PipelinePub.com

August, 2006 | Volume 3, Issue 3

Staying Flexible:
Supporting "Any Mode of Operation" for Triple Play Service Delivery

by Kevin Macaluso and Mehdi Sif of Alcatel

IPTV: The Change Agent

Video is the "change agent" that has triggered a cycle of upgrades in networks across the world. Service providers have made strategic business and network transformation decisions that will allow them to become fully engaged in the IP television (IPTV) and triple play businesses.

To benefit from triple play opportunities, operators must ensure that their networks can accommodate new demands for dynamic, content-rich applications and bandwidth-intensive services over the next five to ten years. As a result, distributed, end-to-end service delivery architectures, as offered by the leading triple play equipment vendors, have become a de facto blueprint for service providers and vendors alike for enabling and accelerating triple play network transformations in large-scale IPTV rollouts around the world.

Over the past 18 months, leading triple play solutions vendors and their service provider partners have pioneered numerous IPTV service rollouts, and developed unique operational IPTV expertise by working very closely in the IPTV "trenches". This unique expertise has enabled key vendors to augment and solidify their architecture blueprint for triple play service delivery to cater to a multitude of network and deployment environments with different deployment criteria and operational characteristics:

- Legacy infrastructure and network assets: Integrate and consolidate different legacy network elements and operational environments, present mode of operations — geographic coverage, density, available infrastructure
- Region- or geography-specific characteristics: IPTV legislation, competitive landscape, time-to-market pressures, etc.
- Strategic options: IPTV as tactical, incremental service over HSI versus more strategic investment, business model and infrastructure transformation (i.e., service provider positioned at the center of the value chain, as opposed to being network operators or bandwidth reseller)
- Customer base: Service take rate, broadband penetration, deployment size, price elasticity of demand, availability of content
- Other factors: Penetration of "plug-and-play" appliances in households (e.g. set-top boxes [STBs], PCs, voice over IP [VoIP] phones) and more

This document reviews some key findings in the industry and provides significant empirical data relating to the specifics of IPTV network rollouts and associated modes of operation across more than 40+ of the largest IPTV service deployments worldwide, exemplifying how operators can rollout a new generation of infrastructures that can optimize triple play service delivery for "any mode of operation" — i.e. for any combination of access technology, home gateway, authentication protocol, and connectivity mode, as well as subscriber management, policy enforcement and content insertion choices.

Combining Access Technologies to extend Service Reach, optimize delivery

The success of triple play and rich media services depends on the service providers' ability to provide a dramatically enhanced user experience and more interactivity than the traditional broadcast video network offerings. Service providers must indeed deliver user-centric broadband services — that is, any content, to any user at any time, in the most efficient and cost-effective way. This need for flexibility and delivery of services to the most economical point dictates that operators must use a variety of access types and technologies to reach all subscribers cost-effectively, over both fixed and mobile access methods.

For service providers, this typically means results in a mix of access technologies including CO-based DSL (multi-ADSL); fiber to the node (FTTN) (i.e., ADSL2plus), very high-speed DSL (VDSL) and VDSL2; fiber to the user (FTTU) based on a passive optical network; 3G mobile; wireless fidelity (WiFi); and worldwide interoperability for microwave access (WiMAX). The key challenge for operators when they introduce these technologies is to minimize the operational impact by maintaining a unified mode of operation across all access networks. Ideally, therefore, access nodes should share the same equipment practice, typically run the same software, and present unified interfaces, and modes of operations toward the aggregation network. In this way, operators can rationalize their networks and simplify their operations in the aggregation and edge networks. This is achieved through a new generation of service delivery infrastructures that can leverage the full breadth of access portfolio and methods (xDSL, FTTx, wireless etc.) enabling the ultimate flexibility in the first mile.

Home Gateway Deployment Models

There are vast disparities across regions for home gateway choices, with no predominant mode of operation across service providers globally. In North America, service providers favor a routed home gateway mode of operation and because of the larger average number of home appliances per household (STBs, VoIP phones, etc.), routed gateways are typically used to simplify subscriber and host/appliance management challenges.

In Europe, the Middle East and Latin America, on the other hand, the use of bridged home gateways represents the predominant mode of operation, where continuity from the HSI mode of operation seems to be the preferred approach.

These results conclusively point to the need to support any type of home gateway within a service delivery framework. Service providers must provide the full spectrum of subscriber and host/appliance management capabilities (quality of service [QoS]/security, authentication, authorization and accounting [AAA], troubleshooting, billing, etc.).

For example, all plug-and-play VoIP phones within a household must be authenticated automatically, and inherit the host-specific QoS, security and other applicable policies that will allow service providers to, for instance, mark or remark all voice traffic homogeneously within the same household. At the same time, service providers must make sure that the billable entity or subscriber receives the appropriate billing information for all VoIP calls from all VoIP appliances within the same household.

Authentication Methods and Protocol Choices

The predominant mode of operation for broadcast TV and video on demand (VoD) service implementation is dynamic host configuration protocol (DHCP) for the vast majority of all deployments across regions. Although a majority of legacy consumer HSI deployments are based on point-to-point protocol (PPP)/RADIUS technologies for telco companies1, 80 to 95 percent of all providers worldwide have made the strategic and technological decision to leverage DHCP as the predominant mode of operation for their triple play infrastructure. DHCP provides proven, robust and more efficient authentication mechanisms that enable better throughput and transport efficiency, multi-appliance plug-and-play connectivity, maximize flexibility for policy enforcement, content insertion and subscriber management, and facilitate and accelerate the migration from legacy infrastructures through native support for HSI, voice, video and managed enterprise services.

