White Paper

Seven Best Practices for Service Assurance in Cable Networks

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Introduction

By all accounts, cable operators are encountering mounting competition on multiple fronts these days. Besides dealing with fiercer-than-ever competition from telecom and satellite TV providers seeking to expand into cable's core markets, cable operators are also running into powerful new rivals such as Google Fiber and coping with the rising threat of video cord-cutting from "over the top" (OTT) providers such as Netflix, Hulu and YouTube.

Further, with an entire generation of young adults entering the workforce who have never known a cable or telephone bill, just a wireless bill, cable operators are facing a potentially huge sea change in consumer demand for their services. For this new generation – likely the first of many to come – the smartphone acts as a communications hub that's restricted only by their wireless carrier's limitations on data usage. These users constitute a growing cadre of "cord-nevers," rather than cord-cutters.

Faced with such developments, cable operators are now embracing IP technologies and networks like never before, as a way to deliver more advanced video, data, voice and multimedia services to both residential and commercial subscribers and stay a step ahead of their ambitious rivals. They are also looking to appeal to those young, mobile-oriented, Web-savvy consumers who may not be inclined to simply follow in their parents' footsteps and subscribe to traditional pay TV services. Cable providers are leveraging IP to introduce faster broadband speeds, multi-screen video, WiFi, metro Ethernet, VoIP and advanced business services, to name just a few.

Cable operators are particularly looking to use IP technology to deliver more advanced video services to customers, such as Internet video, network-based digital video recorders (DVRs), cloud-based user interfaces, mobile video and remote DVR programming. In addition, they are seeking to deliver live and on-demand video streaming services to a rapidly growing array of IP-connected consumer devices both in and outside the home, including connected TV sets, PCs, laptops, gaming consoles, smartphones, iPads and other tablets.

In North America, for instance, such leading MSOs as Comcast, Time Warner Cable, Cox Communications, Cablevision Systems and Rogers Communications have already launched live TV feeds of their linear programming lineups for iPads, iPhones, Android phones and tablets, and other mobile devices in subscribers' homes. And increasingly, as they gain the all-important content licensing rights, cable operators are starting to stream live TV to mobile devices outside the home as well.

But even as cable operators make this essential conversion to IP-based products and services, they are potentially missing out on other prime opportunities that IP technologies and networks have to offer. Specifically, they are missing out on the chance to play influential new roles in the emerging IP value chain as the separation of IP services from IP networks continues to change the world – not just for MSOs, but all communications service providers.

One such critical role is the orchestration of IP service delivery on behalf of the "long tail" of third-party application and content owners and their shared subscribers. To fulfill this role, cable operators must develop a comprehensive view of network users and their services, as well as the infrastructure that these services travel across and the devices used to access them. MSOs can use this comprehensive view to help monitor, manage and manipulate service delivery on a per-subscriber, per-service basis, so that they can meet the expectations of both customers and partners while managing growing traffic volumes and controlling rising delivery costs.

Fortunately, cable operators are in an excellent position to play this service delivery orchestration role, because of the reach, flexibility and quality of their hybrid fiber/coax (HFC) networks. But they will need to overcome some of the major technical, operational and other challenges associated with IP service delivery.

For one thing, the service delivery infrastructure is growing more complex, due to the layered nature of IP service architectures, the proliferation of new consumer electronics devices and the fragmentation of the IP services value chain. For another, the surge in demand for content and data services is causing an explosion in network traffic, requiring continual expansion of the infrastructure to handle it. In addition, services are increasingly transforming into "blends" of different service components from multiple providers that need seamless management and delivery against a single service-level agreement (SLA). Finally, many cable operators have yet to adapt their mindsets and internal operations to a dynamic IP environment, which is a far throw from the certainties of their legacy world.

This white paper proposes a new, broader approach to IP-based service assurance would help cable operators play this orchestration role and reduce the complexity of delivering services in an IP environment. While MSOs will still need to manage their networks and carry out familiar service assurance processes, they will need a far broader and a more unified set of functions to successfully orchestrate IP service delivery management. All stakeholders involved in service delivery over IP will need to tap into rich intelligence that identifies the complex interactions among services, networks, subscribers and their devices; visualizes this data in an accessible way; and enables stakeholders to act proactively within their domains.

