

Telstra Wholesale Ethernet Access

Flexible and scalable nationwide
Carrier Ethernet solutions
conformant to MEF specifications

Ethernet is the most widely used networking technology for data transmission because it offers reliable and cost-effective wide-area network connectivity.

Our industry-leading Ethernet services are designed to be customisable to meet the changing demands of your business and your customers. Our extensive Ethernet coverage enables you to make the most of business opportunities across Australia.



WHOLESALE



Using Ethernet Access

Ethernet Access connects tail ends with a head end. For example, it can be used to connect branch offices to a head office or connect your end user's premises to your point of presence. Examples of typical Ethernet Access end-users include:

- Retail stores – for inventory management systems using Virtual Private Networks (VPN)
- Small to medium businesses – for corporate Internet, cloud, collaboration, video and VoIP solutions
- Large corporations – for key components within a complex IP-VPN solution

Ethernet Access Overview

The Ethernet Access (EA) offers MEF CE 2.0 certified Carrier Ethernet services targeting the business access market. Ethernet Access provides you with flexible and robust point-to-point and point-to-multipoint (aggregation) Ethernet connectivity through proven Virtual Private LAN Service (VPLS) and pseudowire technology in our core networks. Four classes of service (CoS) enable you to prioritise traffic end-to-end according to your performance needs.

Coverage is available nationally on Telstra-owned fibre and copper accesses. That coverage is complemented by nbn™ FTTP, FTTN, FTTC and FTTB accesses in those areas which have been declared nbn ready-for-service (RFS). Further augmentation on FTTC and HFC is anticipated in the future. (A full ESA list detailing coverage footprint is available from Telstra on request). Where a new tail-end service is to be provided over a Telstra fibre access, a Telstra mobile access can be optionally used as a backup to improve the service availability of the tail UNI.

A Telstra-supplied NTU conveniently hides these physical access considerations behind the MEF-defined service constructs, thereby seamlessly integrating with Telstra on-net services as part of the overall EA product construct, as shown in figures 1 and 2. Where a tail-end service is provided over an nbn access, the complexities of

nbn AVC/CVC management are all handled by Telstra, making your life easier.

End-to-end 'logical' service connectivity across these physical accesses is via a virtual connection (VC). In the case of a MEF-defined E-Line service, this VC associates two user network interfaces (UNIs) and is called an Ethernet virtual connection (EVC).

In the case of a MEF-defined E-Access service, the virtual connection associates a UNI at the tail end with an external network-network interface (ENNI) at the head end and is called an operator virtual connection (OVC).

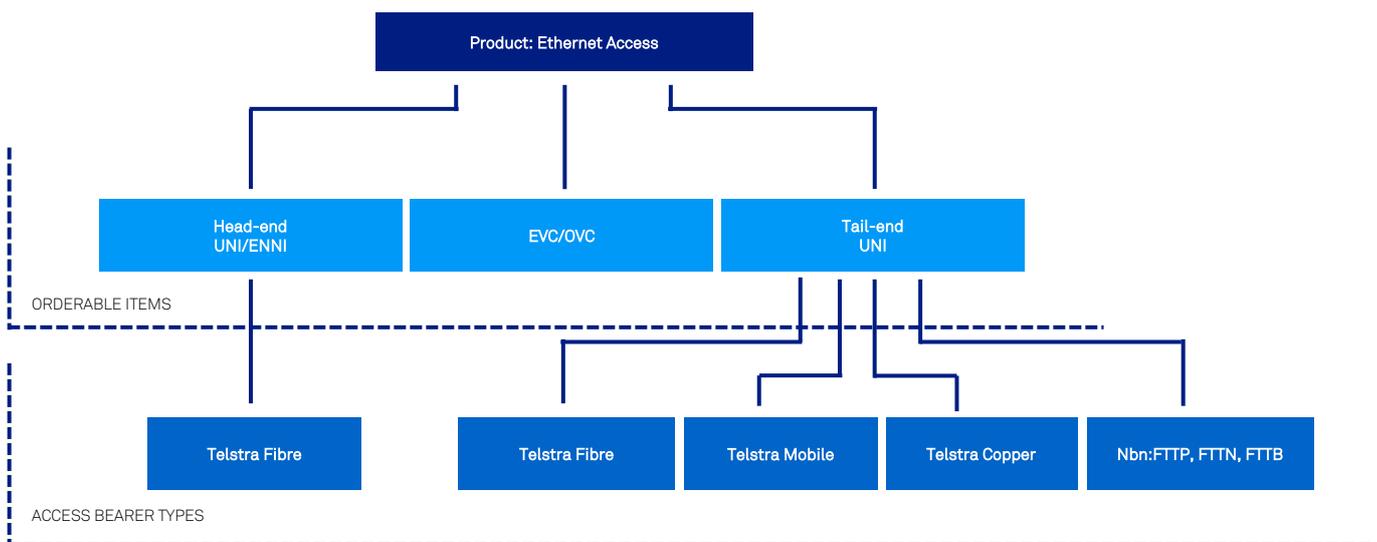
UNIs and ENNIs are ports on the NTUs into which you connect your own customer premises equipment (CPE). OVC-based services are often colloquially called "Q-in-Q" services.

