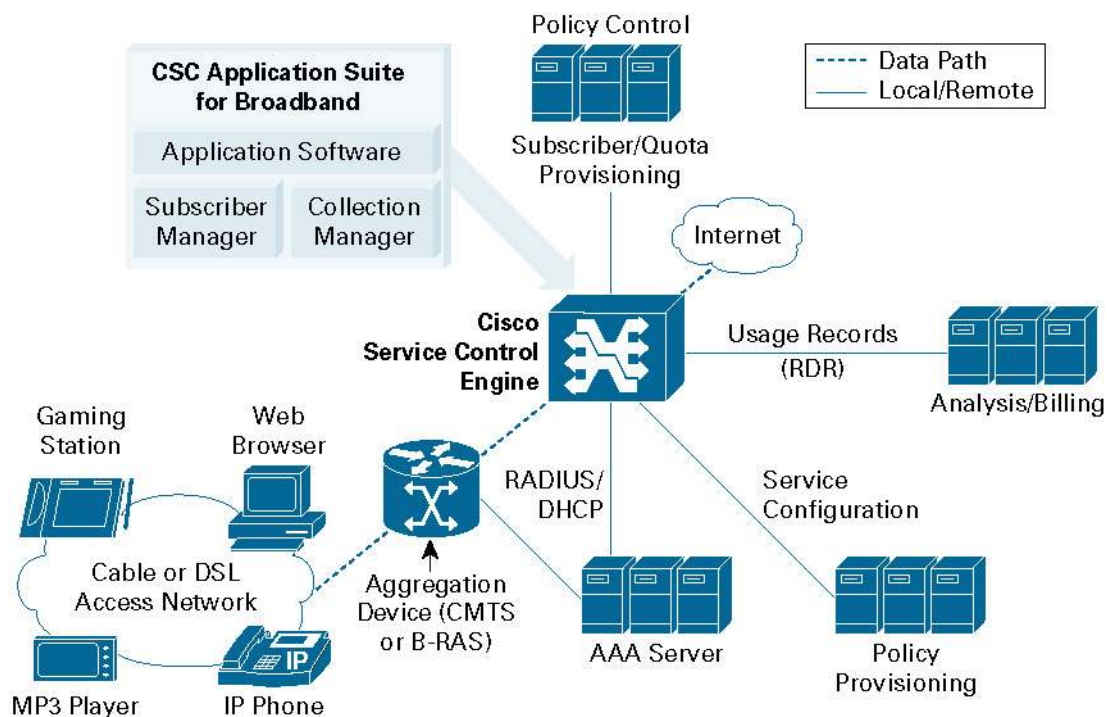
THE SERVICE CONTROL SOLUTION

Service control, both a software and hardware solution, is an IP network element built specifically to address the infrastructure gap challenging broadband operators. Situated "in line" on the IP data stream, the platform performs hardware-accelerated, stateful deep packet inspection to accurately classify and control traffic by content, application, and subscribers.

The platform's customized hardware is built to combine extremely efficient stateful processing of traffic into a fully programmable framework, which balances between performance and flexibility needs. This allows the platform to process gigabits of traffic while ensuring it is adaptable enough to address traffic-analysis requirements resulting from changing or emerging applications and protocols.

Typically installed at the broadband edge network upstream of the aggregation device (broadband remote-access server or cable modem termination system [CMTS]), the platform interoperates with subscriber-authentication and -management components as well as billing, data-collection, and policy-provisioning systems to transparently deliver dynamic, customized, and application-differentiated broadband services to subscribers (Figure 1).
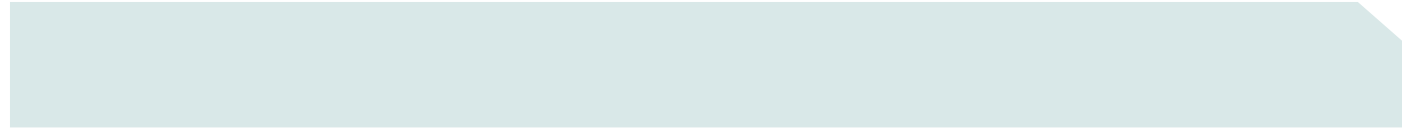
Figure 1

Cisco® Service Control Engine with Cisco Service Control Application Suite for Broadband Network

A service control platform provides broadband operators with a rich set of tools to manage network traffic and address performance as well as service security issues. The solution offers providers ways to create new paradigms for the definition and delivery of broadband services. Operators can tailor the broadband experience of each subscriber in accordance with any defined policy, and truly differentiate broadband service offerings. Service control applications are specifically designed to assist operators by improving network analysis and reporting as well as establishing more granular control for the deployment of new services and billing models. The following section outlines the potential applications of service-control technology in broadband networks and potential areas of direct impact upon an operator's business.

Usage Analysis

Improving and developing new business models requires that broadband service providers accurately understand their subscribers' usage. Service control technology is intended to dramatically improve analysis. Obtaining meaningful usage data from IP networks is a particularly difficult task.

Service control technology provides high-performance application and subscriber-aware traffic classification, offering operators unrivaled visibility into network activity. By tracking all IP traffic flows and performing stateful deep packet inspection, the solution collects statistics about the applications and services used by individual subscribers. Taking the guesswork out of capacity planning and detailing the subscriber demographics helps operators uncover the new revenue potential and hidden operational costs associated with IP service delivery in broadband networks.

