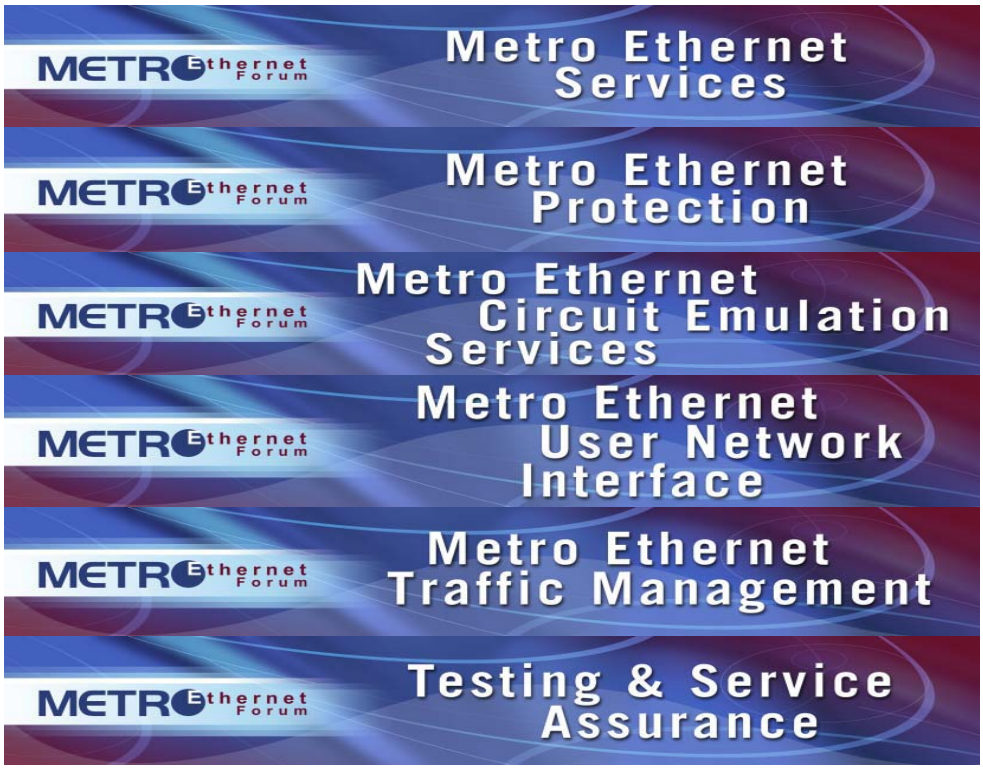
SUPERDEMO 2004

Metro Ethernet … At Your Service!



A METRO ETHERNET FORUM WHITE PAPER

June 2004

SUPERCOMM 2004 in Chicago, IL

Hall A, booth 20736

Tuesday June 22nd to Thursday June 24th 2004

SUPERDemo 2004: A Showcase of Progress

SUPERDemo 2004 showcases the remarkable progress accomplished by the Metro Ethernet Forum (MEF) over the past 12 months.

Organized into six *Technology Focus Areas*, the MEF SUPERDemo 2004 features ground-breaking demonstrations of the five new Metro Ethernet Forum technical specifications ratified since the MEF SUPERDemo 2003.

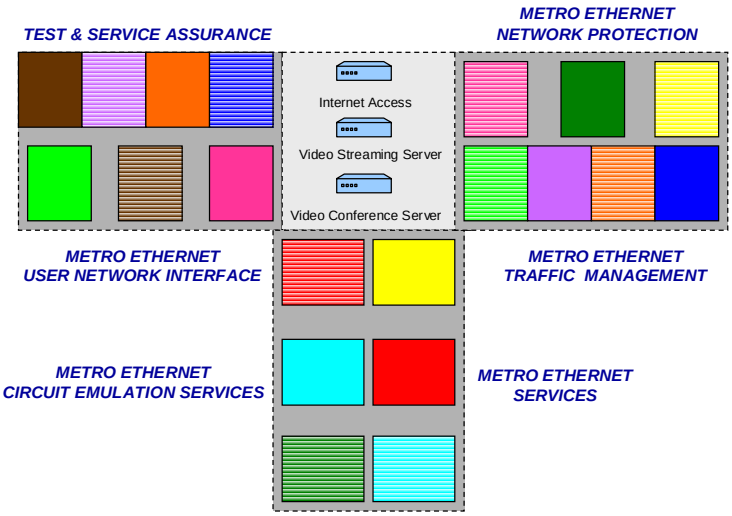
Twenty MEF member companies have joined to give SUPERDemo 2004 attendees an unprecedented look at the key building blocks that carriers will use to deploy profitable metro Ethernet services.

The six *Technology Focus Areas* are:

- ***Metro Ethernet Services***
- ***Metro Ethernet Network Protection***
- ***Metro Ethernet Circuit Emulation Services***
- ***Metro Ethernet User Network Interface***
- ***Metro Ethernet Traffic Management***
- ***Metro Ethernet Test and Service Assurance***

This year's demo gives attendees a first look at a full range of Ethernet services featuring the new MEF protection and traffic management specifications designed to shield Ethernet services from network failures and guarantee Service Level Specifications for data, voice and video. Attendees will also see the first interoperable implementations of the MEF specification for circuit emulation services over Ethernet and a comprehensive set of test and service assurance capabilities focused on metro Ethernet services.

MEF SUPERDemo 2004 Technology Focus Areas



MEF SuperDemo 2004 Participants

METRO ETHERNET SERVICES
- FOUNDRY NETWORKS
- METROBILITY OPTICAL
- TPACK

METRO ETHERNET NETWORK PROTECTION
- ATRICA
- CORRIGENT SYSTEMS
- NORTEL NETWORKS

TRAFFIC MANAGEMENT
- ALCATEL
- EXTREME
- TRANSWITCH
- CISCO

USER NETWORK INTERFACE
- HATTERAS
- CIENA
- NATIVE NETWORKS

CIRCUIT EMULATION SERVICES
- ZARLINK
- RAD DATA COMMUNICATIONS
- REDUX COMMUNICATIONS

TEST & SERVICE ASSURANCE
- AGILENT TECHNOLOGIES
- IXIA
- SHENICK
- SPIRENT COMMUNICATIONS

The Technology Focus Areas show interoperable implementations of the five new Metro Ethernet Forum technical specifications:

- **MEF 1** *Ethernet Services Model, Phase 1*
- **MEF 2** *Requirements and Framework for Ethernet Service Protection in Metro Ethernet Networks*
- **MEF 3** *Circuit Emulation Service Definitions, Framework and Requirements in Metro Ethernet Networks*
- **MEF 4** *MEN Architecture Framework Part 1*
- **MEF 5** *Traffic Management Specification, Phase 1*