The Rapidly Changing Cable Landscape

Over the last few years, the technical, operational and competitive landscape has shifted dramatically for cable operators, leaving many of them scratching their heads about the best ways to succeed in the future. First, cable providers now face a very different set of pay TV and broadband rivals than they did just five years ago. The competitive challenges to cable's 65-year rule of the pay TV market are multiplying and intensifying. In the U.S., for instance, such rivals as DirecTV, Dish Network, Verizon and AT&T are aggressively expanding their digital video, HD, on-demand, DVR, mobile video, multiscreen video and other next-generation video offerings.

In addition, cable operators must deal with the changing expectations of their subscribers. No longer content to just take whatever channels, bundles and service quality are offered to them, consumers are increasingly demanding that MSOs deliver more compelling choices. Having gotten a taste of better picture quality from satellite TV providers such as DirecTV, better user interface guides from competitive players such as TiVo and greater content choice from Netflix and other leading OTT providers, consumers are increasingly expecting MSOs to match these offerings.

Also, consumers are increasingly expecting cable operators to provide better access to premium content. As competitive video providers offer easier, less complicated and lower-priced selections of premium programming, cable operators are feeling more price pressure on their premium bundles. As a result, MSOs are finally starting to explore à la carte programming and simpler, less costly routes to premium channels and packages.

Further, consumers are increasingly seeking to watch their desired content on any device, anywhere, at any time. No longer satisfied with viewing shows on their home

TV sets at a time arbitrarily established by a programming network or pay TV provider, they want to view those shows whenever and wherever they want, whether they're using a tablet, smartphone, Xbox game console, smart TV, OTT set-top or other video-enabled device. So cable operators must satisfy these demands by extending their content to multiple devices, both inside and outside the home, as quickly as possible.

Besides coping with the changes in the competitive environment and consumers' expectations, cable providers have to deal with today's rapid technological changes. With the accelerating shift toward IP-enabled delivery networks in the pay TV and telecom environments, MSOs must make that transition themselves to keep up with their rivals, extend their reach, streamline their distribution systems and cut costs. Plus, they must carry out this tricky transition without disrupting service to their tens of millions of existing video, voice and data subscribers.

What's more, as the IP service revolution picks up speed, cable providers must find more ways to tap into the freedom this revolution offers them. That means using IP technology to create and enable new services and products for residential customers. In particular, it means creating and enabling new cloud-based services, such as IP video user guides, network DVR service, and search and navigation tools.

Similarly, cable providers must leverage IP technologies to create and enable new services and products for commercial customers, including advanced VoIP, Ethernet, mobile broadband, WiFi, desktop video conferencing and managed services. As on the residential side, this means creating and enabling new cloud-based services, including remote backup, online security, data recovery and retrieval, and software as a service (SaaS).

Figure 1: The Impact of the Changing Cable Landscape

CHANGE	IMPACT
Emergence of new competitive rivals	Competitive challenges to cable's pay TV dominance are multiplying and intensifying, putting greater pressure on MSOs.
Consumers expecting better service offerings	Cable operators must find ways to improve user interfaces, programming guides, picture quality and content choices.
Customers seeking better access to premium content	Cable providers start exploring the idea of offering à la carte programming choices to subscribers, instead of just bundles.
Subscribers demanding multiscreen content on-demand	Cable operators scramble to extend their reach to other devices, both inside and outside the home, and secure needed content rights.
Accelerating transition to IP technology	Cable providers must speed up their own upgrades to all-IP networks to streamline distribution systems and reduce costs.
Need to offer cloud-based services	Cable operators begin turning to the cloud to introduce new products and services quicker and more efficiently.
Need to create new commercial services	Cable providers turn to IP technology and the cloud to offer new products and services to business customers as well.