One key concern for service providers is to facilitate and accelerate the migration from a legacy PPP/RADIUS-based HSI installed base to a unified, DHCP-based mode of operation for all services. Such a unified mode of operation should be optimized and streamlined, capable of scaling to the massive demands of triple play and IPTV service rollout. It is therefore critical that the underlying service delivery architecture provide the element, service and subscriber mechanisms that can natively support and integrate the legacy AAA functions, while also progressively migrating HSI subscribers and integrating them within a unified DHCP-based mode of operation for triple play services.

Optimized service delivery architectures must provide a comprehensive set of legacy AAA support functions, including AAA/RADIUS proxy and PPP offload capabilities, together with the most comprehensive and complete set of subscriber management, AAA and DHCP capabilities to support native retail and wholesale HSI service (in addition to voice and video). Today's industry leading Ethernet service switches and service router platforms were purpose-built to provide the full set of scalability, service richness, high-availability and subscriber management capabilities required for truly integrated triple play service operations. Additionally, leading triple play vendors have also innovated and pioneered unique capabilities, such as Programmable Subscriber Configuration Policy (PSCP), which facilitate and accelerate the seamless migration to a unified DHCP-based mode of operation, while leveraging existing, legacy HSI AAA/Radius profiles.

Subscriber and Service Connectivity Modes

In North America, service providers have a strong preference for a VLAN-per-subscriber connectivity model, possibly to mimic modes of operations that were used for previous ATM-based VPI/VCI connectivity models, which are the norm for HSI deployments.

In Europe, Latin America and the Middle East on the other hand, service providers have adopted the VLAN-per-service model as the predominant mode of operation. Other service providers across the globe have adopted deployment models such as VLAN per service, per subscriber or VLAN per IP DSLAM. These cases point to the need to support any combination of connectivity modes within the same service delivery framework.

Service delivery platforms must provide the comprehensive set of subscriber management and policy enforcement capabilities that allow service providers to deploy optimized triple play services over any combination of broadband service access node (BSAN) to broadband service aggregator (BSA) connectivity modes across the second and third miles.

[1] The vast majority of cable deployments and managed communication services from telcos leverage DHCP almost exclusively

Optimized Policy Enforcement and Content Insertion

Operators are working on new service delivery architectures that will be the foundations for their service rollouts for a variety of IPTV and other triple play services over the next five to ten years. Therefore, these architectures need to be highly flexible, service-rich, and dependable resource pools, allowing service providers to engage in rapid innovation and deployment without requiring the complete re-design of their services or the installation of new equipment.

This new generation of service delivery infrastructures implements the optimal distribution of service intelligence over the entire access, aggregation and edge network, rather than concentrating the policy enforcement point at arbitrarily defined single policy enforcement points, as was the case for fairly static, low-bandwidth HSI deployments. A more flexible and optimized deployment of services in a network guarantees high quality and reliable delivery of all services to the user.

For example, multicasting from a centralized point in the network (subscriber termination point) would result in the situation where every packet for every channel being watched would be sent as a separate unicast stream to each subscriber across the network, even if thousands of customers on the same digital subscriber line access multiplexer (DSLAM) were watching the same channel. This approach contrasts with optimized service delivery implementation, which intelligently replicates and forwards content (through multicasting functions) to the access or aggregation network, depending on actual traffic patterns and channel audience, to achieve minimum-cost video distribution.

Likewise, for VoD or advertising content insertion for BTV channels, actual economics, demographics and traffic/viewing patterns will determine the most optimal and cost-effective content insertion point. For example, specific demographics, age groups and ethnicity in a given region may dictate that the most economic point for inserting foreign language soap operas would be within the central office. Other content may be seldom viewed in a given region, but still viewed broadly (by millions of subscribers) across all regions, so would justify insertion at a more centralized location in the third or fourth mile.

Building triple play service deliveries based on legacy HSI network limitations (i.e., fixed, arbitrarily defined policy enforcement points on legacy BRAS) can lead to exponential cost structures and significantly higher risk of restriction as service offerings and behaviors evolve over time.

By design, service delivery architectures must enable the required distribution of service intelligence and policy enforcement of functionalities that were typically centralized in the BRAS for HSI. These functionalities are migrated and augmented to address the stringent QoS, security, accounting, authentication, scalability and service availability demands of triple play rollouts.

In conclusion, dealing with different deployments around the world, it's clear that triple play service delivery architectures must cater to any mode of operation without fundamentally impacting the architectural principles itself. Ultimate flexibility must be enabled for content insertion, policy enforcement, and service intelligence across the infrastructure, allowing service providers to continuously optimize their infrastructure based on actual and evolving traffic patterns. Service delivery architectures must be elastic and enable right-sized deployments that can grow cost-effectively to support mass-market IPTV service rollouts.

Mehdi Sif is Director, Triple Play Solutions Marketing for Alcatel, in Mountain View, California, USA. Mr. Sif has previously held multiple senior product line management and marketing positions at Bay Networks, Shasta Networks (Nortel Networks), and Juniper Networks. Mr. Sif is the recipient of the 2004 U.S. Presidential Volunteer Service Award for his ICT sector assessment work with the International Executive Service Corps.

Kevin Macaluso is Vice President of the Service Router product group within the IP Networks Division (IPD) of Alcatel. In his current role, he manages the complete lifecycle and P&L of Alcatel's IP/MPLS Service Router and Ethernet Service Switch product lines and is a leader in developing Alcatel's IP strategy. Kevin holds an MBA from Harvard Business School (1993) and a BSEE from Santa Clara University (1985).