What are the benefits?

National coverage

Our national coverage means you only have to engage a single-supplier, leading to total cost of ownership benefits. Using Telstra's Ethernet Access product means you only deal with one entity, avoiding the extra time and cost of managing operational and technical relationships with multiple suppliers.

Figure 1: Product Construct



Save costs

Ethernet aggregation handoff to you at interface (UNI/ENNI) speeds of up to 10Gbps leads to cost saving, lower port count and rack space reduction compared to other/older technologies or using multiple lower speed Ethernet interfaces.

Lower your equipment costs and reduce space, power and cabling requirements through service multiplexing. This enables one interface (UNI or ENNI) to support multiple VCs. It also allows new VCs to be provisioned more efficiently and rapidly on the same interface (available on Telstra fibre accesses only).

Scalable Bandwidth

Connect more flexibly across a range of bandwidths and easily upgrade bandwidth as needed with scalable and granular bandwidth options on virtual connections (EVCs/OVCs) provisioned with different classes of service (CoS).

Meet customer needs

Prioritise traffic to meet your customers' needs with multiple classes of service (CoS) from end to end across the VC. This can be done using either Layer 2 (802.1p) or Layer 3 (DSCP) mapping and/or VLAN ID.

Protection

Choose from network topology options that suit the way you want to protect against network failures with access resiliency options for EA. Single uplink (SU) (99.9%), SU with mobile backup (99.95%) and fully redundant (FR) (99.98%) head-end access target availability options for both E-Line and E-Access services are shown in figure 3. Geo-diverse access redundancy is subject to specific zoning business rules. For fibre tail-ends, only the SU, SU with mobile backup and FR co-located options are supported. For Telstra Copper and nbn-based tail-ends, only the SU option is supported. Protection is customer-managed, typically at layer 3. However for SU with mobile backup, fibre link protection is automatically employed at layer 2 through Telstra-owned tail-end NTU.

Quick fault management

End-to-end connectivity fault management (CFM) enables us to quickly diagnose and address customer-originated connectivity issues. Ethernet Access will also enable tunnelling of selected customer-originated service OAM frames for end-user Layer 2 diagnosis. In the event of faults, this OAM also allows us to do performance monitoring on VCs to give you a high level of confidence because we can establish whether target SLA parameters like frame loss, frame delays and variation are operating within the design 'envelope'.

Online access

Manage your IT and network provisioning more efficiently with online access to quoting, ordering and billing.

Industry best practice

Have the confidence you are getting industry best practice with our MEF CE 2.0 certification on EA services supplied over Telstra fibre accesses.

