



White Paper

Cisco Service Control: A Guide to Sustained Broadband Profitability

The competitive broadband environment is putting significant commercial pressures on service providers. The massive investment cost of increased network capacity, new network management challenges, and declining average revenue per user (ARPU) are forcing the service provider community to rethink some of the basic technical and business models defining broadband services today. In response to these challenges, Cisco Systems® has created a framework for the profitable delivery of broadband services over an IP network.

This paper explains how the Cisco® Service Control Solution, a cornerstone of the Cisco Service Exchange Framework and the Cisco IP Next Generation Network Architecture, puts operators firmly in control, helping optimize and personalize the network experience to increase end-user satisfaction. As broadband becomes a fundamental part of daily life, personalization becomes essential to maintaining ARPU and ensuring sustained profitability for broadband services.

BACKGROUND

Broadband Service Providers—The Emerging Challenges

Although the financial benefits from delivering multiple services and applications over a converged IP network infrastructure are widely recognized, this business model also presents service providers with a new set of challenges. The ability of service providers to deal effectively with these challenges is likely to determine sustained profitability and return on investment from broadband services.

Some of the issues providers must contend with include:

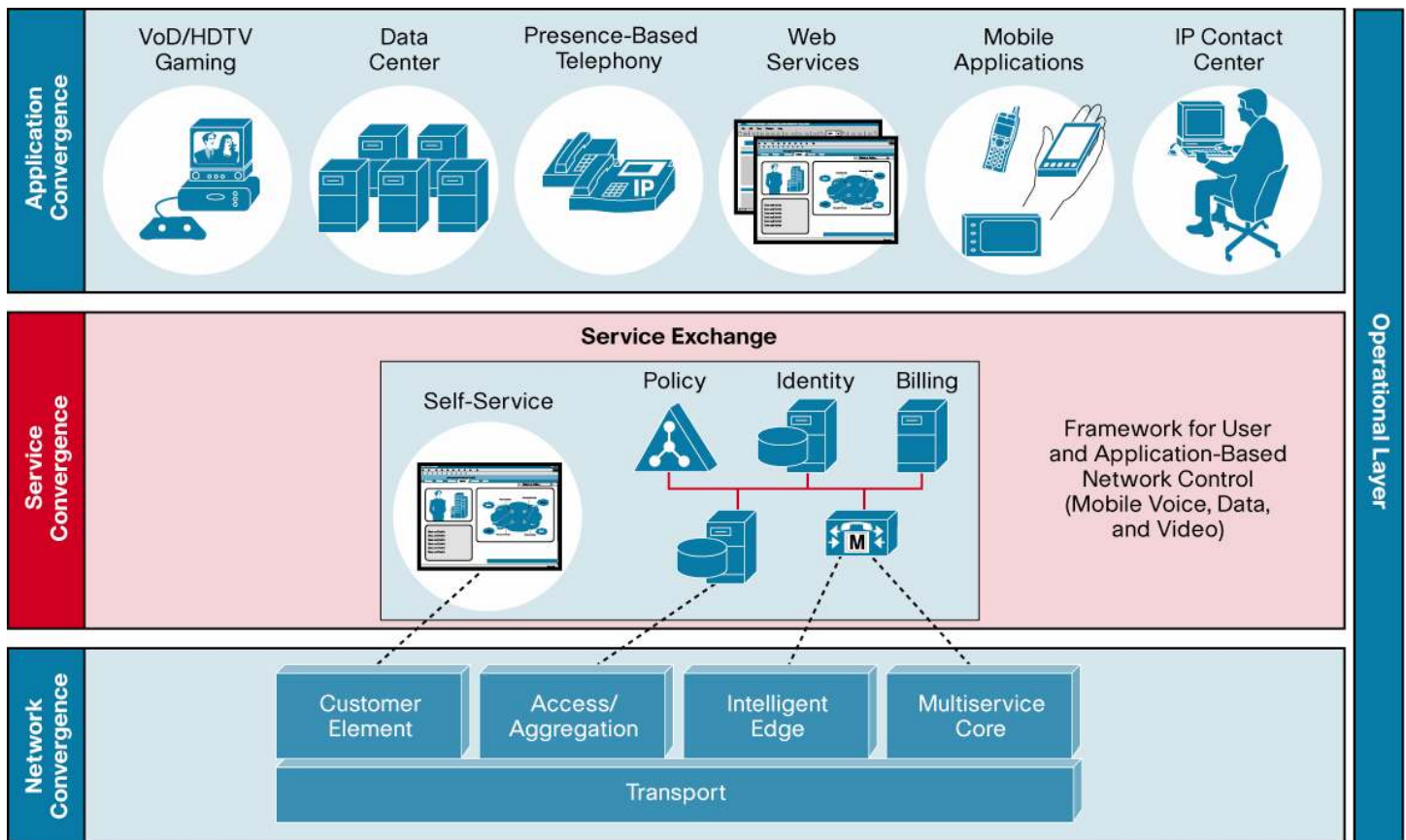
- **Growth in Last-Mile Access**—Recent advances in access technologies to optimize “last-mile” bandwidth allow providers to introduce new multimedia services. However, technologies such as ADSL+, FTTP, and cable wideband that support rates of 100 Mbps or more per user have also created new traffic management challenges and a potential source of commoditization of high-speed transport.
- **Deregulation and Increased Competition**—Broadband services regulation is shifting toward an open-market approach. Local Loop Unbundling (LLU) and video deregulation are creating dramatic growth in the number of services to which consumers can subscribe. Consequently, increased traffic is making it more difficult for providers to emphasize conventional points of differentiation, such as performance and customer service. Providers need to solve these problems while searching out new ways to stand out in a crowded marketplace.
- **Ensuring Network Performance and Customer Satisfaction**—Today’s broadband customers are more intolerant and unforgiving than ever before. Traditional standard offerings, such as Internet packages with pre-agreed volume limits, are no longer acceptable ways to manage their higher expectations. Customers want to be able to monitor and police their own bandwidth allocations as opposed to having their accounts blocked when they hit their limits. They also want to make these choices in real time and not several hours later.
- **Nonfacility Services**—The growth in Internet bandwidth to the home introduces a new dynamic between service providers and nonfacility operators offering services such as voice, IPTV, or video on demand over any broadband connection. Service providers must identify the new business models that can satisfy this new class of provider while avoiding having their networks become a low-priced bulk commodity.
- **Market Penetration**—The aftermath of the telecommunication bubble has resulted in a mandate for sustained profitability rather than simply focusing on increasing market share. It is clear that with the evolution of broadband and triple-play (data, voice, and video) technologies providers must find new and customized service bundles to attract the mass market and ensure customer loyalty. However, providers continue to struggle with how to meet these needs and the best way to assess market dynamics when rolling out innovative service bundles that extend market penetration and revenue growth.