Source: Heavy Reading

The Case for Advanced Service Assurance

To carry out such complex service orchestration tasks, cable operators clearly need to invest more heavily in service assurance strategies and methods. Greater investment in service assurance is critical for operators because it leads to higher customer satisfaction rates and lower churn rates. As a result, service assurance can become a critical differentiator for MSOs in their competitive battles with telcos, satellite TV providers, Internet video players and other rivals.

Thus, it's not all that difficult to build a strong rationale for cable operators to invest more heavily in service assurance tools and technologies. In fact, there are several prime reasons why cable operators should start making those investments right now, as discussed below.

First, with the aid of service assurance methods, cable providers can more effectively measure and improve the quality of experience (QoE) for their customers. With the high bar set by the home TV viewing experience, for instance, MSOs face growing pressure to offer similar high-quality viewing experiences to viewers using numerous other video-enabled devices, including laptops, tablets, smartphones and game consoles.

At the same time, delivering a high QoE to the customer can be more complex in a mobile environment, because it requires ready signal access and quick service authentication no matter where the subscriber is located or may be roaming. High QoE also requires constant monitoring of service delivery because bandwidth conditions and other factors are constantly changing. Service assurance enables cable providers to deliver a consistent, seamless viewing experience on all screens, in all locations, at all times, no matter how the devices may vary in bandwidth capacity, video resolution, screen size and overall capability.

Second, service assurance enables cable operators to deploy their technologies, equipment and services more efficiently. With its assistance, MSOs can more effectively track and target where and when to launch new services, make necessary fixes, upgrade systems and equipment and upsell new premium services and products. In other words, they can make changes as the user experience dictates, instead of relying on guesstimates.

Further, by investing more heavily in service assurance, cable operators can take immediate steps to boost their operational efficiencies and increase coordination among various business units. Thus, it represents a "take charge," proactive strategy, rather than a more passive, reactive strategy.

Specifically, cable providers can improve operational efficiencies by reducing their closely related mean-time-to-knowledge (MTTK) and mean-time-to-resolve (MTTR). MTTK is a critical component of MTTR, because it turns out to be the biggest factor in the overall time it takes to resolve a problem on the network. If the time that it takes to *learn* the problem can be drastically cut, so can the overall time that it takes to *resolve* the problem.

With the aid of service assurance, cable operators can also increase coordination among their different, sometimes warring departments. For instance, they can make it easier for such disparate divisions as engineering, planning and marketing to work together smoothly as one large, integrated team with joint goals, rather than individual units with their own separate agendas.

Figure 2: Prime Reasons for Greater Service Assurance

REASON	RESULT
Measure and improve the quality of the customer's experience	In response to higher expectations, cable operators can offer better viewing experiences over a wide range of devices.
Deploy new technologies, equipment and services quicker	Cable providers can track and target new service launches, product upgrades and network repairs more effectively.
Boost operational efficiencies and enhance coordination among units	With increased operating efficiencies and greater unit coordination, cable operators can reduce their time-to-market.
Track and resolve problems sooner and quicker	Cable providers can also leverage these greater operating efficiencies to diagnose and fix problems preemptively.

Source: Heavy Reading

The Key Goals of Advanced Service Assurance

Beyond investing more heavily in basic service assurance, cable operators need to put greater resources into more sophisticated service delivery management. Whereas basic service assurance focuses on preventing, finding and fixing problems in the service delivery network, next-generation service delivery management goes much deeper, focusing on actually bringing new and existing services to subscribers.

This more advanced version of service assurance requires that cable operators meet a number of critical targets. In fact, Heavy Reading and NetScout have identified five key goals for next-generation, IP-oriented service delivery management to achieve, as described below.

1. Proactively Detect Problems Occurring in the Network or Service: This goal can be accomplished through an early warning system that leverages IP traffic to understand how the network, services and multi-dimensional nature of IP networking work. The chief aim of any early warning system is to identify service performance issues before large numbers of users are affected.