Metro Ethernet Services
Technology Focus Area

SERVICES PARTICIPANTS

Tpack GE Switch
Foundry Switch
Foundry CE
Tpack FE Switch
Metrobility CE

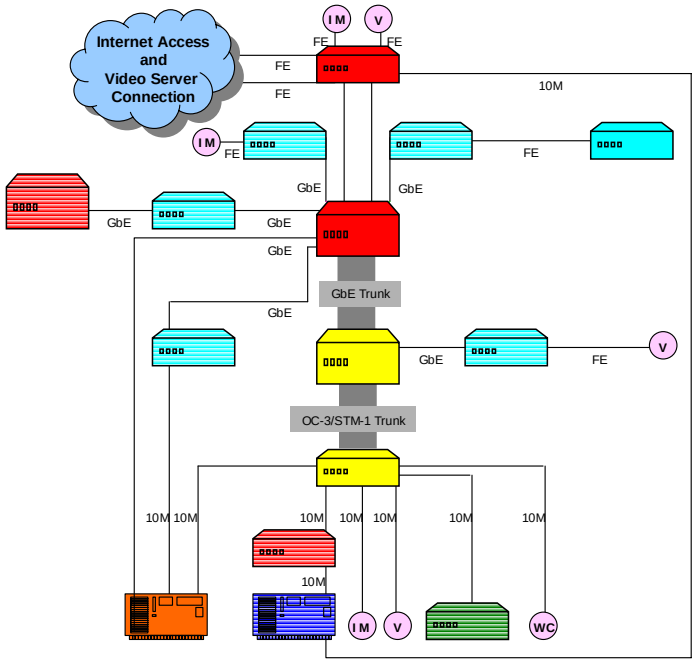
CES PARTICIPANTS

RAD IP Mux 1000 CES
RAD IP Mux 11 CES
Redux CES
Zarlink CES

NETWORK APPLICATIONS

V	Video
I M	Instant Messaging
WC	Web Cam
VoIP	Voice over IP

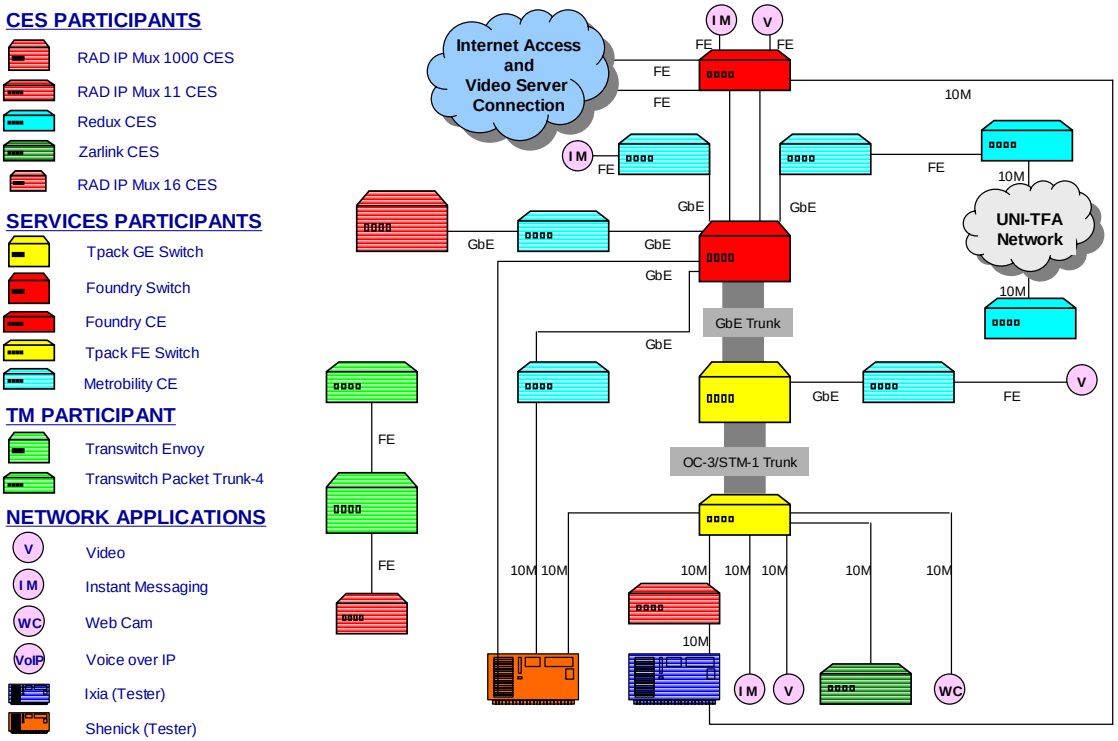
Ixia (Tester)
Shenick (Tester)



Carrier Class Services Over Ethernet

The *Metro Ethernet Services* Technology Focus Area demonstrates the service attributes of E-Line and E-LAN metro Ethernet services defined in MEF 1. The network built from Foundry Networks, Metrobility Optical and TPack equipment will allow attendees to see both service multiplexed and dedicated E-Line services. Ethernet services that are multiplexed at the UNI demonstrate a capability similar to Frame Relay allowing subscribers to build hub and spoke topologies to interconnect central multiplexed sites and multiple remote sites. Non-multiplexed E-Line services are more analogous to traditional private line services that give subscribers a dedicated connection but with flexible 'on-demand' bandwidth. Circuit emulation services, defined in MEF 2 are run over these non-multiplexed E-Line services.

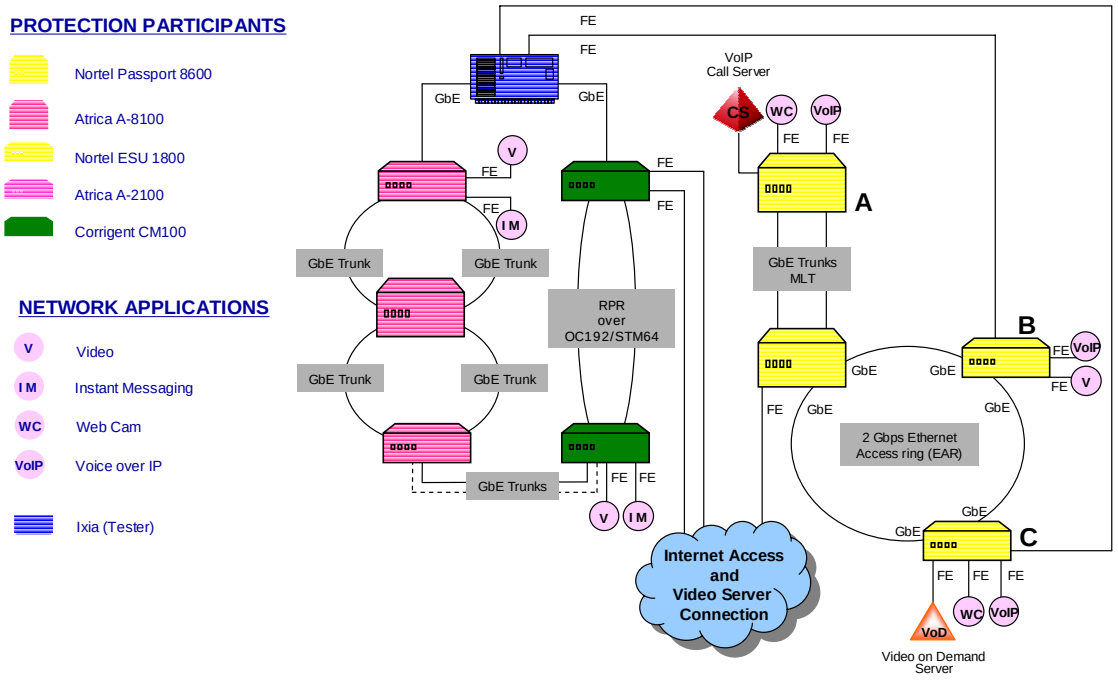
Circuit Emulation Services over Ethernet
Technology Focus Area



T1/E1 Over Carrier Class Ethernet

The *Circuit Emulation* Technology Focus Area demonstrates the transmission of TDM traffic over non-multiplexed E-Line services as defined in MEF 3. Interoperability between Circuit Emulation Services equipment will be demonstrated between RAD and Transwitch and also REDUX and Zarlink. The demonstration will transport POTS phone calls originating and terminating on TI/T3 circuits over E-Line services which will simultaneously transmit high loads of Ethernet data traffic sourced from Ixia and Schenick testers.

