

Telstra Wholesale Ethernet Access and Ethernet Backhaul

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.

Ethernet Access and Ethernet Backhaul Overview

Telstra Wholesale's Ethernet Access (EA) and Ethernet Backhaul (EB) products offer MEF CE 2.0 certified Layer 2 connectivity services respectively targeting the business access and backhaul markets. Four classes of service (CoS) enable you to prioritise traffic according to your performance needs.

Coverage is available at more than 2,000 Exchange Service Areas across Australia. (A full list detailing the 1800+ Fibre serviced ESA and copper footprint is available from Telstra on request). The products provide you with flexible and robust point-to-point and point-to-multipoint (aggregation) services through proven Virtual Private LAN Service (VPLS) and pseudowire technology in our core networks. Copper or fibre optic access cables provide physical connectivity from the Network Terminating Unit (NTU) at each of your sites to the serving Telstra exchanges.

End-to-end 'logical' service connectivity across these physical access cables 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.

These two products also offer customer-managed protection via redundant fibre optic access cables to geographically diverse Telstra access exchanges. Both products use the International Telecommunications Union (ITU) Y.1731 recommendation on Ethernet networks and operations, administration, maintenance (OAM) functionality. This OAM provides comprehensive and granular layer 2 fault management and performance monitoring, enabling us to quickly diagnose and sectionalise faults.

Using Ethernet Access

Ethernet Access connects tail ends and a head end. For example, it can be used to connect your branch offices to your head office or 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

Using Ethernet Backhaul

Ethernet Backhaul enables connection between your points of presence (PoPs), Telstra equipment buildings where you have equipment (e.g. DSLAMs) and data centre sites. You can use virtual connections (EVCs/OVCs) with different bandwidths and different classes of service (Cos) to prioritise network management and signalling, voice, content delivery (IPTV channels) and residential internet data.

What are the benefits?

National coverage

Our **national coverage** means you only have to engage a single-supplier, leading to both operational and total cost of ownership benefits.

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 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) and classes of service (CoS).

Meet customer needs

Prioritise traffic to meet your customers' needs with **multiple classes of service (CoS)**. 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 and EB. Single uplink (99.9%) and fully redundant (99.98%) head-end access availability options for both E-Line and E-Access services are shown in the figure. Geo-diverse access redundancy is subject to specific zoning business rules. For tail ends, only the SU and FR co-located options are supported. Protection is customer-managed, typically at layer 3.

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**.

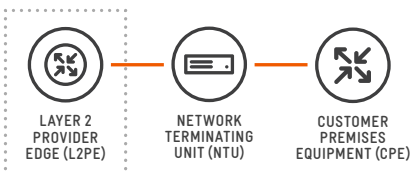
Industry best practice

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

Access Resiliency Options

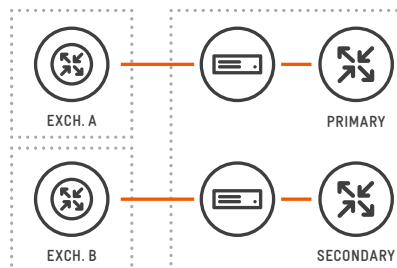
Single Uplink (SU)

99.90% Access Availability



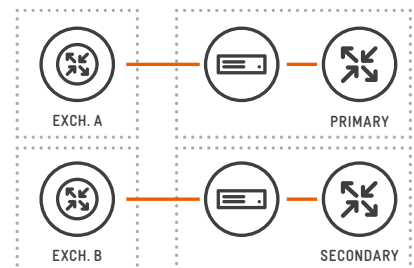
Fully Redundant (FR) Co-located

99.98% Access Availability



Fully Redundant (FR) Geo-diverse

99.98% Access Availability



Comparing Product Capabilities

Using internationally recognised MEF terminology describing Carrier Ethernet Services, the table below summarises the relative capabilities of the EA and EB Products.

