

## The MPLS & Ethernet World Congress 2008

February 11, 2008

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Last week the 10<sup>th</sup> edition of the MPLS & Ethernet World Congress was held in Paris. About 900 people attended the conference, with more than half of those attendees coming from fixed and mobile vendors, augmented by a good number of service operators, and also some regulators and broadcasters.

It was an upbeat event, due to the strong demand that operators and vendors are seeing for MPLS implementation, and their increasingly optimistic forecasts for the years ahead. The vendor exhibition area was augmented by the EANTC (European Advanced Networking Test Center) demo room showcasing an interoperability platform that demonstrated a complete mobile backhaul transport network supporting MEF and IP/MPLS Forum defined services.

Fifteen vendors participated in the EANTC demo, included Alcatel-Lucent, Ceragon, Ciena, Cisco, Ericsson, Harris, Huawei, Ixia, Lightstorm, MRV, Nokia Siemens Networks, Nortel, RAD, Spirent and Telco Systems.

### Key topics:

Key topics throughout the conference included the ongoing process of Ethernet and MPLS technology merging, OAM considerations, multicasting, mobile backhaul, services, and the ongoing competition between T-MPLS and PBT, PBB and PLSB.

The four days of the conference were densely packed with presentations from vendors, service providers and regulators. Our comments and thoughts on some of the key topics addressed follow:

### A possible change in the list of PBB-TE supporters?

The debate between Ethernet and MPLS merging process through T-MPLS, PBB-TE and PBB is drawing strong interest in the community. **PBB and PBB-TE** have made dramatic progress in gaining operator interest over the past year, supported by the pioneering role of Nortel.

Alcatel-Lucent has been the staunchest supporter of T-MPLS, though vendors such as Ericsson and Nokia Siemens Networks are among those supporting both T-MPLS and PBT-TE, and vendors such as Ciena, Meriton, and others both announced and not have joined Nortel in supporting PBT-TE. But as the interest in PBT-TE has grown, particularly now that Nortel is in the process of bringing **PLSB** to market to address multi-casting and greater manageability, we wonder if Alcatel-Lucent's position regarding support of PBT could change. If Nortel can gain enough momentum, Alcatel-Lucent could be forced to support PBT as well as T-MPLS,

though due to the strength of conviction they have expressed on supporting T-MPLS to the exclusion of PBT, we think they will not do so until it is obvious that it is a foregone conclusion that Nortel has succeeded in gained strong mindshare with operators. Mention of the possibility of supporting PBB together with MPLS during an Alcatel-Lucent presentation at this conference could potentially indicate that the company's stance toward PBT might change to a more agnostic view in future, but Alcatel-Lucent has neither officially stated this intention nor confirmed such a direction at this time.

### **Still some open issues with PBB-TE: time and cost**

The lack of **Multicast support** can be considered the major issue for PBB-TE, seen its importance in supporting IPTV rollouts - the service that more operators are most certain about when it comes to revenue potential - and operators will want to see control plane development underway too. But these are problems that no doubt will be solved in time, and which Nortel is working on as part of Provider Link State Bridging (PLSB). If PBT-TE has a potential "Achilles Heel," it is **time**...not whether these enhancements can be achieved, but when. If it has a second potential "Achilles Heel," it would be **cost**. Nortel needs to prove that after it adds all this new functionality, it will still have the promised cost effectiveness relative to T-MPLS. The biggest potential obstacle to PBT-TE is not developing future multicast support or a control plane, but rather getting operators to see enough value in it, both operationally and from a cost perspective, to make it worth their wait because T-MPLS provides a viable alternative available today.