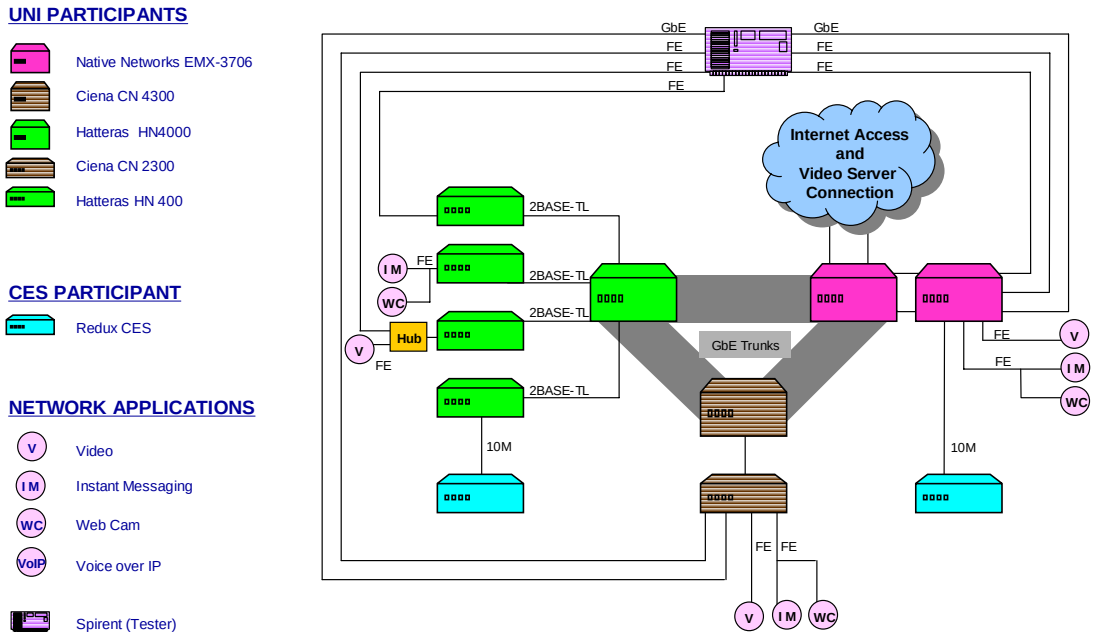
Metro Ethernet Network Protection
Technology Focus Area



Carrier Class Protection for Ethernet Services

The *Metro Ethernet Network Protection* Technology Focus Area demonstrates that an Ethernet network can provide carrier-grade availability by protecting and restoring Ethernet networks within 50 milliseconds – the industry standard set by SONET/SDH networks. This demonstration by Atrica, Corrigent and Nortel Networks shows different mechanisms described in MEF 2 that service providers can use to offer highly available Ethernet services. Voice, video conferencing and streaming video applications will run on the network to demonstrate how service quality is unaffected when network failures occur. Ixia testers will measure protection and restoration times and generate data traffic over the protected network.

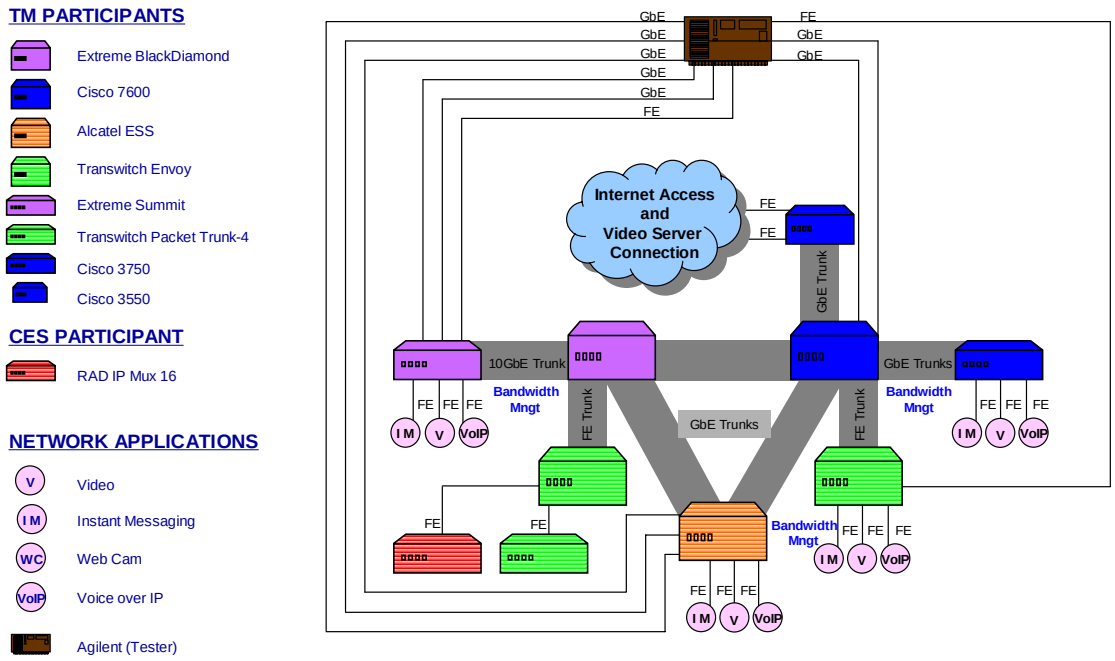
Ethernet User Network Interface
Technology Focus Area



Ethernet Services over the User Network Interface (UNI)

The *Ethernet User Network Interface* Technology Focus Area demonstrates the critical demarcation point between subscriber and service provider networks described in MEF 1 and MEF 4. To ensure the stability of their respective networks, both parties must agree on service attributes such as interface mode and speed, the handling of Layer 2 control protocols such as Spanning Tree, the tunneling of subscriber VLANs and service multiplexing at the UNI. Hatteras, Ciena and Native Networks equipment interoperate to give both enterprise subscribers and service providers a close-up view of the full range of available UNI attributes. Spirent testers connected to the network are used to verify the performance and service quality of the Ethernet services at all of the configured Ethernet UNIs.