Although these concerns differ in impact across individual markets and geographies, they all raise pressures on service providers and their broadband operations. Taken together, they are significant threats to containing operational costs while addressing decreasing ARPU, jeopardizing operators' margins and profitability.

Cisco Service Exchange Framework and Service Control Solution

To help service providers manage the changing environment, Cisco Systems has defined a solution architecture (Figure 1) termed the Cisco Service Exchange Framework (SEF).

Figure 1. Cisco Service Exchange Framework



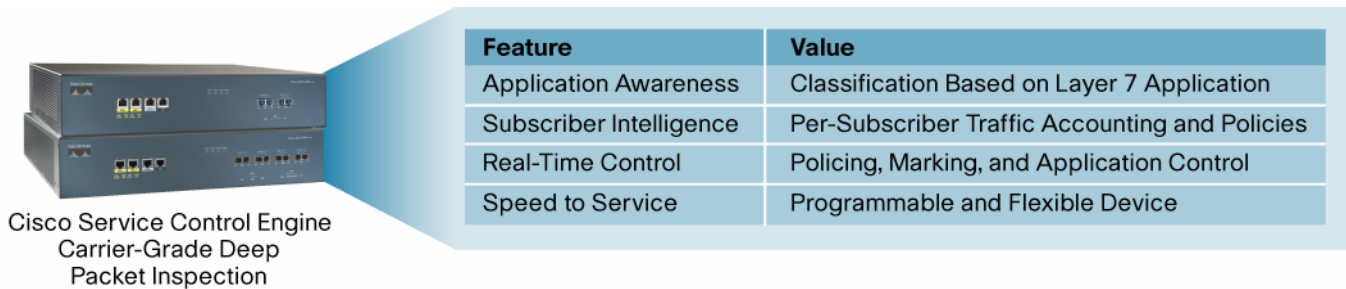
Cisco SEF is a combination of intelligent transport devices, services, and policy control points integrated through an open set of interfaces. This intelligent service layer is designed to assist service providers to better manage and control advanced IP service delivery by offering better ways to identify subscribers, classify applications, guarantee service performance, and make use of location and presence to deliver a personalized, dynamic, and application-aware networking experience to subscribers. Cisco SEF runs on a converged, all-IP network and interacts with application delivery platforms responsible for providing the end-user application experience. Using this framework, providers can define policies over their networks that extend well beyond simple packet transport. These policies can consider information such as:

- **Who the Subscriber is**—The identity and profile of the individual subscriber.
- **What the Subscriber is Doing**—Applications used by the subscriber and the content being accessed.