In the intelligent early warning system envisioned here, alerts are automatically sent out on any emerging network, service or application performance issue or service degradation beyond pre-defined threshold levels, as well as any potential security threat, such as an excessive amount of authentication failures from a WiFi access point, or a spike in outbound voice traffic from an IP address to a location known for voice fraud. The system quickly locates and identifies any emerging problem, making it easier to resolve. The system also provides a simplified, easy-to-read view into end-to-end service delivery.

2. Improve the User Experience: By understanding network and service performance from a customer-centric view (in other words, a service view by location, by device and by service), cable operators can improve the customer experience by slicing operations by service, rather than by network layer. Naturally, it is critical for

cable providers to manage the performance of their networks, services and applications. Effective monitoring plays a huge role in this management process.

So what's needed are comprehensive network performance monitoring views – ranging from application traffic flows to full packet payload details – in the core, distribution and access areas of the network, as well as within virtualized data center environments. With these comprehensive views, cable providers can effectively monitor and troubleshoot the services that they deliver to their customers, allowing operators to optimize their network investments and grow key infrastructure as usage demands.

3. Optimize the Network and Services: Knowing the unique service being offered, as well as the market or user being targeted, cable operators can effectively and efficiently provision resources to the service. This knowledge enables operators to optimize the capex and opex investments they have made in their networks and new services.

4. Provide a Consistent User Experience: Cable operators can deliver a consistent experience to users through the consistent application of service and policy. Such application ensures that customers receive the same priority of service no matter where they go. Voice traffic always receives top priority, while high-speed Internet and video (premium/pay/standard) traffic are appropriately provisioned and tiered to offer the maximum user experience.

5. Increase Operational & Business Intelligence: It's all about having a better understanding of customer consumption of network and services, including where, when and how they are being consumed. It's about having a better understanding of consumer behavior and how that behavior shifts over time. Most importantly, it's about having the best, most consistent data on which to base those decisions. It's also about being able to build up a data set with history. And it's about being able to layer over that data set any analytics engine the operator prefers, along with the flexibility to change the analytics engine, yet still preserve the underlying data and porting it to the next analytics engine.

Figure 3: Five Key Goals for Cable Service Assurance

GOAL	ACTION
Proactively detect network & service problems	Create an early warning system leveraging IP traffic to identify service performance issues before many users are affected
Improve the user experience	Improve the customer's experience by slicing operations by services, devices and location, rather than by network layer.
Optimize the network & services	Provision resources to services more effectively by knowing both the services being offered and the markets/users being targeted.
Provide a consistent user experience	Apply service and policy consistently to ensure that customers receive the same priority of service no matter where they go.
Increase operational & business intelligence	Develop a deeper understanding of consumer behavior trends, customer consumption patterns and related data to make the best decisions.

Source: Heavy Reading

Best Practices for Advanced Service Assurance

Now that we have spelled out the five key goals of service delivery management systems, let's look at the ways that cable operators can meet these prime targets. In this section, we lay out the seven practices for achieving these goals.

1. Adopt an IP-Oriented Mindset: The management activities that support an IP-based service delivery orchestration role go well beyond traditional service assurance approaches. Cable operators will need to manage network performance, albeit in a dynamic and more extensive environment, with multimedia and data-oriented "bursty" traffic over broadband networks, rather than video traffic over RF networks. MSOs will also have to manage the performance of individual applications with a wide variety of traffic profiles, ranging from OTT apps to latency-sensitive, mission-critical and branded services.

Cable operators will have to deal with complex interdependencies between applications and the infrastructure over which they are being delivered. And MSOs must understand the impact of application and network performance at an individual customer level so they can deliver the customer experience that underpins the SLAs and business models for which subscribers have signed up. Cable operators need to switch their existing service assurance mindsets and "siloed" operations away from "just" managing the network toward an understanding of the broader, unified set of processes involved in managing IP service delivery.

