Feedback from the Carrier Ethernet Interoperability Test 2008

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Testing Goals, Revisited

- Progressed Multi-Vendor interoperability
  - Verified new solutions: E-Tree, E-LMI, clock synchronization with IEEE 1588, …
  - Showcased the industry’s current state and advances: How far have Ethernet OAM, metro technologies, mobile backhaul services, … got
  - Validated large number of implementations independently
<table>
<thead>
<tr>
<th>Geneva 2007</th>
<th>Berlin 2008</th>
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<tr>
<td>Larger crowd initially</td>
<td>Sustained, substantial interest over all 3 days</td>
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<td>Interest subsided starting on second day</td>
<td>Interop event covered by many conf. presentations</td>
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<td>Metro technology battle dominated – deployment</td>
<td>Detailed questions – SPs are in POC tests / deployment,</td>
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<td>questions rarely raised</td>
<td>coming across interoperability challenges now</td>
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Interoperability Event
Participating Vendors
> 90% Carrier Ethernet switch/router market share
Physical Showcase Experience

110+ devices in 16 racks
- 500 cables, 230 boxes
- Logistics challenge worthwhile! Probably largest test bed worldwide, invaluable experience

Energy consumption – Red hot, not green
- 25 °C in the room, 32 °C on the stage, 60 °C in the racks
- 30 kW electrical power, 15 kW cooling power
- Need to reduce consumption moving forward – for the same practical reasons as seen in POPs
Carrier Ethernet Transport Technologies

- Metro technologies: MPLS, PBB-TE, T-MPLS compete and collaborate
- Steady growth of access/CPE solutions
- Rapid growth of Ethernet-based microwave solutions

Number of Systems

2005 2006 2007 2008

Technologies

Number of Systems

0 5 10 15 20 25 30 35 40

MPLS, T-MPLS, PBB-TE, Microwave, Access and CPE
Questionnaire Responses

Algeria Telecom
Belgacom
Brazil Telecom
Broadband Infraco
British Telecom
Colt Telecom
GTS Novera
GVT
Orange UK

PT Prime
Swisscom
Telecom Italia
Telecom New Zealand
Turk Cell
T-Com / T-Systems
Telefonica
Versatel
Vodafone

(28 in total)
Questionnaire

Relevance of Interoperability Areas

1. Ethernet OAM
2. Ethernet Service Types (E-Line, E-LAN, E-Tree) + Performance Monitoring and Reporting
3. Metro Transport (MPLS, MPLS-TP, PBB-TE)
Results Highlights:
Connectivity Fault Monitoring (CFM)

- 12 router/switch plus 2 analyzer vendors participated
- Tremendous level of support
- Implementations fully interoperable for the three basic services (CC, LT, LB)
- Added Remote Defect Indication tests
Questionnaire

Relevance of Interoperability Areas (2)

4. **Metro Ethernet Security (new)**
5. **Access Technologies**
   + Carrier Ethernet for Business
   + Bandwidth Profile Service Attributes
6. **E-NNI**
Results Highlights:
External Network to Network Interface (E-NNI)

Interface between administrative boundaries

- Remains critical
- No single solution standardized yet – realistic goal at all?
- Peering effort high to date
Questionnaire

Least Relevant Interoperability Areas?

1. IEEE Resilience (Shortest Path Bridging)
2. Circuit Emulation and ATM Pseudowires
3. Carrier Ethernet for Residential Triple Play
4. Provisioning and Dynamic Control Plane

Interpretation:
- Service providers attending CEWC focus business services (not mobile backhaul, triple play) today
- Standardized resilience is an open question
Questionnaire

Opinions From the Show Floor

“We need robust devices based on open standards and offering a good service.” (translated)

“Access devices need to be interoperable with the service provider network with regards to bandwidth profiles, high availability solutions”

“Vast majority of services are over SDH/TDM and IP-VPN. E-Line represents a very small percentage so far.”

“Integrating all networks is not a desirable goal.” (vendor)
Questionnaire
Use of Carrier Ethernet Services

Service Split Between Technologies

- E-Tree
- E-LAN
- E-Line
- IP VPNs
- Layer 1 (SDH, PDH) Services

Today

In three years
Questionnaire
Service-Level Agreements

- Network-centric: 8
- Service-centric: 18
- Application performance focused: 2
Results Highlights:
Clock Synchronization

Base station clock synchronization stable via IEEE 1588 over >24 hours
Network tear down: Holdover procedures nicely visible
Outlook – EANTC Interop Plans for ´09

- Plan to start migration testing of T-MPLS towards MPLS-TP in 02/2009
- Deep dive interoperability testing in Ethernet OAM
- Focus Carrier Ethernet access technologies for business customers – DSL, FTTx, WiMax, …
- Validate advances in OTN (Optical transport network) and its integration with switched/routed services
- Rigid multipoint / multicast service testing
Further Information

EANTC edited a detailed, unbiased white paper (24 pages)