- **Where the Subscriber Resides**—The source of the subscriber connection and the capabilities of the connection type to facilitate this service request.
- **How the Subscriber can use Network Resources**—The means of dynamically controlling network resources to ensure an appropriate user experience in real time.

An important element in Cisco SEF is the Cisco Service Control Engine, a deep packet inspection engine that helps enable service providers to identify, classify, monitor, and control traffic based on application layer parameters (Figure 2).

Figure 2. Cisco Service Control Engine



Integrated into the Cisco SEF, the Cisco Service Control Engine helps operators gain visibility into application and service traffic and control bandwidth and priorities based on application requirements and network conditions. The Cisco Service Control Engine can also allocate network resources according to the profile of each user, and in doing so deliver a personalized broadband experience. The application-aware and subscriber-aware capabilities of the Cisco Service Control Engine help operators account for, and control usage of, any service or application regardless of underlying protocol and transport mechanisms, offering visibility and flexibility in managing network traffic and delivering IP based services.

SERVICE CONTROL APPLICATIONS

This section describes various challenges in maintaining sustainable broadband profitability and outlines how the Cisco Service Control Solution addresses them.

Managing Network Performance and Customer Experience

The Challenge

Regardless of how conservatively a service provider designs its network infrastructure, it cannot economically avoid oversubscription of network bandwidth. Providers must account for overall network expenditure, including rollout costs, network equipment, and transit capacity. The reality is that the cost to deliver a broadband Internet connection greatly exceeds the price a consumer would be willing to pay. For this reason, providers assume network oversubscription to reach an acceptable price.

Because oversubscription is inherent in the broadband business model, service providers face significant challenges in managing the customer experience of their high-speed Internet service. Although this service is uniformly provided on a “best-effort” basis, customers have come to expect a congestion-free, high-quality experience at all times. This is especially true as operators package higher-bandwidth service tiers that not only increase pressure on network resources, but also lower customers’ tolerance of service delivery that is below advertised rates. With the growth of “broadband-aware” applications such as peer-to-peer (P2P) file sharing, podcast downloads, and offnet video streaming or voice chat, network usage is constantly increasing.

Without a service control solution, providers have few alternatives for managing this situation:

- Add more bandwidth in reaction to customer complaints, a solution that only increases network expenditure without a corresponding increase in ARPU and return on investment.
- Ignore the problem and let subscribers manage with whatever bandwidth is available, a solution that results in significant customer turnover.

Although providers have practiced both options, neither is an acceptable or successful long-term approach. Beyond the obvious operational difficulties that arise from bandwidth consumption and managing service diversity, a service provider must establish control over its own expenditure. Cost structure today is dependent on the latest P2P applications or subscriber behaviors more than a provider’s own business priorities. As a result, an increasing number of service providers are turning to the Cisco Service Control Solution to efficiently manage their network capacity and improve user experience.