2. Gain a Unified View of Multi-Dimensional Problems: To orchestrate IP service delivery, cable operators need a comprehensive view of their networks, encompassing their own services, third-party services, and subscribers and their devices. There are complex interdependencies between each and all of these. Every element of service delivery, whether hardware, software or human, can affect any of the others. Without a complete picture of these interdependencies and their status at any given time, MSOs will end up with operational blind spots. To complete their unified view, cable providers may need to extend their vision across the value chain when third-party content and application providers are involved in service creation and delivery. As part of this unified view, cable operators also need greater visibility into what's occurring on both the data and control plane levels of their networks so they can monitor and improve service performance and reliability more effectively and efficiently.

3. Take a Customer-Centric Approach: Cable operators must be able to relate their view of the entire service delivery environment back to each individual customer or a community of like-minded customers. Consider, for example, a group of iPad users watching on-demand programming on their tablets. In this scenario, the users may be distributed widely, but there is still a strong commonality among them. Other demographic splits might be by region or market.

Cable operators must also be able to track and monitor the delivery path that every service takes across their infrastructure (and potentially the infrastructure of their partners) if they are going to provide the correct level of customer experience for every subscriber or each group of like-minded subscribers. Thus, a customer-centric approach is key to supporting new IP business models, managing operational costs and optimizing service delivery.

4. Support Multiple Types of Services: A cable provider's approach to service delivery management should apply to any service it is called upon to deliver, both today and in the future. A cable operator should have visibility of, and the ability to orchestrate, the delivery of any service across its infrastructure, regardless of the type or value of

the service – be it communications, content, cloud or whatever comes next. This means the approach must be extensible to embrace service delivery across new equipment that may be added to the MSO's infrastructure in support of a new service, such as IP video and HDTV, or to new devices that generate demand for new types of applications, such as Apple's iPhone and iPad have done.

5. Support Multiple Service Delivery Stakeholders: In the past, a single function, service assurance, has been responsible for the quality of service delivery. But in the all-IP environment, multiple functions in a cable operator's organization will need to have visibility into different aspects of service delivery to ensure that all the dimensions of service delivery orchestration are covered. The service assurance function will be involved in the day-to-day performance aspects of service delivery, while capacity planners will want to keep an eye on each service's consumption of bandwidth and how this might affect the customer experience. Service operations will want to track how successful new service rollouts have been, while client managers will need early warning that a customer's mission-critical application is running into trouble.

A product manager can benefit from knowing whether customers are receiving the response times the cable provider has been promoting and glean ideas for new service innovations. Meanwhile, content partners will want to be kept informed that SLAs around the delivery of their content/applications are being met. If an MSO invests in creating a unified picture of its service delivery environment, it should enable all service delivery stakeholders to view relevant aspects of the picture in the ways that best suit them.

6. Move From Reactive to Proactive & Real-Time Management of the Service Delivery Environment: Orchestration is an inherently proactive and real-time role; it is simply not possible to orchestrate service delivery reactively. Cable operators must use their enhanced knowledge of subscribers and services to orchestrate their service delivery infrastructure end-to-end – including subscriber devices – so that they can fulfill these requirements. What this means is using the unified picture they have of the service delivery environment to identify, and proactively fix, any areas that might prevent them from hitting SLAs or delivering excellent customer experience. Proactively ensuring that the right service delivery infrastructure is working in the right way at the right time to deliver the right level of service is a key part of IP service delivery orchestration.

As part of this approach, operators should look at their "service enablers." Such components as DNS, DHCP and AAA servers are fundamental in the establishment and delivery of services. Unfortunately, they are often overlooked because they usually serve numerous functions and applications and, with packet flow monitoring, it can be almost impossible to track them on an application/service level.

Proactive, real-time management also means dealing with complexity. IP service delivery infrastructures are far more complex than legacy networks, and they will grow even more complex in the future. The modular, layered nature of an IP architecture introduces many more components than exist in legacy networks, and cable operators will need visibility of – and the ability to orchestrate across – all of them. These include customer devices; components in access, backhaul and core networks; control plane enablers responsible for authenticating and authorizing service requests, as well as charging for them; and data center components, such as application servers on which services are running (and any intervening equipment that might also need to be orchestrated, such as firewalls, load balancers, caches, etc.).

