

Ethernet Active Line Access: Threat or Opportunity?

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Ethernet Active Line Access

What is it ?

- Active Line Access is high speed Ethernet from the End User to the Service/Content Provider.
- It is native Ethernet packet access from one end user location to another or to multiple points or to a NNI hand-off to a service provider.
- Telco provides a managed IP pipe.
- It includes Service Level Agreements (SLA) to provide the end customer with a Quality of Service (QOS) guarantee.



Ethernet Active Line Access

What is it ?

- It presents a direct challenge to the traditional SONET telephone network infrastructure, and promises wide area networking scalable to 10 Gbps and beyond using ubiquitous Ethernet technology.
- Works seamlessly over multiple delivery technologies such as ADSL/VDSL, FTTP, GPON and Wireless and multiple backbone transport vendors.
- The Metro Ethernet Forum (MEF), a standards organization, has made a commitment to the new standard with their simultaneous launch of a Carrier Ethernet Certification Program to accelerate the delivery of industry standard products and services to the end user.



Ethernet Active Line Access

Standards

- Metro Ethernet Forum (MEF), created by key members in the industry, has played a key role in defining Carrier Ethernet Services. The services defined by the MEF include:
 - **E-line:** a service connecting two customer Ethernet ports over a WAN.
 - **E-LAN:** a multipoint service connecting a set of customer endpoints, giving the appearance to the customer of a bridged Ethernet network connecting the sites.
 - **E-tree:** a multipoint service connecting one or more roots and a set of leaves, but preventing inter-leaf communication.



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Other Standards

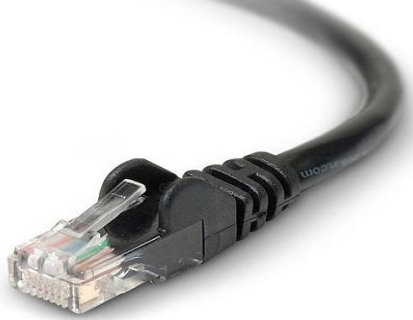
- IEEE 802.1Q Virtual Local Area Networks (VLANs)
- IEEE 802.1Q in 802-1Q (Q-in-Q)
- IEEE 802.1ad Provider Bridge (Stacked VLAN)
- IEEE 802.1ah Provider Backbone Bridge (PBB)
- IEEE 802.1aq Shortest Path Bridging
- IEEE 802.1ag Connectivity Fault Management (CFM-ITU-T Recommendation Y.1731)



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Early Deployments-Ethernet Bridge

- Transparent Point to Point Bridge
 - Using DS-1s and later DS-3s with routers on each end to bridge Ethernet LAN segments
 - Scalability of MAC Tables in routers became a problem.
 - Did not directly support multiple locations.
 - Using native Ethernet transport between local points.
 - Multiple school buildings within a community or a service area.



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- IEEE 802.1Q Virtual Local Area Networks (VLANs)
- Support 4094 VLANs on a transport system.
 - Limits service providers to the number of customers that can be served on a high bandwidth transport system.
- Routers must learn the MAC address of each customer device.
 - Leads to ARP table explosions and broadcast storms as networks change and grow.
- End user routing loops can bring down an entire transport system.



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IEEE 802.1Q in 802.1Q (Q-in-Q)

- VLAN in a VLAN
- Allows service providers to greatly expand the number of users that can be served by an aggregated transport system.
- Preserves customer's VLAN settings
- Transparent across service providers
- Widely used today



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IEEE 802.1ad Provider Bridge (PB)

- Adds customer and service provider VLAN tags (Stacked VLANS)
- Limited to 4094 service providers
- MAC tunneling to hide the customer MAC address from the service provider but service provider tags are visible.



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IEEE 802.1ah Provider Backbone Bridges (PBB)

- Hides Customer MAC addresses from the transport network
- Provider Unlimited Service Scalability
- Eliminates MAC explosions
- Provides customer segregation and security
- Backwards compatibility with previous standards built in



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IEEE 802.1aq Shortest Path Bridging

- provides logical Ethernet networks on native Ethernet infrastructure using a link state protocol to advertise both topology and logical network membership.
- Packets are encapsulated at the edge either in mac-in-mac *802.1ah* or tagged *802.1Q/802.1ad* frames and transported only to other members of the logical network.
- Unicast and multicast is supported and all routing is on symmetric shortest paths.
- Originally designed to support dynamically reconfigurable mesh networks.



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Carrier Ethernet Frame Formats

- G-DA: Customer Designation Address
- C-SA: Customer Source Address
- Data: Customer Data
- FCS: Frame Check Sequence
- G-Tag: 802.1Q Customer VLAN Tag
- S-Tag: Service Provider VLAN Tag
- B-DA: Backbone Destination Address
- B-SA: Backbone Source Address
- B-Tag: Backbone VLAN Tag
- I-Tag: Service Instance

Untagged Ethernet Frame



802.1Q Frame (VLAN)



802.1ad Frame (PB)



802.1ah Frame (PEB)



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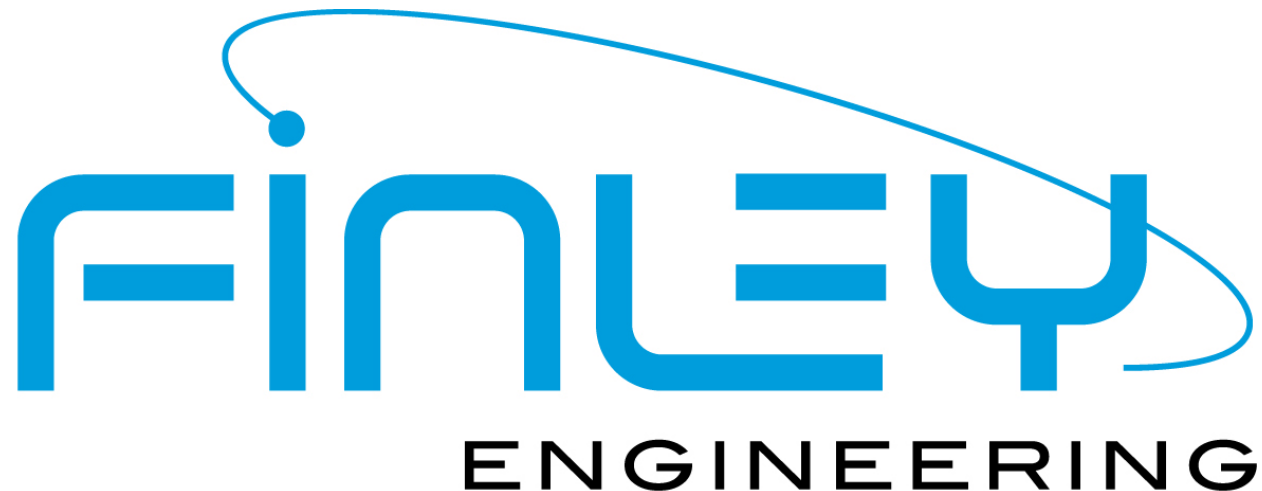
Questions ?



A black Ethernet cable with a standard RJ45 connector, shown in the top left corner of the slide.

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Thank You for Attending !!



INNOVATION TO THE NEXT POWER