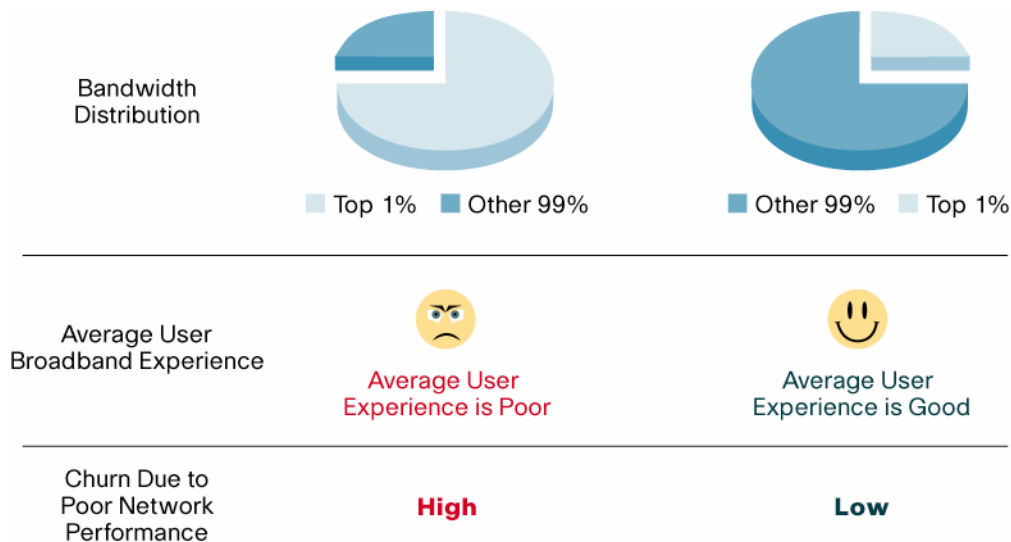
The Cisco Service Control Solution

The ability of Cisco Service Control to classify and enforce traffic policies for Layer 7 applications, as well as its ability to manage traffic on an individual user basis, provides a powerful tool for service providers to manage network traffic through “subscriber-friendly” policies.

Some of the relevant functions include:

- Classification and identification of all application traffic, regardless of port number or IP address, including support for port-hopping applications (P2P applications such as BitTorrent, eDonkey, or Gnutella), multiframe applications (such as SIP voice over IP or RTSP streaming), and “hidden” applications (such as HTTP running on nonstandard port numbers).
- Prioritizing interactive and delay-sensitive applications (such as gaming, voice, streaming, or even Web browsing) at the expense of noninteractive applications (such as P2P file exchange, file downloads, or news transfers), so that preferential treatment can be given to latency-sensitive applications during periods of increased network congestion.
- Establishing “fair-use” policies for customers through usage management algorithms that give every subscriber a fair allocation of available bandwidth—heavy users can no longer take excessive bandwidth and degrade the experience for other subscribers, and therefore, business churn is reduced (Figure 3).

Figure 3. Application of Fair Use Policies



- Destination-aware policies, which serve to keep P2P traffic on-net and off expensive or capacity-strained links, thereby aligning application requirements with network architecture and resource availability.
- Packet marking based on application classification, which enables routers upstream or downstream of the Cisco Service Control Engine to prioritize traffic based on individual application requirements and address congestion at relevant network points.

Using the Cisco Service Control Solution, service providers can improve their subscribers' experience of the high-speed Internet service while maintaining a predictable and controlled investment in network infrastructure (Table 1).

Table 1. Customer Experience: Key Points

Challenge	Cisco Service Control Solution
Broadband networks are oversubscribed.	Cisco Service Control Solution intelligently manages subscribers and applications, maximizing use of network resources and proactively managing oversubscription.
Broadband-aware applications and heavy bandwidth users introduce network congestion and deteriorate network experience, which results in service churn.	Cisco Service Control Solution administers fair usage policy to optimize experience for all subscribers.
Service providers need traffic management tools that can improve customer experience to avoid churn or uncontrolled expenses.	Cisco Service Control Solution ensures bandwidth is granted to latency-sensitive applications or prioritized users during periods of network congestion, maximizing end-users' perception of network performance and overall service satisfaction.

Bundling and Personalizing Service Offerings

The Challenge

In the current broadband market, service providers with the most successful service bundling strategies stand to gain significant market share over their competitors. However, to do so broadband service providers face two challenges to identify or create the most appealing service bundles:

- **Visibility:** Service providers have not had useful tools to collect the actionable usage statistics they need to intelligently segment the user population. The marketing analysis required to define service bundles that appeal to a broad range of customers is very difficult, and to service providers the financial risk can appear highly uncertain.
- **Granularity:** Because of limited ability to define granular policies on subscriber end traffic, service provider attempts to tier and bundle their services have limited effectiveness. Their main tools include crude bandwidth tiers (512 kbps, 1.5 Mbps, 3 Mbps) and occasional byte caps.

Most attempts to create service tiers have met with limited financial success or incremental market share. In some cases they have been rejected by the subscriber community altogether. The Cisco Service Control Solution addresses these challenges by providing the visibility and granularity of application traffic needed to create attractive service bundles.

