Tata Communications and Cisco ASR 9000—

Enabling Next-Generation Carrier Ethernet Transport Services

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The approach to building service provider networks is at a crossroads, with significant changes occurring from the applications being adopted by enterprises and consumers and traffic flowing across networks. Cisco Visual Networking Index forecast predicts the worldwide IP traffic is going to quintuple from 2008 to 2013. Market drivers include the ongoing surge in end customer bandwidth requirements fueled by new high-bandwidth applications such as video, network-based storage, data centers interconnect over WANs, 3G/4G wireless backhaul, virtualization/cloud computing, Video Teleconferencing/TelePresence and online gaming to name a few.

- IP traffic will quintuple from 2008 to 2013
- In 2013, two-thirds of a zettabyte will cross the global network
- Internet video streaming and downloads will grow to 90% of consumer, IP traffic by 2013 (60% excluding P2P)
- Business Video conferencing will grow tenfold over forecasting period

The common denominator for this transformation is the consolidation of network services over a converged Carrier Ethernet infrastructure. Carrier-class Ethernet has become a fundamental requirement in the transformation toward IP Next-Generation Networks (IP NGN) and their associated services. In a recent report, Infonetics Research estimated that service providers generated $20.8 billion from carrier Ethernet services in 2009 with a healthy growth rate (through the economic downturn) of 23% compared to 2008 numbers. In addition to raw bandwidth growth, the very nature of the services needed is expected to evolve. For instance, the need for services beyond conventional basic point-to-point transport is expected to grow and specifically the demand for multipoint services such as E-Lan and E-Tree is expected to grow significantly in order to address applications such as video distribution and data center virtualization.
A future-proof carrier Ethernet network is one designed to handle all such emerging services in a reliable, scalable and flexible manner for years to come. This is the basis for the design of Tata Communications’ cutting edge new carrier Ethernet transport network. There are many engineering innovations and enablers within the design of this next-generation network. This technical note briefly examines two of the key technology enablers for this new network viz. the Cisco ASR 9000 platform and the Provider Backbone Bridge (802.1ah) technology.

**Provider Backbone Bridge**

The figure below illustrates how the Provider Backbone Bridge (PBB) feature of the ASR9K helps a carrier Ethernet network to scale. By isolating and providing aggregated network paths for multiple separate edge/access networks, the PBB feature enables a true carrier class provider Ethernet network. The attributes of such a network include:

- Ability to hierarchically scale a carrier Ethernet network to worldwide level with hierarchical separation of access and aggregation domains from the core domain (see following figure).
- Ability to support all services such as E-Line, E-LAN and E-Tree defined by the Metro Ethernet Forum (MEF) over a single common infrastructure and in a scalable manner.
- Ability to support efficient broadcast and multicast for E-Lan and E-Tree services without requiring inefficient bandwidth or packet replication as can happen in some carrier Ethernet architectures. This becomes critical for multipoint and video services.
- Ability to support millions of individual customer services over a single common infrastructure. For instance, existing networks based only on QinQ or 802.1ad technologies are limited to 4K customer services (VLANs) only.
- Ability to perform traffic engineering to select lowest-latency paths for Layer-2 services resulting in high throughput and low-latency for customer applications such as network data storage/backup and real-time video. This also results in optimal utilization of network bandwidth resources resulting in lowering overall cost of bandwidth to the carrier and to the end customer.
- Better network reliability and robustness. Due to hierarchical separation of access from core, network convergence events in access networks are isolated from the core network and vice versa. This results in better network performance and quality of experience overall – for all users. A topology change in the backbone PBB network does not cause flushing and broadcast/relearning floods of all customer MAC addresses.

All of these benefits result in an efficient and scalable network that allows Tata Communications to provide a flexible set of low cost, reliable point-to-point as well as multipoint Ethernet transport services over a global scale network.
The ASR 9000 is Cisco’s flagship platform for Unified Converged Edge and Cisco continues to invest in this platform to add even more industry-leading features and scalability upgrades in the near future. This industry leading platform is custom-designed to address the needs of next-generation carrier Ethernet services as described earlier and lies at the heart of Tata Communications’ new network.