Getting the right mix of technology, CapEx, OpEx, and time to market makes investing in any approach on which the market has yet to achieve full consensus very difficult for service operators. Their pursuit of profitability over the life cycle of any investment complicates the question of whether T-MPLS or PBT-TE is the better route to go. There is always a "next thing" on the horizon, and operators have to try and make "apples to apples" comparisons between technologies, anticipating future costs -even when one of the apples is riper than the other. And that would not be easy to do, even if vendors did provide unbiased input for business case analysis. T-MPLS has the advantage of time to market. But the amount of interest PBT-TE and the development of PLSB seem to be generating indicate that Nortel, despite coming to market a bit late, will have full opportunity to prove its case in both the labs and Excel spreadsheets of a good number of operators.

### **Difficult choices for service providers wanting to deliver Ethernet Services**

When building their Carrier Ethernet Networks, service providers have a choice of several technologies to deliver Ethernet services: Ethernet switches, Routers, Optical switches, and combinations of the above.

The choice of these technologies is even more difficult due to the fact that several standardization efforts are still in progress, and vendors can come to the market with pre-standard equipment, or make different choices of implementation, without considering that some technology choices may be driven by specific service providers' needs.

Further constraints are dictated by the fact that full multivendor interoperability usually requires maturity in standards and in vendor implementations, and providers are usually reticent to deploy technologies that may lock them into a

particular vendor, but at the same time, they don't want to be forced into using old technology that may not meet their ongoing requirements.

### **Early deployment and subsequent evolution**

A typical Ethernet service provider deployment that was early to market might use Ethernet switches and Q-in-Q for customer separation. As the service offering becomes successful, the provider will frequently encounter the usual Ethernet scaling limitations, and typically will need to support more customers beyond the 4K VLAN tag limit and MAC address limits, and be required to support increased network reliability and feature support such as:

Ethernet OAM (Y.1731, IEEE 802.1ag) for failure detection and notification, dual-homing of customers and switches to protect against single switch failures, in-service SW upgrades, a non-stop control plane and data plane, support for multiple classes of services.

To improve the **scaling** issue, Service Providers can rely on physical hierarchy and tunneling: there are today two primary tunneling alternatives: IEEE 802.1ah Provider Backbone Bridging (PBB) and MPLS-based VPWS for EPL and EVPL, and VPLS for EP-LAN and EVP-LAN services. Each alternative has its pro and cons, as always happens in those cases.

### **Solving the scaling issue with MPLS or PBB**

MPLS strength lies in the possibility to converge infrastructure based on MPLS, on the fact that MPLS and VPLS are widely available and interoperable and allows traffic engineering to optimize backbone use.

On the other side of the coin, with MPLS there is the need to translate between Ethernet and MPLS OAM, and there are also concerns about MAC address scaling in H-VPLS, and full-mesh tunnel scaling in large VPLS networks.

For PBB, one strength it has is that it can be implemented with less change to the existing architecture of many Ethernet networks, and therefore should generate less disruption during deployment - and provide a more efficient multicast support, having native multicast capabilities through the use of multicast MAC addresses. On the weaknesses side, it is still a pre-standard technology, and while link-state routing will come in the future, it currently depends on spanning tree routing. It also may need PBB-TE to optimize backbone utilization.

Today it is not possible to find a single answer as to there being one technology that best fits all cases. Several parameters, such as network topology and its planned evolution, MPLS and VPLS initial support, requirement for multicast services delivery, level of risk that the provider is ready to take in implementing a pre-standard technology, to cite some of them, have to be analyzed in each network to define the best solution.

### **A new combined approach**

An interesting approach was detailed by Verizon and Alcatel-Lucent in two closely related presentations:

The companies have indicated interest in taking advantage of both MPLS and PBB strengths in a combined approach using a VPLS core with PBB access for low cost scaling at the edge. The work is very preliminary today, based still on drafts from individual contributors at this time.