Figure 2: Physical Topologies and Access Bearer Types

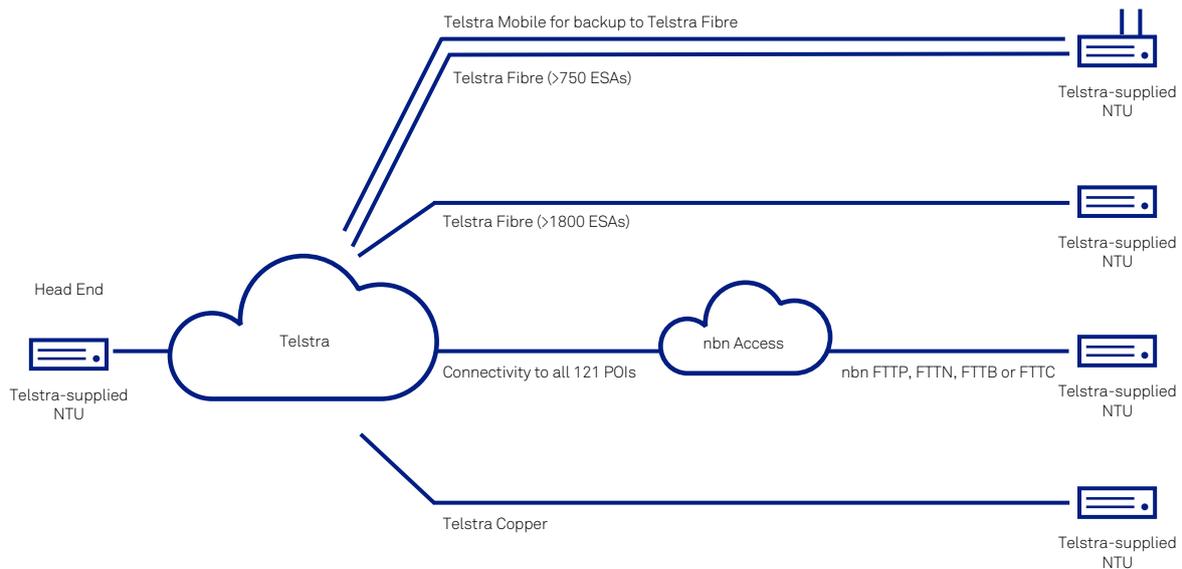


Figure 3: Access Resiliency Options

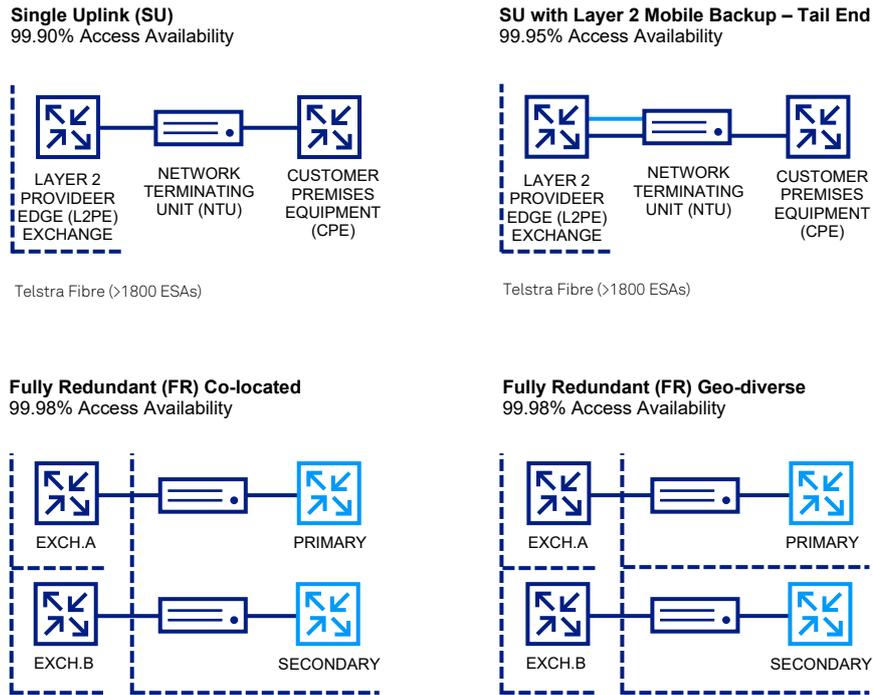


Figure 4: Comparing Product Capabilities

Using internationally recognised MEF terminology describing Carrier Ethernet Services, figure 4 summarises the relative capabilities of the EA Product.