The Cisco Service Control Solution

The application- and subscriber-aware processing of network traffic in Cisco Service Control, as well as its ability to integrate into policy management, billing, and provisioning systems, helps provide a flexible environment for creating services. Service providers can:

- Define application layer rules such as access or bandwidth restrictions for certain applications or content.
- Account for traffic on a per-application basis, with multiple accounting counters per subscriber.

The resulting advantages from the Cisco Service Control Solution enable providers to administer application layer treatment of *any* IP application. Table 2 lists some examples of service bundles that can be defined and delivered by Cisco Service Control.

Table 2. Service Bundles Amenable to Cisco Service Control

Service Plan	Service Specification	Pricing Strategy	Comments
Broadband Light	<ul style="list-style-type: none"> • Mail and Web: 3 Mbps • Other: 64 kbps on demand boost for \$1/day 	<ul style="list-style-type: none"> • \$9.99/month (<i>\$10 less than 3 Mbps service</i>) 	<ul style="list-style-type: none"> • Target market: Dialup users • Tier protection: Eliminate cannibalization of high-end tiers (due to restricted application use)
“Pay-As-You-Go” Broadband	<ul style="list-style-type: none"> • Baseline service: 3 Mbps • Application categories <ul style="list-style-type: none"> – A: Web, mail, IM – B: P2P, radio, news – C: Streaming, gaming, voice (Skype, SIP) 	<ul style="list-style-type: none"> • No monthly charge • Monthly surcharge for application categories: <ul style="list-style-type: none"> – A: \$5 – B: \$10 – C: \$15 (5 GB/category allowance) • Access to service provider affiliated content at no cost 	<ul style="list-style-type: none"> • Target market: Mass market • Bundling strategy: Automatically bundled with managed IPTV or video service
Home Worker/Small Business Package	<ul style="list-style-type: none"> • Baseline service: 8 Mbps • Regulate application use through Web portal 	<ul style="list-style-type: none"> • \$59.99 (+ \$10 surcharge to 8 Mbps service) 	<ul style="list-style-type: none"> • Target market: Power users, multi-customer premises equipment (CPE) customers • Bundling strategy: Bundled with high-end root access point

By creating more sophisticated service tiers, service providers can offer packaged services to specific consumer segments that address their individual preferences and budgets, offering added value beyond simple performance enhancements. Cisco Service Control can contribute significantly to a provider’s ability to innovate in its market and expand its overall market share. Moreover, by crafting such customized service tiers an operator can raise the revenue potential of each customer type and avoid price erosion caused by flat-fee service models. For a simple example, consider the “broadband light” service, which attracts dialup customers who have yet to migrate to broadband but has limited appeal to more experienced users.

Using the application-aware capabilities of Cisco Service Control, service providers can extract new transaction-level information on application activities. This data allows for the creation of advanced billing schemes that enable more innovative service offerings. An example is “pay-as-you-go,” in which a service provider can offer a broadband connection at no upfront cost but collect payment for usage of certain applications and services.

The ability to create transaction-based models is a good strategy for incremental service delivery to customers who want to purchase a combination voice, video, and data service but are not interested in paying monthly charges for Internet access services. The additional costs for the provider are negligible, and it provides a good way for customers to try a provider’s Internet service and potentially adopt that provider for all services.

Dynamic Portal-Based, Personalized Internet Experience

Because so many of today’s subscribers use Web-based e-mail services, choose their own personal content through P2P applications, or host their content on free sites, their relationship with their provider is often limited to a monthly bill for transport services, causing low customer loyalty.

Through integration with a broadband policy server such as the Cisco Broadband Policy Manager, another key element of the Cisco Service Exchange Framework, dynamic service plans can be created that include features such as:

- Quota-based prepaid services.
- Portal-based self-activated services such as a “turbo button” application, parental controls, or network-based antivirus.
- Time-based services providing different service features at different timeframes.
- HTTP session capturing for proactive service notification.

For example, a service provider could create an “allowance-led” service plan in which subscribers who exceed their agreed-upon volume could continue using a service by making an additional payment, or continue at reduced speeds or defer until the following month when their allocation is restored. Users could view their service usage at any time, receive notifications when their usage nears the monthly maximum, or submit payment for additional time (Figure 4).