Some of the industry-leading carrier Ethernet-specific benefits of the ASR 9000 include:
- High bandwidth scalability (400 Gbps per slot and 6.4 Tbps per chassis)
- High logical services scalability (64K logical service flow points, 1M+ IP routes, 512K MAC addresses). Hardware designed for even more scale with future software upgrades. Software architecture designed from the ground up for agile responsiveness to network convergence events even at high services scale.
- Support for all Metro Ethernet Forum service standards including E-Line, E-Lan and E-Tree.
- Next-generation carrier-class OS fully modular and fully distributed to enable scale + resiliency needs of future carrier networking requirements.
- On-chassis support for other applications such as integrated timing support for mobile backhaul; inline video quality monitoring and video caching server for digital video and IPTV services.
• Industry-leading switching throughout while retaining energy efficiency via flexible power management capability. This includes pay-as-you-grow power module support.
• Hardware-based performance for many of the critical carrier Ethernet features including link aggregation, MAC learning/bridging, optimal broadcast/multicast, OAM (802.1ag, Y.1731).
• Wide range of Layer-2 and Layer-3 features supported including latest IEEE, IETF, ITU and MEF standards such as: 802.1Q, 802.1AD, 802.1AH, 802.1AG (CFM), Y.1731, IETF VPLS and H-VPLS, BGP-based auto-discovery and signaling for VPLS, MEF 6, MEF 9, MEF 10 and MEF 14.
• Flexible and scalable quality of service features including scalable, per-service hierarchical QoS, traffic policing, shaping and marking features.
• Carrier class manageability options including CLI, XML, SNMP. Supported via Cisco NMS including Advanced Network Abstraction (ANA) and ACT (ASR9K Craft Tool).

Conclusion

Carrier Ethernet aggregation networks are faced with unprecedented demand for bandwidth, scalability, reliability and multiservice capabilities for wireline, mobile, retail and wholesale services. The Cisco ASR 9000 Series meets these demands in scale and throughput while providing flexibility for different technology choices as part of the Cisco IP NGN Carrier Ethernet design supporting many business models that will enable carriers to expand their offerings in quality and quantity for years.

Tata Communications, a member of the $72.5 billion Tata Group, is a leading global provider of a new world of communications. The emerging markets communications leader leverages its advanced solutions capabilities and domain expertise across its global and pan-India network to deliver managed solutions to multinational and Indian enterprises, service providers and Indian consumers. Tata Communications’ range of services include transmission, IP, converged voice, mobility, managed network connectivity, hosting and storage, managed security, managed collaboration and business transformation for global enterprises and service providers, as well as Internet, retail broadband and content services for Indian consumers. The Tata Global Network encompasses one of the most advanced and largest submarine cable networks, a Tier-1 IP network, with connectivity to more than 200 countries across 300 PoPs, and more than 1 million square feet of data center and colocation facilities. Tata Communications’ unique emerging market depth and breadth of reach includes a national fiber backbone network and access to network in over 60 cities and 125 PoPs in India, strategic investments in South African converged services operator, Neotel, Sri Lanka and Nepal and, subject to fulfillment of conditions precedent, a 50% ownership in China Enterprise Communications (CEC) providing full country VPN coverage in China. Servicing customers from its offices in over 80 cities in 40 countries, Tata Communications is the number one global international wholesale voice operator and number one provider of international long distance, enterprise data and Internet services in India, the Company was named “Best Wholesale Carrier” at the World Communications Awards in 2006, “Best Pan-Asian Wholesale Provider” at the 2006 and 2007 Capacity magazine Global Wholesale Telecommunications Awards and was awarded “Best Progress in Emerging Markets” at the 2008 Mobile Communication Awards. Tata Communications Limited is listed on the Bombay Stock Exchange and the National Stock Exchange of India and its ADRs are listed on the New York Stock Exchange. (NYSE: TCL)