MEF Service Type	MEF Service Definition	Summary Description	EA Mobile Access*	EA Cu Access**	EA nbn Access**	EA Fibre Access
			2 and 10Mbps	2–10Mbps	5–50Mbps	20–2000Mbps
			Standard CoS	Premium CoS		All CoS
E-Line	EPL (MEF 6.1 & 10.2)	<ul style="list-style-type: none"> Point-to-Point EVC-based, UNI-to-UNI Port-based UNI 	✗	✗	✗	✗
	EVPL (MEF 6.1 & 10.2)	<ul style="list-style-type: none"> Aggregated Point-to-Point EVC-Based, UNI-to-UNI C-VLAN-based UNI 	✓	✓	✓	✓
E-Access	Access EPL (MEF 33)	<ul style="list-style-type: none"> Aggregated Point-to-Point OVC-Based, UNI-to-ENNI Port-based UNI S-VLAN based ENNI 	✓	✓	✓	✓
	Access EVPL (MEF 33)	<ul style="list-style-type: none"> Aggregated Point-to-Point OVC-Based, UNI-to-ENNI C-VLAN-based UNI S-VLAN based ENNI 	✓	✗	✗	✓

* Use as a backup for a new tail-end service with Telstra fibre access as the primary. Not all aspects are MEF-compliant on mobile access

** Not all aspects are MEF-compliant on copper access or on nbn Access

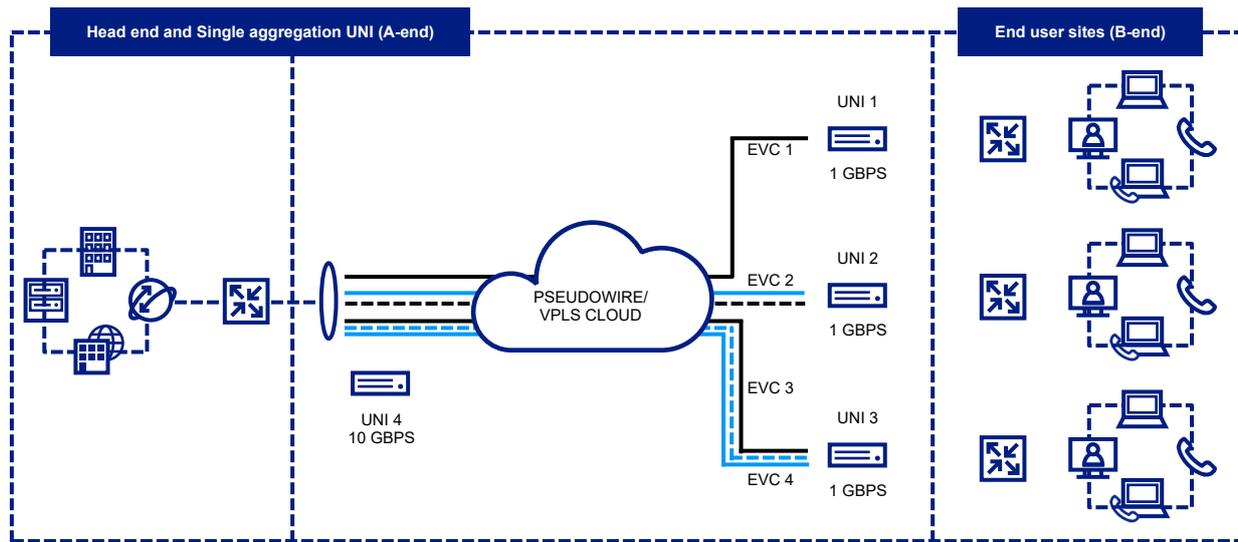
Understanding E-Line Services

MEF-defined E-line services associate a tail end UNI with a head end UNI, via an EVC. Topologically, you can order a service as single point-to-point, or as several point-to-point services to form an aggregated service-set. MEF defines both port-based and VLAN based services. A port-based E-Line service is called an Ethernet private line (EPL) and provides

