
On the way to Carrier Ethernet Interoperability and Reliability

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European Advanced Networking Test Center

About EANTC

The European Advanced Networking Test Center offers vendor independent network quality assurance since 1991.



EANTC, Berlin, Germany

- Test and certification of network components for manufacturers
- Proof of concept evaluation, acceptance tests and network design consultancy for service providers and large enterprises
- Research and development of test methods and analysis tools



Agenda

- Is there a need for Carrier Ethernet Testing?
- Experiences of recent EANTC multi-vendor interoperability tests
- Hot topics for service provider tests: services and applications
- Outlook: Realistic expectations for NNI interop and performance

Carrier Ethernet Justification

Carrier Ethernet one of the hottest topics in wireline networking in 2005/2006

- Carriers seek for scalable and affordable solutions for Triple Play and business layer 2 services
- Many networks are upgraded after telecom investments were delayed in the early 2000's
- "Carrier Ethernet" driven by strong marketing efforts

Status of Standardization

Can standardization keep pace with demand?

- IEEE 802.1 / 802.3 Committees
- Metro Ethernet Forum (MEF)
- ITU NGN Focus Group

Protocols / Services Yet To Be Standardized

- Provider Bridges
- Operation, Administration & Maintenance (OAM)
- Network-Network Interface (E-NNI)

Relevance of Carrier Ethernet Testing?

Will implementations be compliant soon?

- Many more vendors than in the router market
 - Diverse markets (core, aggregation, DSLAMs, CPEs, ...)
 - Different service provider architectures
- Carrier Ethernet Testing is key to increase product quality and service provider confidence

Services and Applications

Residential Triple Play:

- Video requires huge bandwidth scalability, multicast replication
- Voice requires application-specific traffic prioritization, low latency, intelligent filters
- Data requires queue-in-queue encapsulation, MAC address scalability

Business applications:

- Multipoint (E-LAN) requires suitable network service
- Multicast, QoS also used

Current Areas of Testing

Carrier-Specific Ethernet Test Areas:

- L2 Scalability to many 10,000 customers in an Ethernet cloud
- Interfacing with core / aggregation networks (MPLS, IP)
- Protection and High Availability
- Security (Denial of Service attacks)
- User-Network Interface (facing CPEs)
- Multicast performance both for Triple Play and business VPN services
- Service Level Management (QoS, DiffServ)
- Provisioning, Network Management

Recent Public EANTC Tests

Public Multi-Vendor Interoperability Test

At Carrier Ethernet World Congress
Berlin, September 2005

- Improve Multi-Vendor Interoperability
- Validate Carrier Ethernet Standards
- Demonstrate Sample Network Design



Sponsored By **METRO** Ethernet Forum

Supported By **T** Systems

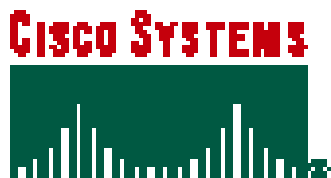
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Participating Vendors