Figure 4. Dynamic Service Plan Created with Cisco Broadband Policy Manager



Partnering with Nonfacility Service Providers

The Challenge

One of the most significant risks that broadband service providers face is the threat from ‘nonfacility’ service offerings for music or video downloads, VoIP, or interactive gaming. With the increased bandwidth for high-speed Internet services, operators risk having their service regarded as a baseline commodity as their users subscribe to third-party services from off-net destinations. Examples include:

- Broadband voice services such as Skype, Google-talk, or Vonage that directly compete with a service provider’s VoIP service offering.
- Online DVD streaming and download services such as CinemaNOW or RealNetworks SuperPass, which compete for subscription fees of IP-based video services.

Although nonfacility services ride on a best-effort network and may not have the same quality control as the provider’s services, for many users the experience is good enough, and nonfacility operators benefit from lower operational expenses and a larger addressable market, making them formidable competitors.

However, broadband service providers can treat nonfacility operators as partners rather than competition. By creating an “open network” environment through which nonfacility operators can ensure adequate customer experience for their application traffic, broadband service providers can open the door for new revenue-sharing schemes. To do this efficiently, a broadband service provider must be able to easily identify the traffic streams of nonfacility services so that it can adequately bill for, audit, and guarantee their performance. The application recognition and granular billing capabilities of the Cisco Service Control Solution help in the development of these services.

The Cisco Service Control Solution

Using the application recognition capabilities of Cisco Service Control, a broadband service provider can identify the usage for any third-party application running over its data network, enabling:

- Analysis of service usage to determine service penetration and marketing demand. This capability is useful for establishing a baseline of relevant services to either partner on or compete against.
- Through integration with Cisco Broadband Policy Manager and standard frameworks such as PacketCable™ Multimedia (PCMM), dynamic quality-of-service (QoS) policies can be set for the specific application flows to ensure priority in the broadband access network. This type of support provides added incentive for the nonfacility operator to partner with the service provider for joint delivery of quality services.
- Through integration with billing systems, the ability of the Cisco Service Control Solution to report usage per-application session provides the necessary information to audit and bill for nonfacility services.

The advantage of this architecture is that immediate partnerships between broadband providers and nonfacility operators can be automated, making it possible for broadband operators to partner easily with nonfacility operators, thereby rapidly increasing their ability to offer new services and meet rising demand for a diversity of content.

Table 3. Service Bundles and Tiered Services: Key Points

Challenge	Cisco Service Control Solution
A service tiering strategy is essential for service providers to gain market share.	Cisco Service Control Solution can account and control traffic on an individual subscriber basis based on application criteria.
Without proper visibility tools it is impossible to determine the appropriate service tiers.	The detailed application-aware capabilities of the Cisco Service Control Solution facilitate advanced billing plans.
Granular network control is required for the creation of successful service tiers.	By integrating with the policy management capability of the Cisco Broadband Policy Manager, the Cisco Service Control Solution can deliver a dynamic and personalized broadband service. Using the Cisco Service Control, operators can create service plans that attract specific market segments and avoid cross-cannibalization or price erosion.

SUMMARY

Faced with increased costs for network capacity, new network management challenges, and declining ARPU, broadband service providers need to fundamentally change their business models to ensure long-term success. To do so their networks will benefit from the additional service intelligence provided by Cisco Service Exchange Framework and the Cisco IP Next-Generation Network.

As an integral part of Cisco SEF, the Cisco Service Control Solution offers providers a path to sustain profitability and a valuable resource for competitive differentiation. Tables 1 and 3 summarizes how the Cisco Service Control Solution addresses these challenges. Operators can now deploy next-generation network technology to identify subscribers, classify applications, ensure QoS, and meter and charge for individual applications or bundles.

As part of a phased implementation, following are some of the benefits delivered by Cisco Service Control:

- **Critical Analysis**—An important step toward better control of the network, helping service providers understand the behavior of customers and applications in the network.
- **Optimized Network Performance**—Enabling better prioritization of applications in the network.
- **Increased Deployment Capability at Reduced Cost**—Freeing bandwidth that can be deployed for new high-speed services or enhance the speed of existing ones without expensive upgrades in the access network.
- **Unique Differentiation**—Offering ways to introduce robust tiered service offerings.
- **Enhanced Customer Service and Service Personalization**—Reducing churn and customer support through personalized broadband service, enabling self-selectable service offerings or self-administration of accounts.
- **Greater ARPU**—Providing a more fulfilling and personalized customer experience in real time, putting providers in better position to sell additional services and generating more revenue per user.
- **Attract New Business**—More direct sales resulting from differentiated value propositions and partnerships with nonfacility service providers to create new revenue-sharing models while offering more services or content choices to subscribers.



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