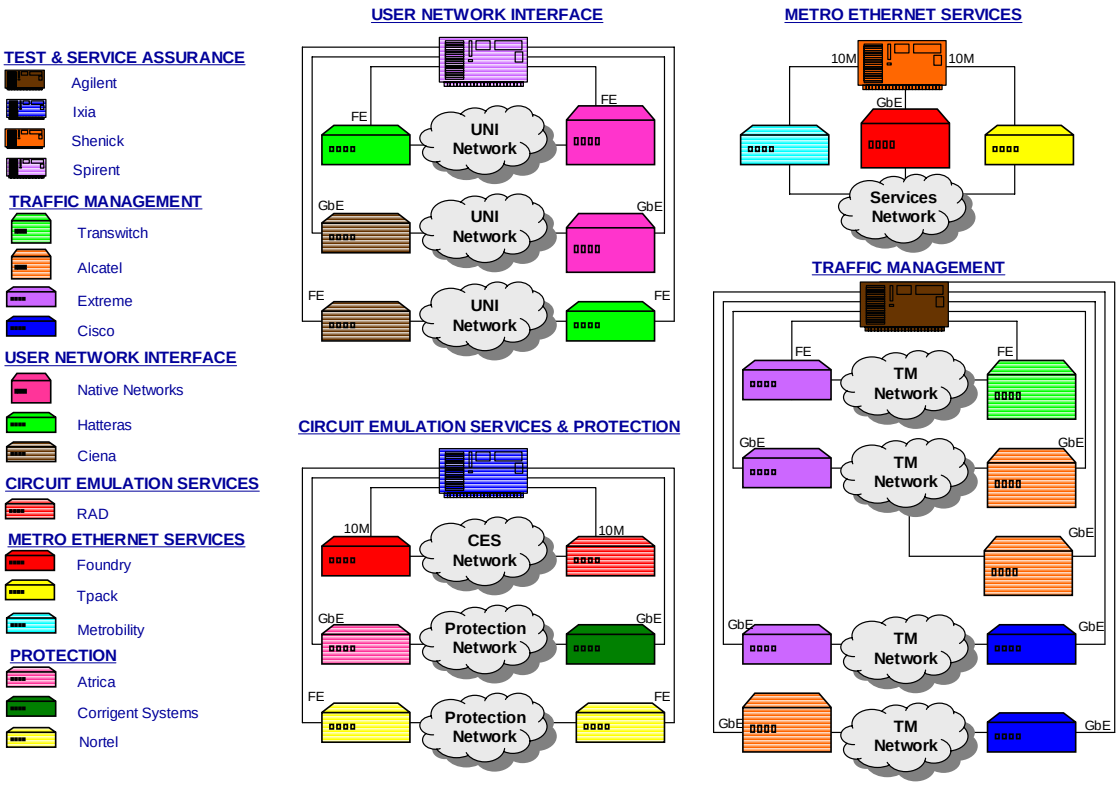
Ethernet Traffic Management
Technology Focus Area



Carrier Class Ethernet Traffic Management

The *Ethernet Traffic Management* Technology Focus Area demonstrates support for the voice, video and data services using the bandwidth control and service quality capabilities defined in MEF 5. An Ethernet network interconnecting Alcatel, Cisco, Extreme and Transwitch switches demonstrates VoIP calls, streaming video with data traffic generated by the Agilent tester saturating all network connections. Both Committed and Excess Information Rates configured as part of the E-Line services are also verified by the Agilent tester.

Metro Ethernet Test & Service Assurance
Technology Focus Area



Carrier Class Testing for Carrier Class Services

In the *Metro Ethernet Test & Service Assurance* Technology Focus Area, test equipment from Agilent, Ixia, Shenick and Spirent verify a full range of attributes of the metro Ethernet services running in the Ethernet Services, Ethernet Network Protection, Circuit Emulation, Ethernet UNI and Ethernet Traffic Management Technology Focus Areas. Testers are used to emulate end-to-end Ethernet services, measure performance parameters such as one-way loss, delay and jitter, measure network protection and restoration times, verify Service Level Agreement compliance and offer high levels of data traffic to analyze service quality under network stress conditions.

Vendor Contributions

Foundry

Foundry Networks, a performance leader in end-to-end switching and routing, offers a complete range of products for metro Ethernet networks. Built with service provider needs in mind, the NetIron series of products offers complete, high performance, cost effective solutions for layer-2 and layer-3 metro service providers. The NetIron series offers different port densities and form factors ranging from the NetIron 4802 stackable for provider edge and multi-tenant unit (MTU) applications to the NetIron 40G for high-density multi-10 GbE distribution/core layer applications.

In this demonstration, the NetIron 400 provides the gigabit core switching functionality in the services focus area, while the NetIron 4802 provides the edge switching functionality. The NetIrons carry a variety of E-Line (Point-to-Point EVC) and E-LAN (Multipoint-to-Multipoint EVC) services, with 802.1Q VLAN tagging, QoS, and bandwidth profile enforcement using hardware-based rate limiting implemented in the JetCore ASICs. The demonstration will highlight how these Ethernet services can be effectively employed to transport traffic belonging to different applications like data, video, instant messaging, etc.

Metrobility Optical Systems

Metrobility Optical Systems' E-Services Network Interface Device (NID) is a secure, intelligent demarcation device for delivering optical Ethernet E-Line and E-LAN services. The E-Services NID gives service providers important operations, administration, and maintenance (OAM) capabilities including remote management and troubleshooting features at the remote site that are critical to the delivery of secure, private and managed Metro Ethernet services.

The E-Services Line Card supports delivery of Metro Ethernet Forum (MEF) -defined point-to-point E-Line and multi-point E-LAN services. Traffic belonging to each service is classified by, and tunneled over, pre-determined VLANs for segregation and transport across carrier networks. Controlled at the Services Line Card, VLANs identify and segregate the specific ISP-access or corporate-access E-Line service, and determine corresponding prioritization and traffic management parameters for the associated traffic.

DHCP client functions are enabled on the E-Services NID for obtaining its management (endstation) IP address, network mask, and default gateway for the service provider's network. If a DHCP server is not found, the E-Services NID will use a unique *zeroconf* IP address for initial provisioning. As the CPE demarcation point, the Services Line Card responds to PING requests addressed to unicast and subnet broadcast addresses by delivering information on the health and status of the device and its network connection. SNMP provides Internet-standard management and can be used for surveillance and fault management. Carrier-class management access control protects against denial of service on the management channel.

The Services Line Card supports the IEEE 802.3ah standard for operations, administration and maintenance (OAM) of Ethernet in the Last Mile (EFM). The EFM/OAM standard enables IP-less remote failure indicators including Dying Gasp, frame level loopback, event notification (errored frame seconds), and MIB polling.

The E-Services NID is comprised of an R851-1S or R851-SS Gigabit Ethernet Services Line Card mounted in a Radiance R200 chassis. The Services Line Card supports copper-to-fiber or fiber-to-fiber connectivity. The copper port offers auto-negotiation of 10/100/1000Mbps. Fiber optic connectivity flexibility is provided through the use of small form-factor pluggable (SFP) optics.

Tpack

Tpack delivers MEF compliant products that fulfill the vision of 3G SDH / SONET and offer Intelligent Metro Ethernet Services. This technology reduces CAPEX and OPEX for Operators, and allows them to leverage installed network technology as the foundation of new revenue-generating services.

As part of the MEF SuperDemo 2004, Tpack shows a two-node Ethernet-over-SDH/SONET network, which provides E-LAN and E-Line services as an integrated solution.

The demonstration services are delivered to the end-user over standard 10/100/1000 electric and optical Ethernet interfaces, using VLAN-tagged frames. The services are carried internally in the Tpack network as MPLS flows, each associated with a unique UNI bandwidth profile. All the standard MEF bandwidth profile parameters (CIR, CBS, EIR and EBS) can be specified. “Frame coloring” is also supported, as the treatment of frames, which violates the profile, can be specified.

Service flows are either switched according to the VLAN-tags in the frames (E-LAN), or tunneled directly to the peer UNI (E-Line).

The Tpack network also demonstrates how legacy SDH/SONET STM-1/4/16/OC-3/12/48 networks can be utilized to their full capacity through the use of Virtual Concatenation (VCAT), LCAS, GFP/LAPS/POS, and an MSP 1+1 protection scheme. The bandwidth can be freely structured as VC-4/STS-3s, VC-3/STS-1, or VC-12/11/VT2/VT1.5 and concatenated into VCAT groups (VCGs) to form flexible data pipes. Basic SDH/SONET trail monitoring features such as TTI, BER performance calculation, and defect detection is also supported. In the MEF SuperDemo the Tpack network will use a number of VCGs running over four protected STM interfaces.

Atrica

Atrica Inc., a leader in the metro Ethernet vision, technology and market, designs and manufactures Optical Ethernet Systems that enable service providers to deliver profitable Ethernet-based services and transport worldwide. As a founding member of the MEF, Atrica fully supports MEF’s activities and is compliant with the E-Line and E-LAN services defined by the MEF.

Atrica's demonstration features Ethernet service interoperability, end-to-end SLAs for a video conferencing and an instant messaging application, and sub-50 millisecond network protection of these services.

The video conferencing and instant messaging services flow to and from the Atrica network across a Corrigent Systems network demonstrating Ethernet service interoperability with end-to-end guaranteed bandwidth and SLAs. In parallel, a test data stream flows from an Ixia tester across both the Atrica and Corrigent network back to the Ixia tester for statistics and measurements. Fiber breaks are simulated at various points in the network thereby demonstrating sub-50 millisecond protection; the video and instant messaging application show no visible effects and their sessions continue uninterrupted. The Ixia tester measures and displays the outage time to be well below 50 milliseconds.

Atrica's family of products on display includes the A-2100 Optical Ethernet Edge Switch, A-8000 Optical Ethernet Core switch and the ASPEN Network Management System.

Corrigent Systems

Corrigent Systems offers a unique Packet ADM that integrates SONET/SDH technologies such as Virtual Concatenation, GFP and LCAS with advanced packet technologies including Resilient Packet Ring (RPR), Ethernet and MPLS for use in metro-optical networks. It enables SONET/SDH transport infrastructures to support data and multimedia streams including triple play services using standard protocols and interfaces.

We are demonstrating the capability of an OC-192/STM-64 optical ring composed of two Corrigent CM-100s to restore traffic in sub-50ms using the recently completed IEEE 802.17 (RPR) standard, and compliant with MEF 2 - "Requirements and Framework for Ethernet Service Protection in Metro Ethernet Networks". Test equipment connected to the ring allows us to measure restoration time. Additionally, we will show video traffic resilience on the ring in the event of a ring fault. This demo supports both E-Line and E-LAN services and we are demonstrating interoperability between the Corrigent ADM and Ethernet switching equipment.

The Corrigent CM-100 ADM provides a full suite of Ethernet and TDM services from Fast Ethernet to 10GE and from DS1/E1 to OC-48/STM16. It allows carriers to minimize capital cost by consolidating all services on a single packet-optimized metro transport infrastructure.

Nortel Networks

Nortel Networks is showcasing its industry leading Optical Ethernet Switching Solutions that support 50ms SONET-like network protection and restoration over a low cost Ethernet Access Ring. In the Metro Ethernet Forum's SUPERCOMM SUPERDemo, Nortel Networks is demonstrating live, carrier grade Triple Play (voice, video and data) services over an Ethernet access ring using its industry proven Passport 8600 Metro Ethernet Services switch, Ethernet Service Module (ESM) 8668 and the Ethernet Service Unit (ESU) 1800 building access node. Demonstrating live IP telephone calls using the Nortel Networks carrier-grade Succession IP telephony solution, video conferencing and movies on demand (VoD), Nortel Networks provides a field proven and profitable solution for delivering converged voice, video and data services such as broadband Internet access, Telephony, HDTV broadcast television, Movies on Demand, Live Pay per View events, and VPNs over a metro Ethernet network infrastructure.

Defining a new class of Optical Ethernet edge device, Nortel Networks ESU 1800 provides the subscriber demarcation point and entry ramp onto the service provider's network over a protected 2 Gbps Ethernet access ring. The ESU 1800, in conjunction with the ESM 8668 module in the Passport 8600, provides the Ethernet user-to-network (UNI) interface, delivering cost-effective, secure, highly available and scalable separation of subscriber traffic. The solution also reduces OpEx via advanced OAM tools such as single ended service provisioning and end-to-end Ethernet Virtual Circuit (EVC) continuity testing. The ESU 1800 building access node provides 50ms network protection over a low cost Ethernet access ring while the Passport 8600 provides 50ms network protection using multi-link Ethernet trunking (MLT) into the metro core network creating the end-to-end network protection and restoration required to deliver triple play voice, video and data services for business and residential customers.

The ESU 1800, Passport 8600 and ESM 8668 can be used in conjunction with other Nortel Networks products to match the provider's service delivery technologies used in their metro core - for a SONET/Resilient Packet Ring (RPR) metro core, the OPTera Metro 3500 Multiservice Platform, for an MPLS metro core, the Multiservice Provider Edge 9000 series or OPTera Metro 8000 Services Switch and for a CWDM/DWDM metro core, the OPTera Metro 5200/5100 Multiservice Platform. Nortel Networks Optical Ethernet Solutions enable service providers to support the most profitable triple play services over the broadest range of service delivery technologies including Ethernet over Fiber, RPR, WDM, next generation SONET/SDH and MPLS.

RAD Data Communications

RAD's patented TDMoIP® technology has gained widespread acceptance since its introduction almost two years ago. As implemented in the IPmux™ and Vmux™ .

RAD's new IPmux-11 and IPmux-14 products provide industry-leading price-performance, especially when deployed in conjunction with the IPmux-16 featuring new channelized T3 capabilities. The IPmux-11 accepts single T1 or E1 input along with dual user Ethernet feeds with traffic management capabilities such as rate limiting, prioritization, etc. These inputs are transported over copper or fiber Ethernet uplinks. The IPmux-14 has the same capabilities as the IPmux-11, but can accept up to four T1 or E1 inputs. Both products support VLAN stacking, WEB and SNMP-based management and a broad range of clocking options.
The IPmux-11 and IPmux-14, offer solutions that enable Service Providers to deliver TDM-based legacy services across a converged Ethernet/MPLS network, with a very attractive ROI.