If a cable provider is orchestrating the delivery of third-party or blended services, it will need to manage third-party infrastructure components as well. Cable operators

will require a way of abstracting this complexity, while still being able to drill down into it to resolve the root causes of complex service delivery problems.

7. Deliver Performance at Scale: Cable providers will need to orchestrate service delivery across large-scale IP environments, in which they will inevitably be handling, and trying to make sense of, very large sets of data associated with service delivery on a per-subscriber, per-service basis. Therefore, any approach to service delivery orchestration must be able to manipulate large volumes of data in a highly efficient, cost-effective way that supports the MSO's business and customer experience goals.

To achieve such scale, cable operators need to automate the capture and use of intelligence. The ability to apply a high level of automation to service delivery orchestration is critical to managing costs and dealing with scale and complexity. Without automation, MSOs will be unable to build unified, multi-dimensional views of their service delivery environments, disseminate these views in a timely way to multiple service delivery stakeholders and proactively manage service delivery paths on a per-subscriber, per-service basis. Instead, they will be delivering services blind, unable to identify and resolve delivery problems in time and incurring large customer management costs and risking subscriber churn.

By carrying out these best practices, cable operators will go a long way toward ensuring that their networks are future-proof. While IP is the new constant in the world of networks, both it and the technology it runs over will continue to evolve and change over time. Cable operators should make sure that the management processes and technologies they are putting in place to support IP service delivery today can support future services, protocols and generations of mobile and fixed technologies as they are introduced.

Figure 4: Seven Best Practices for Cable Service Assurance

PRACTICE	DESCRIPTION
Adopt an IP-oriented mindset	Manage performance with multimedia and data traffic over broadband networks, rather than video traffic over RF networks.
Gain a unified view of multi-dimensional problems	Develop a comprehensive view of one's networks that covers own services, third-party services, subscribers and devices.
Take a customer-centric approach	Relate one's view of entire service delivery environment back to each individual customer or group of like-minded customers.
Support multiple types of services	Be able to orchestrate, the delivery of any service across its infrastructure, regardless of the type or value of the service.
Support multiple service delivery stakeholders	Create visibility into service delivery for many units so that all dimensions of service delivery orchestration can be covered.
Move to proactive, real-time management of service delivery	Use enhanced knowledge of subscribers and services to orchestrate the service delivery infrastructure from end to end.
Deliver performance at scale	Manipulate large volumes of data in an efficient, cost-effective way by automating the capture and use of data.

Source: Heavy Reading

Conclusion

Cable operators are clearly on the hot seat right now. Facing stiff competitive threats everywhere they turn, operators are under greater pressure than ever to deliver more sophisticated products, services and features to their existing customers and keep them happy. Operators are also under greater pressure to develop new, innovative bundling packages and pricing plans to appeal to their ever more demanding prospective customers – especially the new generation of consumers not attuned to paying for multi-channel video service.

Due to such pressures, cable providers are wisely turning to IP-based technology for their salvation. With the embrace of IP, cable providers can deliver the more advanced products, services and features they need to compete, including cloud-based DVRs, Internet video, WiFi-based home networking and metro Ethernet.

But the adoption of IP technology alone is simply not enough; the implementation of a much higher level of customer service assurance is critically needed as well. Without greater service assurance and improved service delivery, cable operators will not be able to track and target their new services effectively and boost QoE for their customers. Nor will they be able to increase their operational effectiveness and efficiency or improve the coordination of their disparate business units.

Fortunately, there are steps that cable providers can start taking now to optimize their service delivery management and orchestration. By following the seven best practices spelled out in this white paper, they can ensure that their freshly minted IP networks can meet the demands of both today's services and products and tomorrow's. As customer demands evolve and grow, providers will be able to evolve and grow as well, rather than constantly reacting in desperate attempts to catch up.

In other words, a high level of service assurance has become a must-have in the swiftly emerging IP environment. It's high time for cable operators to start treating it that way.