Traffic Optimization

The growing number of broadband Internet subscribers and the emergence of broadband-aware and bandwidth-hungry applications such as P2P file sharing or streaming media is impacting the cost and profit equation for service providers. Regardless of the amount of data capacity operators make available, new applications and growing file sizes make network congestion inevitable. The incremental costs of network upgrades and transit reduce operators' margins. A service control solution helps providers reduce costs.

Using state-of-the-art capacity and throughput management applied to network traffic on a global, subscriber, or individual flow-level hierarchy allows operators to dictate how network resources are distributed, which becomes equally important for latency sensitive applications such as voice or interactive gaming. The result is improved subscriber experience and overall satisfaction with broadband network performance as well as reduction in transit costs and costly network upgrades.

Service Network Security

The lack of security-conscious home users and the open nature of the Internet create a breeding ground for network security threats impacting both service providers and subscribers. Subscribers are under a constant threat of DoS attacks and worm and virus infection. Recent threats have created "security storms" resulting from popular viruses such as Sasser, Slammer, and Blaster. Additionally, as more "IP-enabled" handsets and personal digital assistants (PDAs) become a target for hackers, service security turns out to be a paramount issue for operators on all fronts.

Increased network traffic caused by the multiplicative effect of infected hosts results in increased administrative costs and technical support calls as operators seek to track, disable, and block the spread of a virus attack. Infected machines generate network congestion as they attempt to propagate a viral infection, resulting in performance degradation for all users. Service control-enabled networks stop and proactively mediate security threats that create unwanted traffic and network congestion while increasing providers' costs.
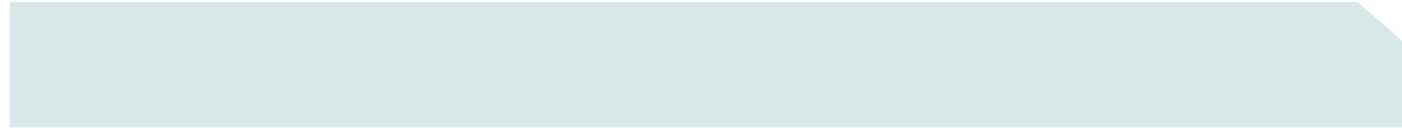
Tiering and Access Control

Differentiating service levels and compelling new content can further advance the migration of dialup users to broadband access, creating the necessary critical mass of users for premium-content service deployment. As content proliferates and content suppliers begin to partner with network operators, both mobile and broadband service providers will need to protect copyrights, which may be based upon subscription, and prevent unauthorized access to content.

A service control platform helps operators account for usage on an individual subscriber level, while enforcing different policies on a variety of applications or services. This dynamic, subscriber-centric enforcement model allows for the creation of access and throughput-on-demand services that can improve overall subscriber satisfaction by allowing subscribers to select or gain access to chosen content and resources. Providers can initiate truly customized broadband products and services and enforce service parameters directly correlated to the needs of individual users.

Content Charging

If the network could differentiate among different types of content, value service offerings differently, or track and meter combined usage, mobile and broadband operators would be better able to competitively package and value content in unique ways. A content-charging solution

offers carriers the ability to increase revenue and take advantage of infrastructure investments by adding pre- and postpaid content-based services to mobile service offerings. Broadband operators can create application quotas, and mobile carriers can use the content-charging solution to enable real-time charging of traffic according to sophisticated rate plans and control traffic based on advanced pre- and postpaid billing models. Real-time charging is performed against a subscriber's balance in line with traffic, preventing potential revenue loss.

Premium Service Enablement

The ability of the IP network to generate compelling new services is unlimited. As the number of Internet subscribers grows and the number of intelligent portable devices increases, the market for broadband is positioned to accept new premium service offerings such as VoIP, online gaming, music downloads, VoD, and streaming television. These services offer the potential to dramatically increase average revenue per user (ARPU) for the service provider, further increasing the overall value of network assets.

Integrating into existing QoS frameworks and communicating with policy servers and network transport elements, service control technology helps enable dynamic, real-time provisioning of network QoS based on application activity, greatly simplifying integration and delivery costs associated with multiple services delivery.

BRIDGING THE INFRASTRUCTURE GAP

As broadband networks increasingly power next-generation communications, operators must increase their visibility and improve their control over network activity. Enabling IP networks to differentiate between services such as VoIP, Web browsing, music downloads, video streaming, or P2P traffic makes it possible to control the quality of individual services or charge for them effectively. Cisco Service Control technology closes this infrastructure gap.

A service control network element adds a programmable service layer to broadband networks, helping enable providers to identify subscribers, classify applications, guarantee service performance, and charge for multiple IP services without costly infrastructure upgrades.

Specifically built to fit into broadband edge networks, the Cisco Service Control platform offers broadband operators unparalleled control over network traffic and subscriber usage. Now an operator's transport network can be augmented with vital functions. For a small incremental investment, operators can quickly deploy new IP services, reduce overall costs, amortize massive investments in network access across multiple services, establish new partnerships with third parties, and trial new business models. The capability to profitably delivery premium IP services has arrived.

CISCO SYSTEMS

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the
Cisco Website at www.cisco.com/go/offices.

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica
Croatia • Cyprus • Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR
Hungary • India • Indonesia • Ireland • Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico
The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto Rico • Romania • Russia
Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan
Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe