



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

Interest in Interoperability Event

Geneva 2007	Berlin 2008
<p>Larger crowd initially Interest subsided starting on second day Metro technology battle dominated – deployment questions rarely raised</p>	<p>Sustained, substantial interest over all 3 days Interop event covered by many conf. presentations Detailed questions – SPs are in POC tests / deployment, coming across interoperability challenges now</p>

Participating Vendors

> 90% Carrier Ethernet switch/router market share



Physical Showcase Experience

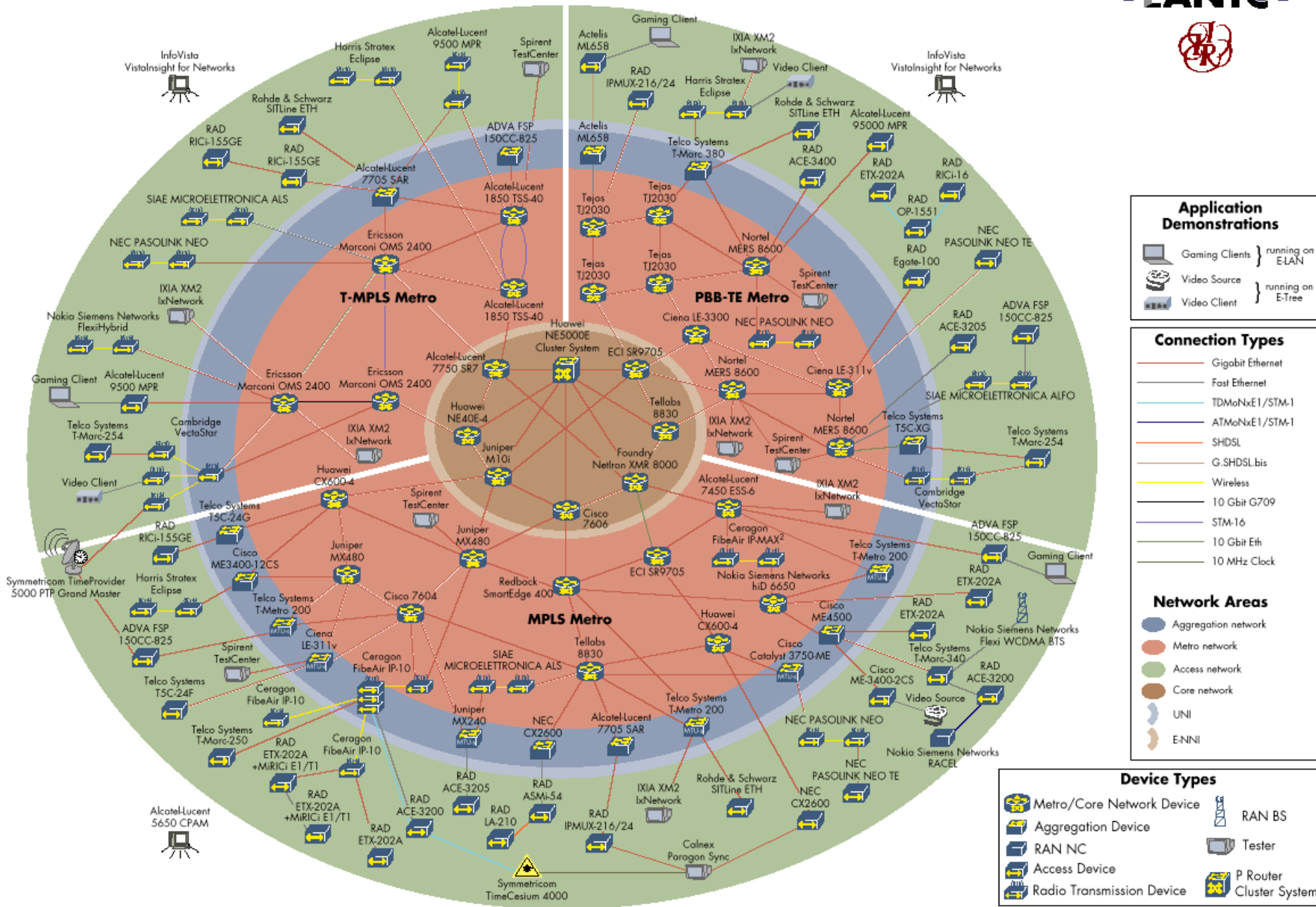
110+ devices in 16 racks

- 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

Multi-Vendor Carrier Ethernet Interoperability Event 2008



Application Demonstrations

- Gaming Clients } running on ELAN
- Video Source } running on E-Tree
- Video Client }

Connection Types

- Gigabit Ethernet
- Fast Ethernet
- TDMoNxE1/STM-1
- ATMoNxE1/STM-1
- SHDSL
- G.SHDSLbis
- Wireless
- 10 Gbit G709
- STM-16
- 10 Gbit Eth
- 10 MHz Clock