At the upcoming SUPERDemo, to be held under the auspices of the Metro Ethernet Forum (MEF) at Supercomm 2004 in Chicago, RAD Data Communications will join forces with TranSwitch Corporation in demonstrating circuit emulation system (CES) interoperability using TDMoIP® technology over an MEF-compliant Ethernet service. The demonstration will team RAD's IPmux-16™ TDMoIP gateway with TranSwitch's PacketTrunk-4™ internetworking gateway. The demo will focus on transporting voice and T1 TDM traffic over an Ethernet network and feature advanced traffic management capabilities. These include voice prioritization and the efficient handling of bursty data traffic.

At SUPERDemo, RAD will also conduct a separate demonstration of T1 and LAN service over E-line services. An IPmux-11™ Ethernet multiservice gateway, designed for deployment at the customer premises, will be used to transport both VLAN and CES traffic over an E-Line cloud to a carrier-class IPmux-1000™, a product designed for deployment at points-of-presence (POPs) and central offices. The E-Line cloud will be based on equipment manufactured by Foundry Networks, Metrobility and Tpack. By assigning different VLAN tags to voice and data, the IPmux-11 illustrates how economical T1 services can be added to metropolitan Ethernet networks using a one-box solution at the customer premises.

Redux Communications

Redux Communications is demonstrating tunneling of E1/T1 traffic over a Metro Ethernet Network using its Arranto 100TE and 400TE TDM over Packet Gateways. The Redux Arranto is being demonstrated in two setups; point to point over an MEF supplied E-Line and Interoperating with a second MEF CES vendor, Zarlink.

The objective of the demonstration is to prove the ease with which multiple E1/T1 circuits can be transported transparently across Metro Ethernet Networks. This is achieved through the use of standard, fully featured, available E1/T1 equipment including PBXs, channel banks and multi-service cross connects in conjunction with Metro Ethernet. The demonstration also shows interoperability between two MEF members of the Circuit Emulation Service over Ethernet group in accordance MEF mandatory CESoE specifications.

The Arrantos are connected to each other and to a Zarlink platform over E-Lines supplied by MEF vendors, Native Networks and Hatteras Networks using standard 10/100 BaseT connections. The TDM interfaces of the Arranto systems are connected to a variety of standard third party TDM voice and data devices.

Redux provides TDM over Packet gateway solutions in a range of system, module and integrated circuit platforms.

Zarlink

For the SuperComm SuperDemo, Zarlink is demonstrating a T-Line (TDM-line) service across a standard E-Line (Ethernet point-to-point) service over Metro Ethernet. The demonstration is achieved using the Circuit Emulation Services over Packet (CESoP) ZL50110 device inter-operating with the Redux RS-160 device.

The ZL50110 is a single chip solution offering CES over Ethernet for up to 32 T1/E1 lines or 2 T3/E3 lines, therefore providing the inter-working function between the TDM circuit-switched network and the Ethernet packet-switched network.

On the evaluation board for the ZL50110, the TDM interface is connected to either a handset via a PCM CODEC, or an E1 tester through an LIU. The Ethernet interface port is connected to the Metro Ethernet Network via off-the-shelf PHYs. PRBS is sent from the E1 tester, through the ZL50110 into the Metro Ethernet network to the RS-160 and back to the original E1 tester for BERT verification. Calls will also be running between the two devices, again showing inter-operability.

Ciena

CIENA is showing the CN 4300 and CN 2300 in the MEF SUPERDemo as optical transport options for E-LINE and E-LAN services. The CN 4300 is a scalable, purpose-built multiservice platform that integrates ADM functionality, transport aggregation, Ethernet switching and cross-connect functions for services based on both CWDM and DWDM. The CN 2300 is a CWDM-based multi-services optical access platform that provides a managed demarcation point between the service provider or cable operator's network and the customer. Besides aggregation and add drop functionality, the CN 2300 adds enhanced performance monitoring, fault detection and localization, single-ended remote management, local/remote loop-back control, and <50 microsecond protection switching.

Together, these solutions allow network operators to deliver a mix of services such as, managed private line and virtual private line Ethernet services for SME/enterprise customers, or backhaul of triple play residential services. CIENA products employ three unique features to deliver these services with the highest reliability and lowest network impact and cost. These features are SONET Wraparound(tm), Virtual Wire(tm), and End-End SLA stats collection. SONET Wraparound allows operators to open additional capacity on their existing fiber infrastructure that is running legacy services over SONET/SDH. This approach creates essentially free additional bandwidth for new Ethernet service deployment. Virtual Wire is a patented technology, which allows for the simple, but contention free bit multiplexing of Ethernet or storage data onto one or more wavelengths of light. The end result is transit delay (latency) of only three microseconds and zero delay variation (jitter) - for up to 100% line utilization. End-End SLA stats collection monitors and stores complete SLA performance statistics from Circuit hand-off to Circuit hand-off. For network operators, this means any application can be transmitted with the highest service quality automatically, with full reporting on how service guarantees were met back to the end customer.

Hatteras Networks

Hatteras Networks is capable of delivering carrier-grade E-Line and E-LAN service options using standard IEEE 802.3ah 2BASE-TL over first-mile, voice-grade copper. Hatteras Networks' Metro Ethernet Copper Access™ (MECA) solution provides the platform with which carriers can use to deliver a robust suite of converged services to business subscribers. Leveraging the cost and simplicity benefits of Ethernet, carriers can use MECA to generate new business from existing private line customers with higher bandwidth, high-quality enhanced data and IP voice services, as well as win new customers not served with fiber. Interoperability with the MEF User-to-Network Interface (UNI) and Network-to-Network Interface (NNI) assures interoperability of the Hatteras Networks MECA™ equipment with carriers' existing metro Ethernet networks.

The cornerstone of Hatteras Networks' MECA products is the stackable HN4000 Aggregation Platform which provides industry-leading density for cost-effective large-scale aggregation. A temperature hardened, ultra-compact form-factor optimized for first-mile access, the HN4000 allows high-speed IEEE 802.3ah 2BASE-TL Ethernet to extend carriers Metro Ethernet services to business customers in copper-connected buildings. Carriers can leverage the advanced service and traffic management architecture of the HN4000 to

deliver multiple services with multiple SLAs to each customer from any metro network, realizing immediate high-margin services.

Native Networks

Native Networks is a leading provider of Metro Ethernet Access equipment and sub-systems, which enable the efficient deployment of high-value, differentiated Metro Ethernet Services over existing SDH/SONET or GigE infrastructure. Our, MPLS Packet Ring, multi-protocol aggregation and transport solutions allow carriers to efficiently deploy MEF-compliant services, including multi-point Layer-2 VPNs.