(See draft-sajassi-l2vpn-vpls-pbb-interop-02.txt and draftmartini-pwe3-802.1ah-pw-01.txt)

### **How the two technologies can be complemented**

PBB can potentially bring MAC scalability to the solution, and can help scale VPLS and PWE infrastructure, providing an efficient multipoint distribution scheme for dense multicast communities. An operator could potentially complement this deployment at the edge with a multi-service MPLS/VPLS core, which would let them bring traffic engineering and Fast Reroute features in the core, and allow them to discontinue using STP and eliminating the need for a BVID per service for flood containment.

So the two technologies can potentially be seen as complementary to one another as well as being potential competitive alternatives, using PBB where native Ethernet is required, and MPLS where it is not.

This solution has potential to bring very interesting global benefits, and standardization efforts will have to be closely monitored in particular by those carriers who are aggressively deploying VPLS. One of those carriers, Verizon, has announced an expansion of VPLS in the United States, Europe and Asia-Pacific as an access option to its MPLS-based IP services. Broadwing and Hutchison Global have also announced a VPLS-based intercarrier Ethernet network earlier this year.

### **The EANTC interoperability test was focused on mobile backhauling**

The EANTC showcase lab setup was comprised of over 85 devices from 15 vendors, simulating voice and data service integration over Carrier Ethernet and MPLS networks. The following aspects of vendor interoperability were included in the testing:

- Migration paths: Access, metro and inter-domain circuit emulation services
- Clock synchronization
- WCDMA and GSM mobile applications over PBB-TE metro network
- Metro transport over MPLS, PBB-TE and T-MPLS
- Ethernet OAM
- Resiliency
- Quality of service support
- End-to-end EVPL and E-LAN services

The tests showed interesting and positive progress in interoperability. Not only did implementations of the three major aggregation technologies (MPLS, PBB-TE and T-MPLS) interwork well within their respective metro/aggregation networks, they also correctly interfaced with the MPLS core.

Mobile backhaul has become a hot topic for the telecom industry because packet switched networks can potentially slash the operating costs of leased line circuits, can accommodate bursty mobile data traffic more cost effectively than TDM, and can offer the prioritization, queuing, and oversubscription techniques while satisfying the need for operators to interconnect efficiently with content providers that are building out their own IP networks.

However, packet transport also poses major challenges when implementing an integrated, multiservice network that includes a next-generation core, aggregation and access network. So far, the vast majority of mobile operators are not moving

quickly to packet-based backhaul - due to the issue of how to provide effective synchronization over an IP network not having been resolved yet.

### **Synchronization is the key obstacle**

We think **Synchronization** remains a very key obstacle to migration to an all-IP RAN for more established operators - one that is standing in the way of a lot of revenue potential for vendors and cost savings for operators, and therefore this topic will get a lot of attention from both in 2008. 1588v2 is being extensively tested and refined, but has a ways to go yet before gaining full operator acceptance. Ethernet synchronization may work better, yet does not offer the required legacy support and requires wide fiber availability that is not characteristic worldwide. For now, the inherent synch provided by TDM is keeping deployment of this technology strong in backhaul - with offload of data traffic onto DSL helping cut the cost of mobile data traffic as an interim step for a growing number of operators. And GPS continues to fill in where TDM does not provide the timing, though ultimately we think operators would prefer clocking over the network and are hoping for lower costs by doing so.

### **To conclude**

The debate and vendors' positioning in the MPLS/ PBB-TE arena continues to heat up. Time to market and the total costs of ownership each technology enables will be the main drivers and the game is open between constructors to try to get the most interesting part of this market.

Service delivery technology choices are also generating strong interest, considering the attractive amount of revenues available in this market. Service providers want to be ready to offer the services that best suit customers' need on one side, but that are also the most lucrative for themselves, and are clearly asking vendors help and suggestions to better address this opportunity.

Migration to an all-IP RAN potentially offers interesting opex and capex improvements, but today also scares established operators that are required to face the technological gap brought by the requirement for a viable synchronization tool to the emerging packet networks, and who are looking for the most cost effective means of building a packet network that most cost effectively supports multiple generations of technology.

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