MEF Service type	MEF Service definition	Summary Description	EA Cu Access* 0.256 - 10Mbps	EA Fibre Access 0.5Mbps - 16bps	EB Fibre Access** 2Mbps - 2Gbps
E-Line	EPL (MEF 6.1 & 10.2)	<ul style="list-style-type: none"> Point-to-Point EVC-based UNI-to-UNI Port-based UNIs 	✗	✗	✓
	EPVL (MEF 6.1 & 10.2)	<ul style="list-style-type: none"> UNI-to-UNI C-VLAN-based UNIs 	✓	✓	✓
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 EPVL (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 	✗	✓	✓

*Not all aspects are MEF-compliant on copper. ** EB is not offered over copper access

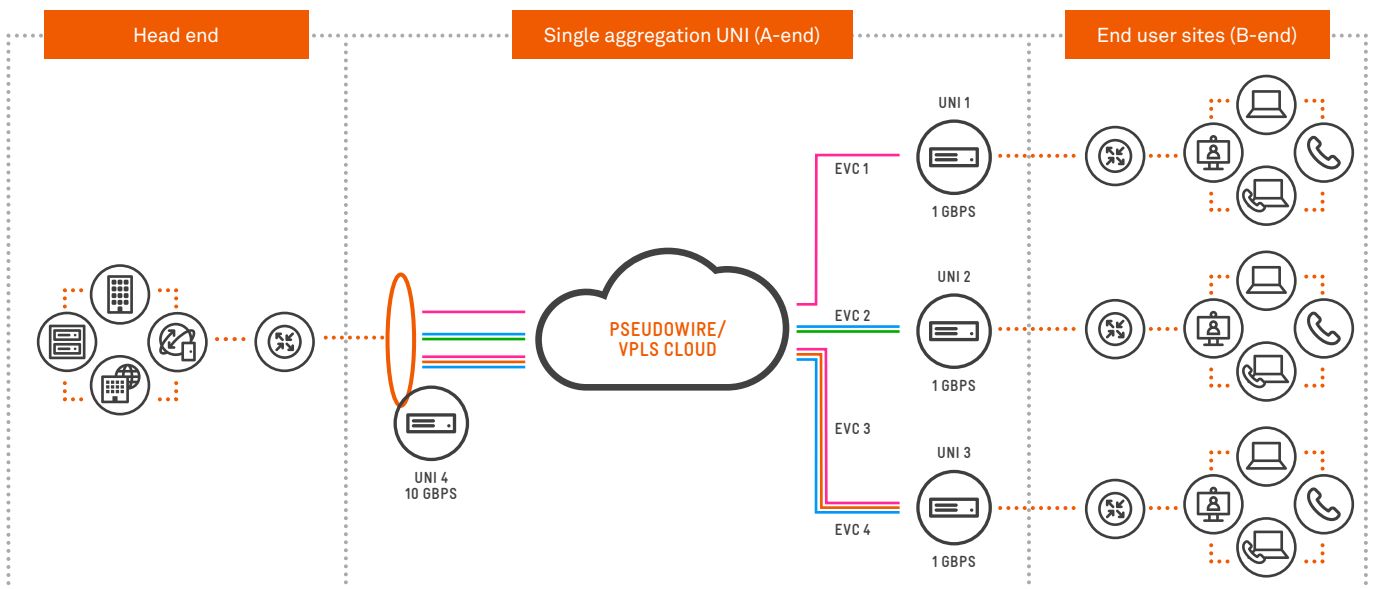
Understanding E-Line Services

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 a 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. You can map one or more CE-VLANs to the EVC at the tail end UNI. 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 and /or Ethernet Backhaul products as shown in the two figures below.