service transparency. A VLAN-based E-Line service is called an Ethernet virtual private line (EVPL) service. Using the MEF-defined “preservation” attribute, if only one CE-VLAN is mapped at the tail end UNI, you can translate its VLAN-ID value so that a different value is mapped at the head-end. This tag-translation capability is useful when resolving

duplicate CE-VLAN IDs. EVCs can be single-CoS or multi-CoS and EVCs can be service multiplexed to create an aggregated service at the head-end UNI. These versatile constructs are available on our Ethernet Access product as shown in figures 5 and 6 below.

Figure 5: E-Line EVPL Services

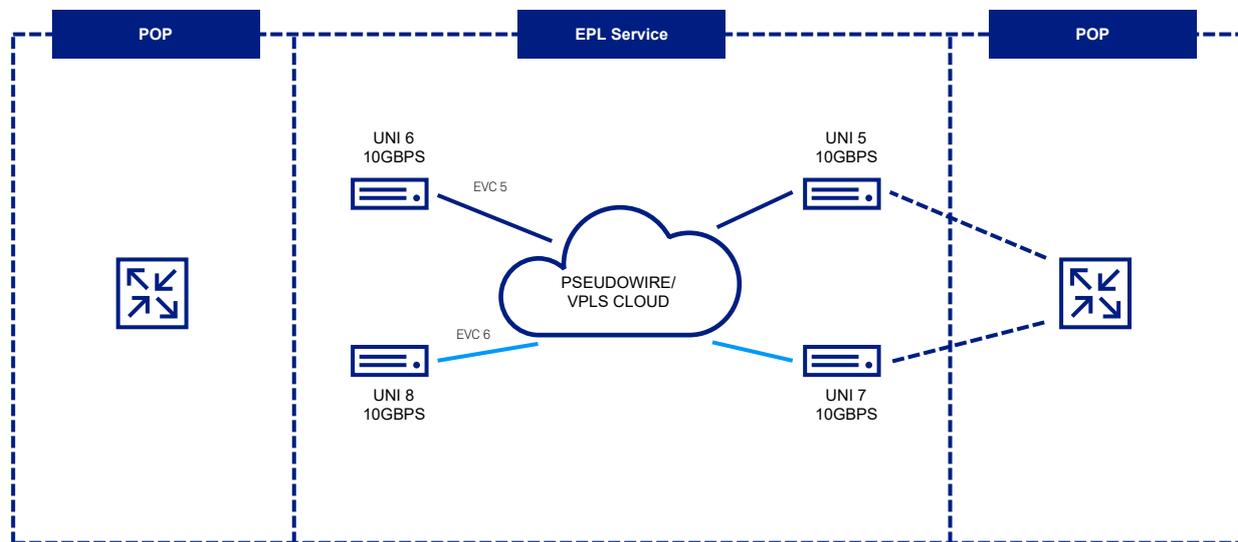


EVPL References

- UNI 1:** Terminates a single-CoS EVC 1 (eg Expedited)
- UNI 2:** Terminates one multi-CoS EVC 2 (eg Premium and Priority)
- UNI 3:** Terminates multiple EVCs: single-CoS EVC 3 and two-CoS EVC 4 (eg Expedited and Standard+Premium)
- UNI 4:** Service multiplexes all these EVCs into a single head-end