Network Areas

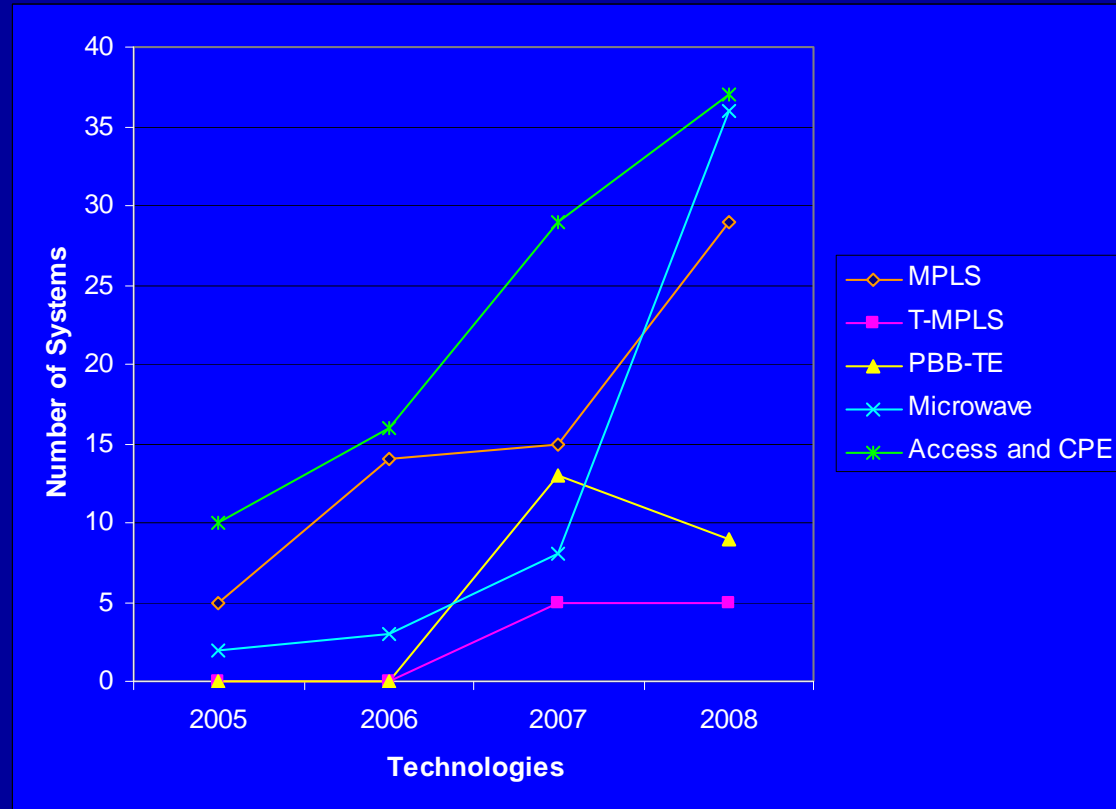
- Aggregation network
- Metro network
- Access network
- Core network
- UNI
- ENNI

Device Types

- Metro/Core Network Device
- RAN BS
- Aggregation Device
- Tester
- RAN NC
- P Router Cluster System
- Access Device

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



Questionnaire Responses

Algeria Telecom

Belgacom

Brazil Telecom

Broadband Infracore

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

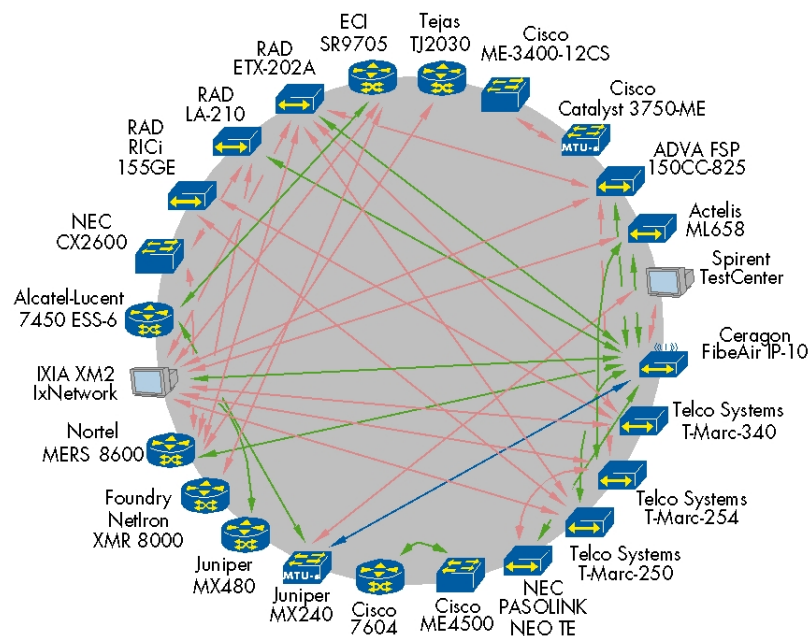
(28 in total)

