IPTV and the Future of Telecom Video Network Architectures

EXECUTIVE SUMMARY

IPTV has now become one of the most talked-about new services in telecommunications, as telecom operators have placed a high priority on delivering video over IP as a means to complete their triple-play service bundles. Delivering video over IP presents many new challenges for carriers, given that its requirements are fundamentally different from those for traditional voice and high-speed Internet services. This in turn creates new opportunities for equipment vendors, as service providers plan to increase spending to build out IPTV networks.

The deployment of IPTV will have significant repercussions for carrier network architectures. Whereas the cable/MSO (multiple service operator) world enjoys a relatively centralized architecture, dominated by a small number of large vendors that essentially deliver end-to-end solutions, the telcos’ distributed IP-based architecture is made up of parts from a wide variety of players, all of which must be integrated seamlessly – from set-top box to the underlying network elements.

IPTV and the Future of Telecom Video Network Architectures assesses the impact that IPTV technology will have on telecom networks, along with market opportunities that IPTV will create for vendors and service providers in the coming five years. The report looks at the hardware and software that make up both the service-layer and network-layer infrastructures for IPTV-capable networks, assessing the new demands on network infrastructure that are unique to the scaleable delivery of IP video. The service-layer infrastructure is defined as components of the system that are specific to delivering IPTV services (i.e., IP set-top boxes, middleware software, video servers, head-end systems, and security software for digital-rights management and conditional access). The network-layer infrastructure is defined as components of the system that underpin the service-layer infrastructure by providing the necessary bandwidth and intelligence to deliver video services most efficiently, including access, edge/aggregation, and core network elements. Beyond providing higher-speed access pipes to the home, which is often thought of as the primary role of the network to deliver video, IPTV is also placing new and unique demands on the IP edge, which are detailed in this report.

This report also analyzes key IPTV initiatives from BellSouth and SBC, as those two RBOCs take aim at building and scaling the largest IP-based video networks to date. Competitive operators in Europe and Asia, in addition to smaller North American independent operating companies (IOCs), have taken the lead in deploying IPTV networks and services, providing a technological proving ground. Along with telco deployments, the report details and analyzes the cable industry’s IPTV initiatives, especially the Next Generation Network Architecture (NGNA) project set up by Comcast, Cox Communications Inc., and Time Warner Cable.
IPTV and the Future of Telecom Video Network Architectures covers IPTV product initiatives from 31 telecom equipment suppliers, including these vendors:

- Alcatel (NYSE: ALA; Paris: CGEP:PA)
- Amino Communications Ltd.
- ANT Software Ltd.
- Arroyo Video Solutions Inc.
- BigBand Networks Inc.
- Bitband Inc.
- Calix Networks Inc.
- Cisco Systems Inc. (Nasdaq: CSCO)
- ECI Telecom Ltd. (Nasdaq/NM: ECIL)
- Entone Technologies Inc.
- Envivio Inc.
- Irdeto Access (a subsidiary of Naspers Ltd. [Nasdaq: NPSN; JSE: NPN])
- Juniper Networks Inc. (Nasdaq: JNPR)
- Kasenna Inc.
- Kreatel Communications AB
- Laurel Networks Inc.
- Microsoft Corp. (Nasdaq: MSFT)
- Minerva Networks Inc.
- Motorola Inc. (NYSE: MOT)
- Myrio Corp. (acquired by Siemens AG [NYSE: SI; Frankfurt: SIE])
- NDS Group plc (Nasdaq: NNDS)
- Occam Networks Inc. (OTC: OCCM)
- Optibase Ltd. (Nasdaq: OBAS)
- Orca Interactive Ltd.
- Redback Networks Inc. (Nasdaq: RBAK)
- Riverstone Networks Inc. (Pink Sheets: RSTN)
- Scientific-Atlanta Inc. (NYSE: SFA)
- Skystream Networks Inc.
- Tandberg Television ASA (Oslo: TAT)
- Tut Systems Inc. (Nasdaq: TUTS)
- Widevine Technologies Inc.

Together, the carrier and vendor interviews conducted for this report yield timely and essential information regarding the technology requirements for IPTV and the likely deployment of IPTV-enabling products in carrier networks.

**Report Scope and Structure**

**IPTV and the Future of Telecom Video Network Architectures** is structured as follows:

**Section I** supplies an overview of IPTV technology, with complete key findings of the report.

**Section II** provides a context for the rest of the report by defining the primary IPTV service offerings that are being planned and delivered.

**Section III** presents an overview of IPTV service-layer infrastructure and its role in the creation of IP video services.