- Expedited CoS: could be VoIP traffic
- - - Priority CoS: could be SQL database query
- Premium CoS: could be email and file transfer
- · - · Standard CoS: could be web browsing

Figure 6: E-Line EPL Services



EVPL References

- UNI 5 and UNI 6:** Terminates a large-bandwidth single CoS EVC (could be premium) for data traffic
- UNI 7 and UNI 8:** Terminates a lesser-bandwidth single CoS EVC (could be Expedited) for Voice/Sync/OAM

- Expedited CoS: could be VoIP traffic
- Premium CoS: could be email and file transfer

Understanding E-Access Services

MEF defined E-Access services associate a UNI at the tail end of a service with an ENNI at the head end, via an operator virtual connection (OVC). As traffic exits the ENNI towards your head-end, an extra VLAN tag is added to each Ethernet frame.

This service tag (S-tag) is concatenated with the customer VLAN tag to create a double-tagged Provider Bridging frame

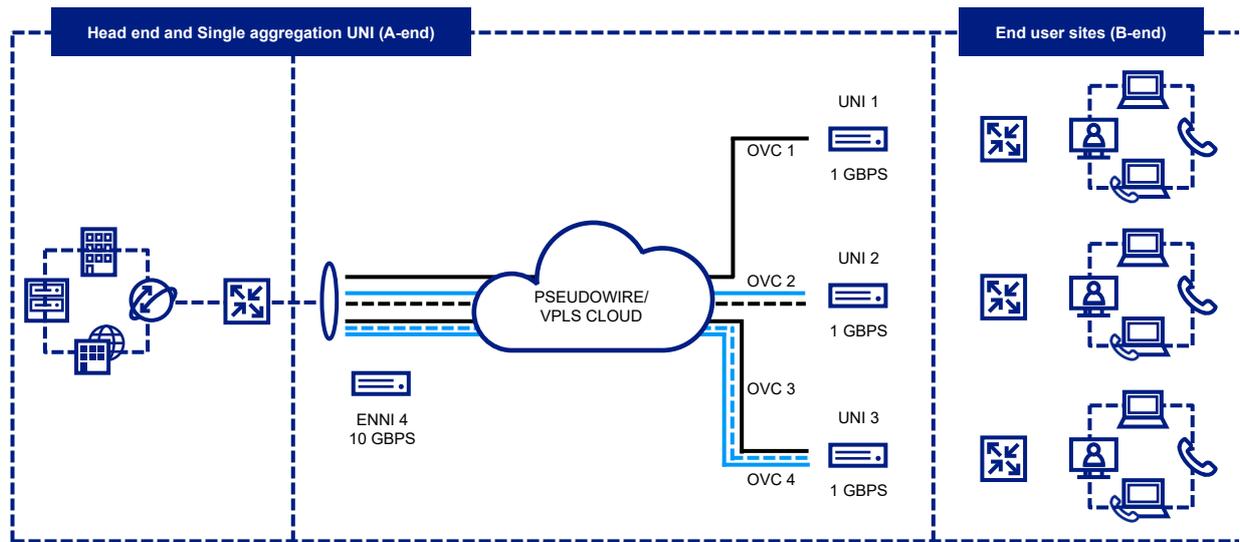
(aka Q-in-Q frame) as defined in the IEEE 802.1ad specification. Service-multiplexing on an S-tag basis at the ENNI creates an aggregated service set. The double tagging provides you flexibility and scale when separating customers and/or traffic flows.

In particular where a duplicate C-tag may be in-service at the tail-end, the addition/concatenation of an S-tag on egress from the ENNI creates a unique

identifier enabling traffic grouping/hierarchy. UNIs on an E-Access service behave identically to tail-end UNI's on E-Line services, noting that CE-VLAN IDs are always preserved on E-Access services.

These versatile constructs are available on our Ethernet Access product as shown in figures 7, 8 and 9 below.