Agilent Technologies



data communications

SIEMENS



River
STONE
NETWORKS™

DMC
stratex
NETWORKS

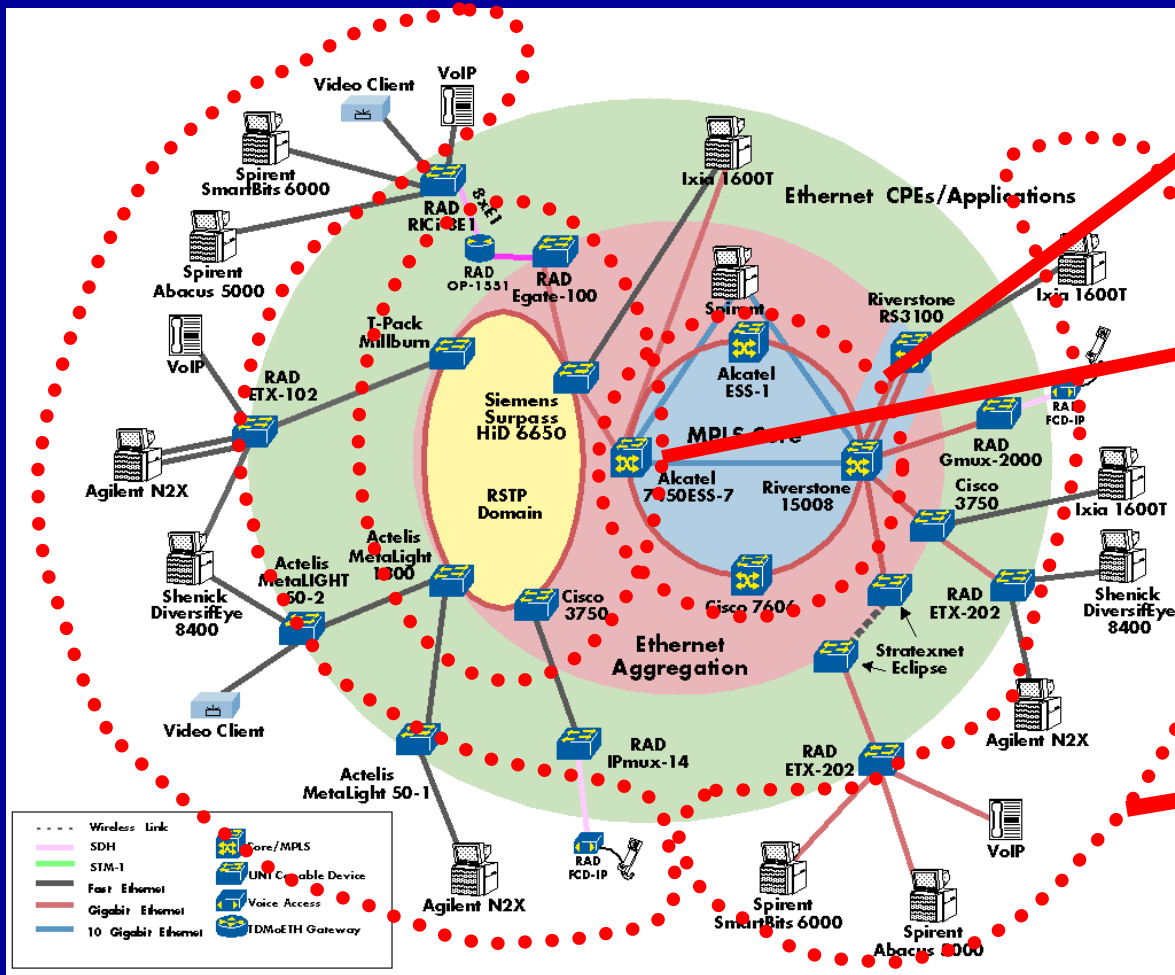


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Network Topology



MPLS Backbone

Ethernet
Aggregation
Network
(City Pop)

CPE Devices
and Analyzers



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Services Tested

E-Line 

- Point-to-Point Business Service

E-LAN 

- Multipoint-to-Multipoint Business Service

Triple Play

- Video Broadcasting and Video on Demand
- Voice over IP Transport
- High-Speed Internet

TDM Support (over E-Lines)



Hotstaging

- Extensive tests conducted to verify end-to-end interoperability
- With on-site support from all participating vendors
- Aug 29 – Sep 2, 2005
- At EANTC lab in Berlin



CEWC 2005 Results

MPLS / VPLS

- Protection ✓

User-Network Interface (MEF 9)

- Jumbo Frames ✓
- Bandwidth Profiles ✓

Network-Network Interface

- Protection (Rapid Spanning Tree) ☠
- Multicast ✓ + ☠

Versatile Access, TDM Support ✓

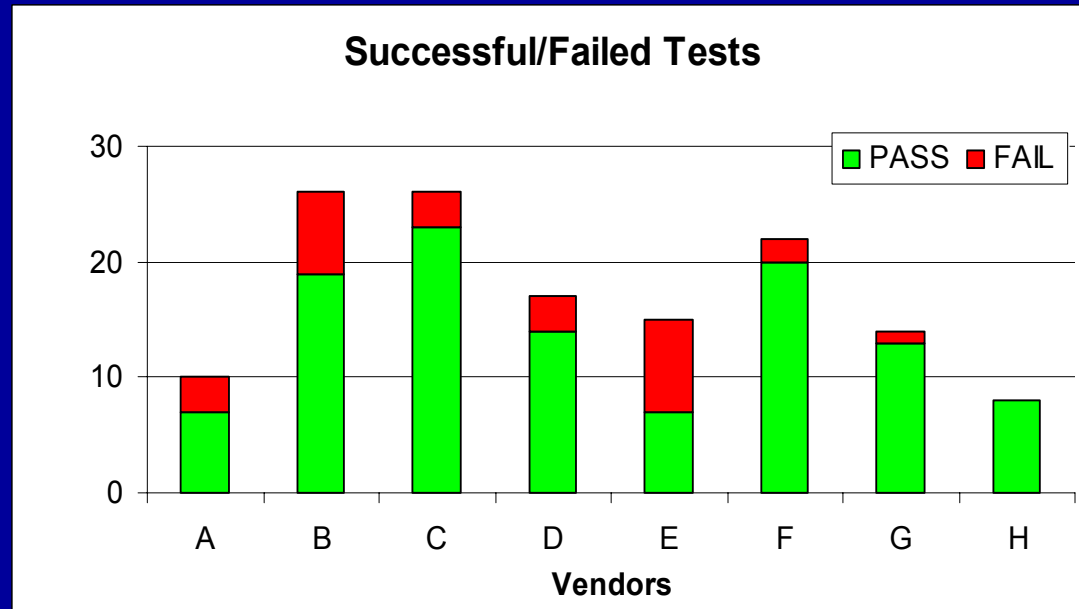
Full white paper at <http://www.eantc.de/cewc05>



Carrier Proof of Concept Tests

Carrier Ethernet architectures are complex

- In fact these are “multi-service” networks
- Coexistence of residential / business services with guaranteed service levels is challenging
- Some Ethernet products have an Enterprise heritage



Example: EANTC Ethernet switch proof of concept test



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Certification Programs



MEF initiated Carrier Ethernet certification for vendors and service providers

- Currently focuses UNI certification
- Goal: Realize reliable interface between carrier network and customer equipment
- More certification areas yet to come: NNI, OAM, Circuit Emulation Services ...

Complements carriers' individual testing efforts, speeds up multi-vendor network deployment



Performance Tests

Carrier Ethernet imposes new scalability, performance, security challenges

Typical issues:

- Cannot learn Ethernet addresses fast enough
- MAC address table too small
- Does not master MAC flooding and hijacking attacks
- Throughput depends on % of mcast/bcast traffic
- QoS implementations not easy to configure, different philosophies / hardware support
- ...

Outlook

- Interoperability at the User-Network Interface (UNI) can be achieved thanks to the MEF
- Stringent Network-Network Interface (NNI) specifications are required to achieve performance and interoperability goals
- Further scalability, protection and multicast testing required in the future

Thank you for your interest!

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