**Section IV** focuses on the effect IPTV will have on telcos' underlying network infrastructure, with an emphasis on edge IP aggregation/routing, and details many of the new requirements for future IP video networks.
## Excerpt 1: IPTV-Centric DSLAM Feature Requirements (Abridged)

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
<th>DETAILS</th>
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<tbody>
<tr>
<td>Gigabit Ethernet Network-Side Interface Variations</td>
<td>Various network-side interfaces will be required depending on the location of the DSLAM: CO-based DSLAMs will require short-haul interfaces, while remote DSLAMs will demand long-haul and/or passive WDM interfaces.</td>
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<tr>
<td>Ethernet Switching Functionality</td>
<td>A full suite of Ethernet switching functions will be required, including: split-horizon forwarding, virtual MAC, support for multiple-transmission media, congestion management, link aggregation, Ethernet OAM, broadcast-rate limiting, loop detection, accounting, Ethernet-ATM interworking, etc.</td>
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<tr>
<td>IP Routing Functionality</td>
<td>Key IP routing requirements include: address allocation and aggregation, robust IP protocol support, static routing, routing protocol redistribution, IP packet filtering, IPv4/IPv6 support, various MPLS functions, access control, QOS, and high availability. Some vendors are pushing enhanced IP routing support on the DSLAM, but the primary requirement is IP multicast.</td>
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<td>Distributed B-RAS Functionality</td>
<td>As architectures warrant, the DSLAM will support distributed B-RAS functionality, including Radius AAA and other relevant B-RAS functions. While this may be supported by some IP DSLAM vendors, it seems this function will continue to be centralized further back in the network.</td>
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<tr>
<td>Video Processing/ Multicast</td>
<td>IGMPv3 support per IETF RFC 3376, implementing multicast by providing the functionality of an IGMP router or IGMP proxy.</td>
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<td>SIP-IGMP Translation</td>
<td>The use of SIP as a means to establish an IPTV session may be deployed in certain network architectures; as a result, the DSLAM will be required to support SIP-IGMP translation of SIP messages to IGMP messages.</td>
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<td>Access Control for Ethernet Switching, IP Routing</td>
<td>Enables the operator to control multiple parameters for subscriber access, including MAC address authentication, port and/or VLAN ID authentication, 802.1x Ethernet authentication, DHCP request forwarding, Radius, DHCP, policy control, etc.</td>
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<tr>
<td>Segmentation for Ethernet Switching, IP Routing</td>
<td>Closed user group support will enable the Ethernet switching component to separate the data of one customer or group from that of another customer or group. Segmentation capabilities for integrated IP routing functions include such features as virtual router support and pseudowire support.</td>
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<tr>
<td>Differentiated Services for Ethernet Switching, IP Routing</td>
<td>Differentiated services will enable the operator to apply different policies and services to different subscriber based on their attributes. Differentiated services can be supported via port or VLAN ID, MAC address, 802.1p, and 802.1x for Ethernet switching capabilities. IP routing QOS, as outlined above, will also be required if integrated.</td>
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<tr>
<td>Scaleability and Performance</td>
<td>Some critical issues here involve both the Ethernet switching architecture and the IP routing architecture, e.g.: line-rate forwarding on all ports, port/fabric oversubscription, head-of-line blocking management, highly scaleable VLAN support, scaleable IGP/EGP/multicast support, rapid LSP setup rates, etc.</td>
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<tr>
<td>High Availability</td>
<td>Hardware, software and protocol high-availability support is required for hitless switchover in the case of hardware and/or control plane failures.</td>
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<td>Evolution Requirements</td>
<td>Evolution requirements may revolve around the migration away from ATM on the customer-facing DSL interfaces and/or the evolution of the DSLAM to support fiber access, as fiber is pushed deeper into the access network.</td>
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</table>

*Source: Heavy Reading*
Section V summarizes worldwide IPTV initiatives and strategic deployments of IPTV networks, including those outlined by some North American RBOCs, including BellSouth and SBC.

Section VI highlights the goals outlined by several of North America’s top cable/MSOs, as defined by the Next Generation Network Architecture initiative. NGNA is essentially cable’s answer to triple-play convergence based on IP.

Excerpt 2: NGNA Video CPE Software Architecture

Section VII offers Heavy Reading’s first attempt at establishing a taxonomy for the IPTV market, breaking down the service-infrastructure and network-infrastructure layers by function and detailing the associated industry players.

Section VIII assesses the market positioning of key vendors in the IPTV ecosystem (both service and network layer) as they roll out products to enable IP video networks.

The report is essential reading for a wide range of industry participants, including the following:

- **Equipment suppliers**: How does your IPTV product portfolio match up with the competition? Does your product line address the key issues that network operators are targeting with their IPTV plans? What’s the most likely timing for broad carrier deployment of IPTV technology?

- **Component and subsystem manufacturers**: Which system solutions are making the most aggressive moves into the IPTV sector? How do system vendor product development plans match up to your portfolio? What are the most attractive prospects for your products?

- **Network operators**: Are your IPTV plans in sync with the market? Which technologies are settling in as the most popular choices? Which vendors will be in the best position to deliver the products you need to build your IPTV-capable network?

- **Investors**: Which equipment makers are in the best position to capture market share in this important telecom industry sector? When will this sector begin to show meaningful and sustainable growth?

IPTV and the Future of Telecom Video Network Architectures is published in PDF format.