Figure 7: E-Access Services

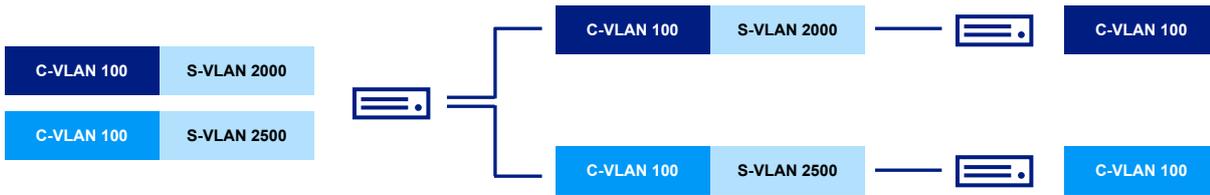


EVPL References

- UNI 1:** Terminates a single-CoS OVC 1 (eg Expedited)
- UNI 2:** Terminates one multi-CoS OVC 2 (eg Premium and Priority)
- UNI 3:** Terminates multiple OVCs: single-CoS OVC 3 and multi-CoS OVC 4 (eg Expedited and Standard+Premium)
- ENNI:** Terminates multiple OVCs: single-CoS OVC 3 and multi-CoS OVC 4 (eg Expedited and Standard + Premium)

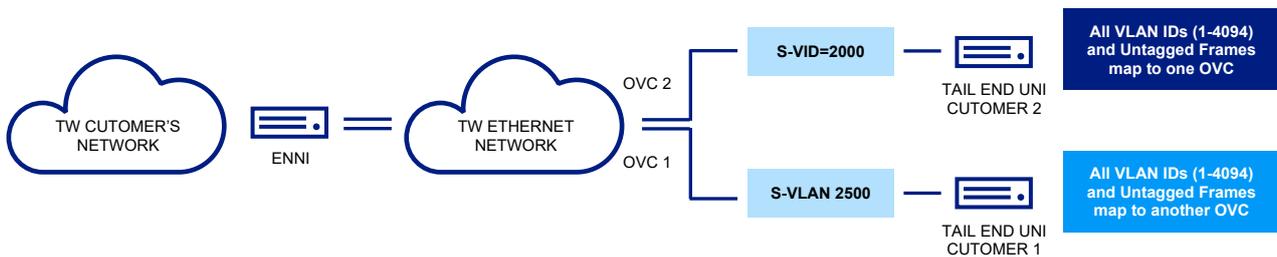
- Expedited CoS: could be VoIP traffic
- - - Priority CoS: could be SQL database query
- Premium CoS: could be email and file transfer
- - - Standard CoS: could be web browsing

Figure 8: Disambiguating Overlapping VLAN IDs using E-Access



Overlapping CE-VLAN IDs of 100 are disambiguated with the addition of the two S-VLAN IDs because the combination of the two IDs becomes a unique identifier.

Figure 9: Using S-VLANs to enable grouping, hierarchy and scale



Note: S-VLAN ID hierarchy ensures that any C-VLAN-ID in the range 1-4094 or untagged can be used by both customers at the same time without risk of VLAN clashes.

Why Ethernet Access with Telstra Wholesale?

Our experienced people

Telstra Wholesale offers a highly skilled and experienced team of specialists to help identify the solution that best suits your needs. Across Telstra (including Telstra Wholesale), over 100 staff hold the internationally respected MEF Carrier Ethernet Certified Professional (CECP) accreditation in addition to other industry-recognised certifications.

You will also receive our expert technical and operational support once the service has been delivered.

Our unrivalled network

We're in the places that you need us, with the EA product having national coverage across more than 2,000 Telstra exchange service areas, which is being augmented across nbn service locations at all 121 nbn POIs.

We pride ourselves on our consistency, service assurance and the cost efficiencies.

Our superior systems

Our proven, integrated systems capabilities and operational support help you manage your business needs with various online tools you can use to quote, order, support and review service inventory on your EA services.