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)



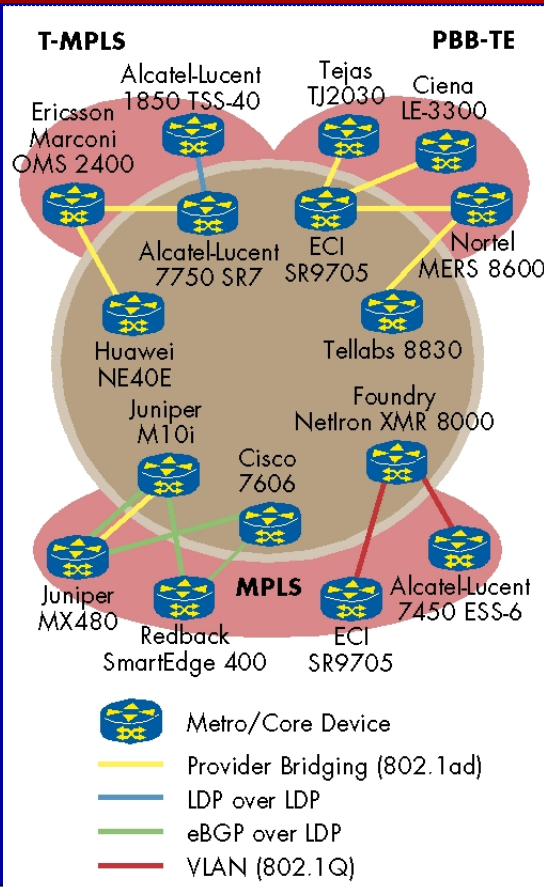
- 12 router/switch plus 2 analyzer vendors participated
- Tremendous level of support
- Implementations fully interoperable for the three basic services (CC, LT, LB)
- Added Remote Defect Indication tests