At the MEF SuperDemo, Supercomm 2004, Native Networks is demonstrating a Metro Ethernet aggregation network based upon its EMX3706 Multi-Service Transport Platform (MSTP), particular focus is placed upon showing the attributes of an MEF-Compliant UNI interface, as well as MEF-compliant Ethernet services and Traffic Management. Native Networks is also showing it's NativeView™ NMS platform, capable of provisioning and managing MEF-compliant Metro Ethernet services. A ring of EMX3706's provides transport & aggregation of E-LINE and E-LAN services using our MPLS Packet Ring, while interworking to two other MEF members. The set-up employs an Ethernet-over-MPLS architecture which can then be transported over protected SONET / SDH or GbE fibre rings or mesh. In addition the EMX3706 is capable of acting as an "MTU" device in a H-VPLS architecture, through the use of LDP or RSVP-TE signaling into a core MPLS network.

The EMX3706 Multi-Service Transport Platform (MSTP), part of the NativeMux™ family, is an industry leading optical access/aggregation platform, combining Metro Ethernet service delivery, Traffic Management mechanisms supporting full range of QoS requirements, open standard compliant interfaces at SONET/SDH, MPLS and Ethernet layers, Carrier Class Service Provisioning, Resilience & multi-layer OAM, in a very cost effective platform. It enables carriers and service providers to build robust, efficient, and flexible Metro networks, support a range of emerging packet data services and applications like Ethernet VPNs, Broadband Backhaul and Aggregation, Video Distribution and Triple Play, Backup and Disaster Recovery.

Alcatel

The Alcatel 7450 Ethernet Service Switch (ESS) fundamentally advances the art of public or private networking by being able to address Service Provider issues and offer scalable, reliable and predictable Ethernet services with guaranteed SLA's that the Service Providers have been used to offering over FR and ATM networks. The 7450 ESS also provides an industry leading Ethernet Services OA&M toolkit to reduce the complexity and cost of service operations. The 7450 ESS offers this at competitive Metro Ethernet price points.

The Alcatel 7450 ESS will be a key participant in the MEF's E-Line and E-LAN service Traffic Management demonstration, with Cisco, Extreme and Transwitch, focusing on delivering triple-play services with carrier class traffic management. The 7450 ESS will be demonstrating it's comprehensive traffic management capability to enable a full suite of higher value Ethernet services – "any Ethernet service, any port" with no impact to performance.

The Alcatel 7450 ESS provides the service attributes to enable Ethernet to be used as a service like any other MAN/WAN service, migrating it from just basic Ethernet connectivity for best effort service.

Cisco Systems

Cisco Systems offers a complete Metro Ethernet solution, which includes *Ethernet in the First Mile* (EFM) *Transport* at Layer 1, *Ethernet* at Layer 2, *Service Delivery* at Layer 2/3+, and end-to-end *Management and*

Provisioning. As part of the Traffic Management Technology Focus Area of the Metro Ethernet Forum SUPERdemo, Cisco Systems is demonstrating the ability to provide a "triple play," or voice, video, and data services, across a QoS-enabled Metro Ethernet network.

The devices in this demonstration network include the Cisco 7600 Series Router as a network-PE device and the Cisco Catalyst 3750 Metro Series switch as the user-PE, as well as the Cisco IP Phone 7960 for the traffic management vendors, and Cisco CallManager Express software to provide call routing. At the MEF's request, the core of the network is point-to-point MPLS tunnels, with 802.1Q networks feeding into those tunnels. Cisco also offers a full variety of service delivery protocols including MPLS VPN, VPLS, Any Transport over MPLS (AToM) via Martini tunnels, VLAN tag stacking, Ethernet to Frame Relay and ATM Layer 2 interworking, and Layer 1 transport —Cisco realizes networks are not all alike and that all protocols do not scale and perform equally.

In addition, Cisco is providing the routing and switching equipment to supply connectivity for all MEF SUPERdemo participants to both the video server and to the SuperComm network.

Extreme Networks

Extreme will be showcasing its Metro Ethernet Services Platform as part of the Traffic Management TFA. The demonstration will show support for the "Triple-Play" of voice, video and data applications over an Ethernet Metro network built with Extreme, Cisco and Alcatel.

High Performance Traffic Management – The focus of the Extreme Network's Metro Ethernet Service Platform demonstration will be to verify support for the preservation of quality of service (QoS) necessary to deliver voice video and data over an Ethernet Metro network. Using high capacity hardware-based switching equipment, the demo will show the importance of the implementation of advanced traffic and subscriber management features at wire-speed. Traffic Management including bandwidth control and QoS can be activated without impact to the forwarding capacity of the switch, even at Gigabit or 10Gigabit speeds. Hierarchical rate shaping based upon these hardware-based traffic management capabilities gives Metro providers the ability to deliver a rich set of differentiated service features over an Ethernet Metro Network

Scalable Metro Infrastructure - To highlight the scalability of Metro solutions, the Traffic Management backbone will consist of an MPLS L2 VPN between the three vendors based upon the H-VPLS specification. H-VPLS allows Metro providers to build virtually infinitely scalable Ethernet networks. Used in conjunction with VLAN and VMAN (QinQ) subscriber management schemes, H-VPLS reflects the state of the art of Ethernet network scalability and provides Extreme customers with a simple migration from basic to advanced Metro Ethernet topologies as their requirements grow based upon the commercial success of their Metro business and their expanding subscriber base.

Resilient Service Protection - Extreme will provide SONET-like protection for an Ethernet access network attached to the Traffic Management TFA backbone. Using Ethernet Automatic Protection Switching (EAPS) version 2 Extreme will show its enhanced capability to provide sub 50-millisecond network resiliency along with support for a variety of complex network topologies including dual attached rings and subtended ring operations.

TranSwitch

At the Metro Ethernet Forum (MEF) SUPERDemo, TranSwitch is demonstrating carrier grade Ethernet Traffic Management with its Envoy™ family of Ethernet controllers and aggregators used in Ethernet over SONET/SDH Equipment to provide E-Line and E-LAN services and carrier-class Ethernet/MPLS/IP Routers and Switches. The demonstration focuses on the efficient and managed transport of multiple services over an Ethernet provisioned UNI. These services include voice over IP (VoIP) via a Cisco IP Phone, streaming video from a video server, and data via Instant Messaging. Viewers will see the effects of changing service parameters like Committed Information Rate (CIR), Peak Information Rate (PIR), Committed Burst Size (CBS) in enabling the service providers to enforce SLAs and providing them increased revenue streams by offering triple-play.

TranSwitch's Envoy platform is connected with Cisco Systems and Extreme Networks equipment to show interoperability across a carrier-class WAN network. TranSwitch is also demonstrating its PacketTrunk™-4 interworking gateway solution for Circuit Emulation Service (CES) in partnership with the RAD IPMux-16™ TDMoIP system. In this demonstration, the PacketTrunk™-4 system and RAD IPMux-16™ system are connected via a provisioned Ethernet UNI service provided by the TranSwitch Envoy platform described above. This demonstration shows structure-aware emulation using AAL1-based encapsulation, as per MEF's emerging Implementation Agreement for PDH Emulation service, and dovetails with complimentary activities in the ITU-T, IETF PWE3 and ATM Forum.