Getting connected

You can order EA services through the standard ordering process, via LinxOnline™ Ordering (LOLO) or our business to business system LinxOnline Interaction Gateway™ (LOLIG). If you don't have access to LinxOnline™, ask your account manager to get you set up. Provisioning lead times will depend on the details of your order.

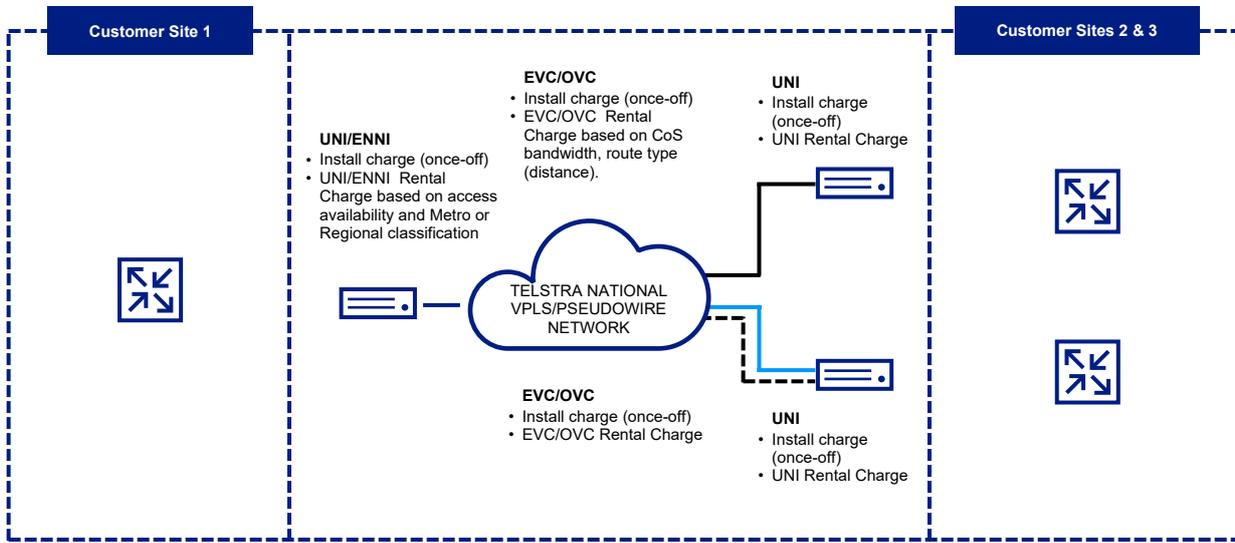
You'll find indicative lead times and activation processes in our Ordering and Provisioning Manual (OPM), available from your service manager. Our team will work with you to ensure the product option combinations you order will optimally meet your needs. You will have access to Quote2Activate™, an online web browser-based tool that is available

24 hours a day, 7 days a week. Using Quote2Activate™ you can obtain preliminary price-checks and provisionally verify service availability information for prospective services, both on Telstra fibre, copper and nbn accesses.

Charges and billing

EA uses route-based pricing for the recurring charges for both point-to-point and aggregated point-to-multipoint services. Our pricing takes into account class of service (CoS) and virtual connection (EVC/OVC) bandwidths, UNI/ ENNI interface speeds, and the service assurance on each virtual connection. These combinations give you a comprehensive range of possibilities. A minimum term of 12 months applies to each service. Non-recurring and recurring charges may be eligible for fixed term discounts. We will bill your services monthly, itemising the installation charges and recurring charges and service assurance charges as applicable.

Figure 10: Key Pricing Elements



Operations and maintenance

You can report service difficulties 24 hours a day, 7 days a week through our LinxOnline™ Service (LOLS) system or by calling the Telstra fault reporting centre.

Documents

Data sheets

- Ethernet Access Data sheets:
 - E-Line
 - E-Access
- MEF technical specifications

More information

For more information, you can:

- Contact your Telstra Wholesale account manager for existing customers
- Contact our **Telstra Wholesale team** for new enquires
- Visit telstrawholesale.com.au