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

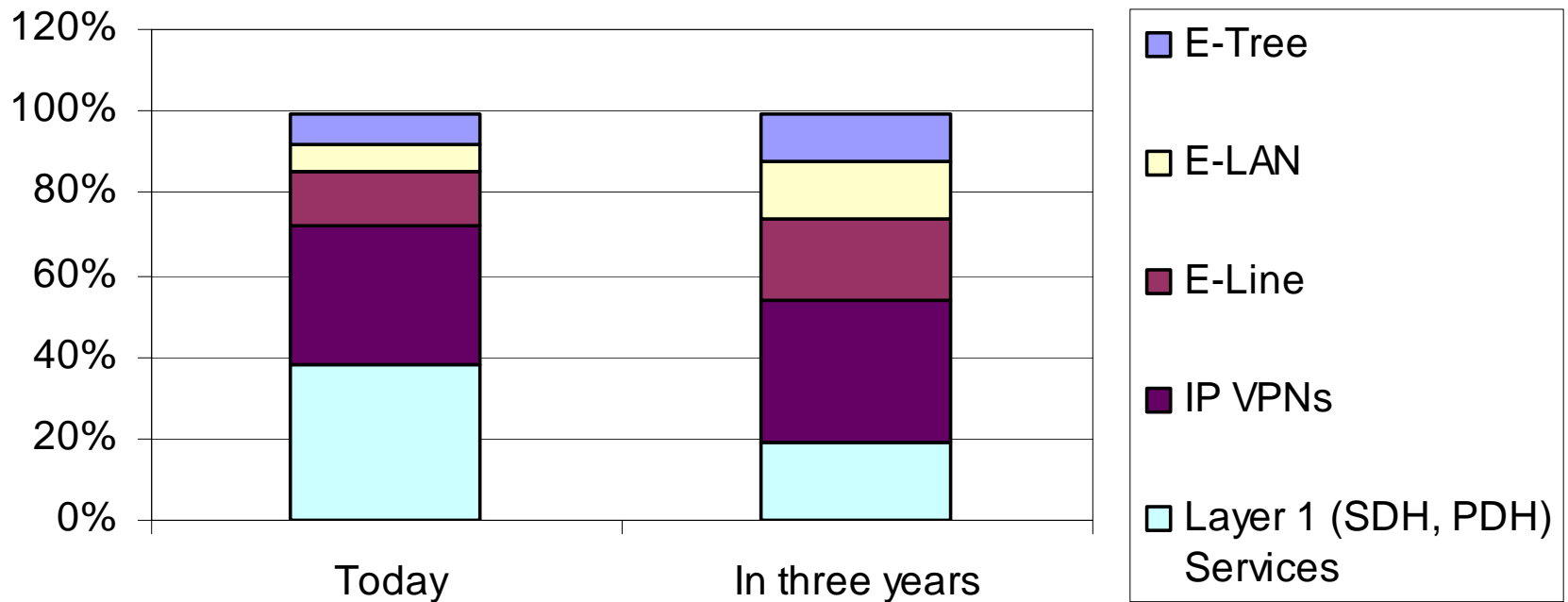
Opinions From the Show Floor

- “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

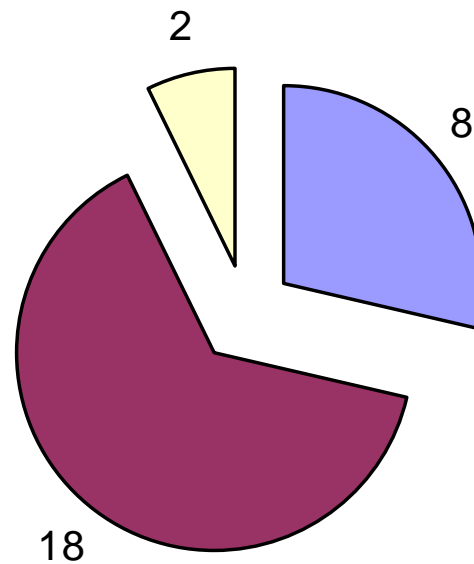
Use of Carrier Ethernet Services

Service Split Between Technologies



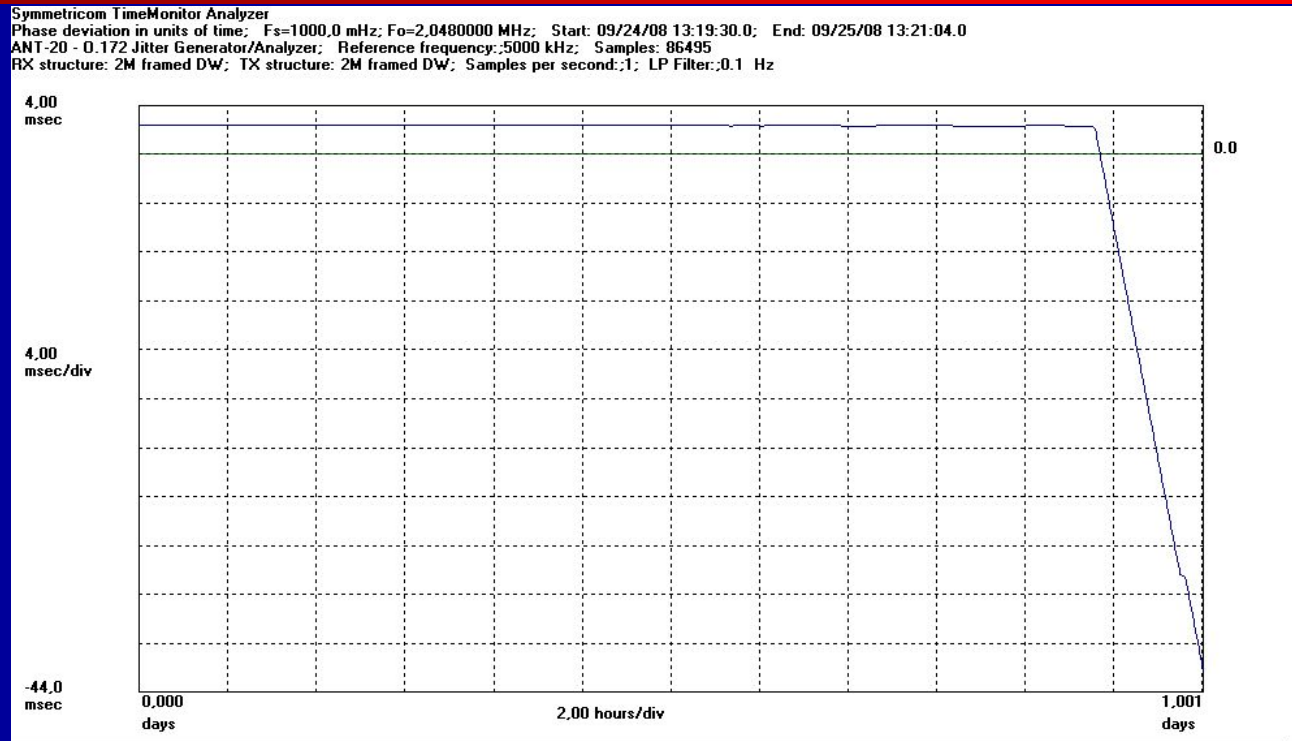
Questionnaire

Service-Level Agreements



- Network-centric
- Service-centric
- Application performance focused

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)

- <http://www.eantc.com/cewc2008>