TranSwitch's rapidly growing Envoy™ family of carrier-grade Ethernet controllers are used by leading Tier 1 system vendors in equipment to support Ethernet over SONET/SDH (E-Line and E-LAN) and L2/L3/L4 Aggregation Routers and Switches. These devices feature TranSwitch's cMAC technology that allows the ability to configure the on-chip Ethernet MAC as multiple ports of Fast Ethernet or a single port of triple-speed Gigabit Ethernet. The devices also provide telecom standard POS PHY L2 and OIF SPI-3 standard interfaces allowing glueless connections to Network Processors (NPU) and GFP/VCAT Framers/Mappers. The device range includes low port count as well as high port count solutions with built in on-chip buffering eliminating costs, power and need for external RAM devices. With large on-chip buffers, these devices can support distances in excess of 100km over Single Mode Fiber (SMF) with full flow control and traffic management to avoid frame loss.

PacketTrunk-4 is targeted to internetworking gateway applications, allowing efficient transport of TDM trunks over PSNs using TDMoIP. It is a single chip solution that incorporates robust clock recovery, encapsulation, jitter compensation, Layer 2/3/4 QoS support, and standards-based support for transport of structured and unstructured TDM signals over a PSN. PacketTrunk-4 serves as a building block for TDMoIP, TDMoMPLS or TDM-over-switched Ethernet networks.

Agilent

Agilent's N2X Multi-Services test solution will be supporting the Traffic Management Technology Focus Area at the MEF SUPERDemo 2004. The test configuration will include a chassis containing multiple 10/100 Ethernet and Gigabit Ethernet cards. Additional interfaces like 10GbE are also made available.

One of Agilent's prime objectives is to verify the Service Level Specifications configured on the Traffic Management Technical Focus Area demonstration network. Parameters such as Committed Information Rate and Excess Information Rate will be monitored on the demo network while it is oversubscribed by traffic generated from the same N2X test platform.

The N2X test solution will also measure the loss, delay and jitter characteristics of Ethernet services which are configured to support real-time voice traffic. Bandwidth profiles as well as the parameters associated with the class of service attributes configured on the Traffic Management network will also be tested and measured throughout the demonstration.

Ixia

Ixia integrates a highly-scalable hardware platform with an optimized operating system (IxOS) that supports a comprehensive set of test and measurement applications. The architecture provides for the emulation of hundreds-to-millions of network users over a single scalable platform, with a mixture of both network and real-world application layer traffic.

Ixia supports the Metro Ethernet Forum in the vital role of testing and debugging functionality, scalability, performance, and interoperability between products and services of multiple vendors.

In particular, Ixia provides comprehensive Metro Ethernet testing, with full coverage for Ethernet interfaces ranging from 10Mbps through 10Gbps, as well as Packet over SONET, Ethernet over SONET, and RPR support from OC-3 to OC-192c. Ixia's highly scalable solutions also offer full control and data plane emulation for IPv4, IPv6, and MPLS.

For the MEF SuperDemo, Ixia will generate the traffic load and verify packet loss, latency, and jitter performance for circuit emulation systems. Ixia will also generate traffic and test end-to-end convergence time to validate protection devices for service restoration to ensure carrier-grade network survivability.

Shenick

The Shenick participation to the SuperDemo consists of the diversifEye 4200 test and performance measurement platform. The system emulates various IP applications and servers, testing network performance with real-world traffic. The configuration consists of a chassis containing two 10/100/1000 Ethernet cards. One test port generates Streaming Video and HTTP traffic classes, which is terminated on the second test port, across a multi-vendor network with E-Line services.

The demonstration shows the performance of the traffic under normal conditions. Service integrity is shown such that no traffic is lost during normal service conditions. SLA metrics are measured and presented. HTTP traffic volume is increased to demonstrate the bandwidth shaping/policing profiles protect the performance of the delay-sensitive video traffic while the Web Server response times diminishes as the volume of HTTP traffic increases.

In addition, Shenick tests and demonstrates the performance of multiple customers, connected to the network via VLAN tagged E-Line services.

Spirent Communications

Spirent Communications is proud to once again be playing a critical and ongoing role in the UNI demonstration. A combination of award-winning Spirent solutions and services will assist in verifying functionality, interoperability, performance and scalability of the E-LINE (point-to-point) and E-LAN (multi-point-to-multi-point) services defined by the Metro Ethernet Forum.

In this SuperDemo, Spirent SmartBits test systems are generating and analyzing traffic through connections to each of the UNI Technology Focused Area participants' equipment, traversing the demo network and back to the originating system for in-depth analysis. The new SmartBits product is designed to accelerate time to market and deployment of these new metro services.

The SmartBits Systems can verify the correct operation of the network in multi-vendor multi-user environments, handle complex VLAN configurations, and test point-to-point and point-to-multipoint committed and peak information tests across interfaces that comply with the MEF UNI standard. Interface support from 100Mbps to 10Gbps is provided, with testing across a collection of metro network topologies.

This system fully interoperates with other SmartBits applications to test Routing, VoIP and Web applications running across these new services.

MEF SUPERDemo 2004 Video Conferencing Server, Video Streaming Server and Optical Fiber

Calwin Technologies, Corning and Entone are non-members providing the video conferencing server, the optical fiber and the video streaming server featured in the MEF SUPERDemo 2004 Technology Focus Areas.

Calwin Technologies, Inc.

Calwin is a leading supplier of software-based video conferencing products that support multi-point-to-multi-point desktop video conferencing. This video conferencing product is the industry's first true real-time IP based communication product that integrates voice, video and data conferencing services.

Calwin is providing a video server to facilitate the demonstration of its high bandwidth real-time video conferencing application. Calwin is creating several video conference rooms for the Services, UNI, Protection and Traffic Management Technology Focus Areas to conduct video conferencing among the area members and to provide a universal conference room for all the area members to participate in video conferencing simultaneously.

Calwin's Video Conferencing product is cost effective and provides high quality. It features a scaleable and secure enterprise architecture, is easy to use and flexible. The application fully integrates video, voice and data conferencing in one product providing full conference recording features in addition to single video recording. Other features include double screens, double videos, voice activation, multiple video templates, enterprise and personal versions, multiple languages and billing support.
surveillance and video phone products.

Corning

Corning Incorporated is a diversified technology company that concentrates its efforts on high-impact growth opportunities. Corning combines its expertise in specialty glass, ceramic materials, polymers and the manipulation of the properties of light, with strong process and manufacturing capabilities to develop, engineer and commercialize significant innovative products for the telecommunications, flat panel display, environmental, semiconductor, and life sciences industries.

As the inventor of low-loss optical fiber, Corning Optical Fiber has a long history of developing and delivering high-value fiber innovations, using the customer's requirements for value and success to drive investment in fiber-optic research and development. Corning is offering a full line of single-mode and multimode optical fibers for all network applications.

Entone

Entone's StreamLiner carrier grade video server provides advanced streaming functions and unparalleled performance using industry standard hardware and Entone's optimized streaming software. The model 2250 featured at The MEF SuperDemo features dual Gigabit Ethernet interfaces, up to 880MB of integrated content storage and the capacity to stream more than 500 streams of MPEG video in a compact, 2U enclosure.

The StreamLiner natively support 802.1Q VLANs (up to 64) and is able to stream both point-to-point and IP multicast data via VLAN. StreamLiner exemplifies the next generation of "distributable" videos server with enable service operators to cache video content strategically with their networks to provide the optimal balance of cost, operational efficiency and interactivity to customers.