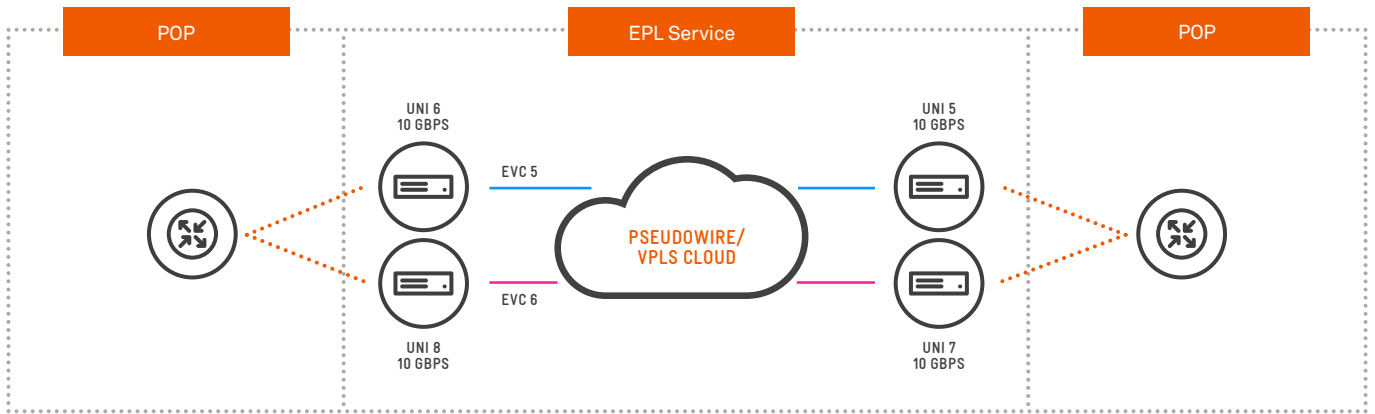
E-Line EVPL Services



EVPL References
UNI 1: Terminates a single-CoS EVC 1 (eg Expedited)
UNI 2: Terminates one multi-CoS EVC, 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

E-Line EPL Services



EPL 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

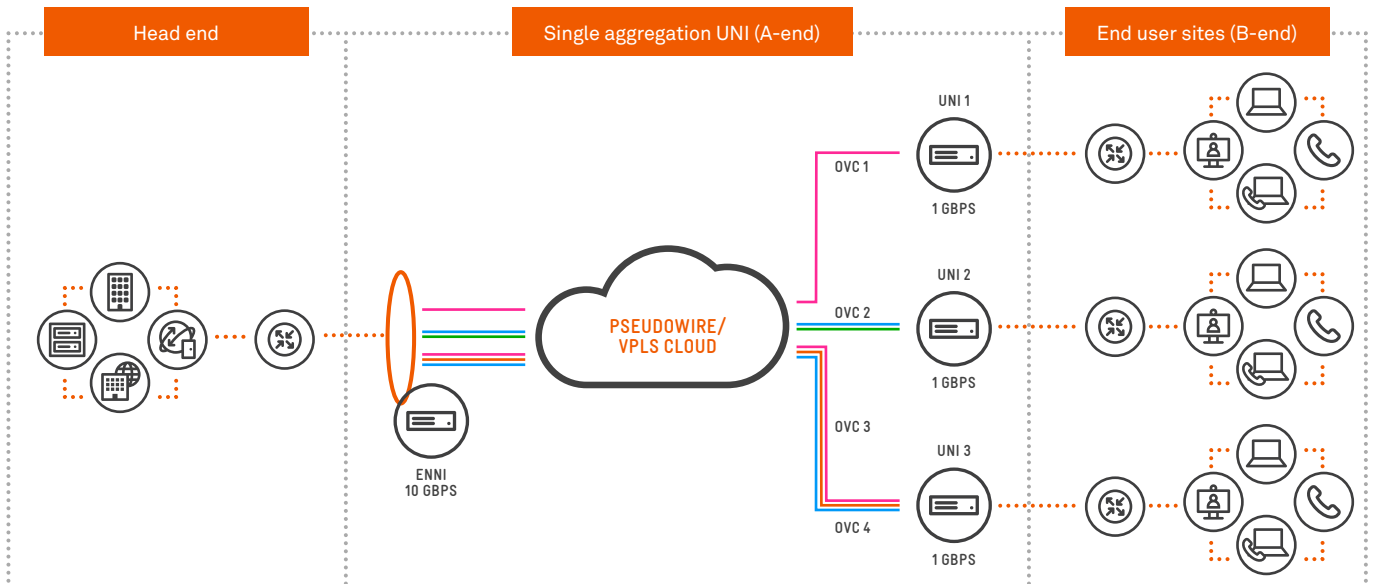
Understanding E-Access Services

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 and/or Ethernet Backhaul products as shown in the three figures below

E-Access Services



Access EVPL References

UNI 1: Terminates a single-CoS OVC 1 (eg Expedited)

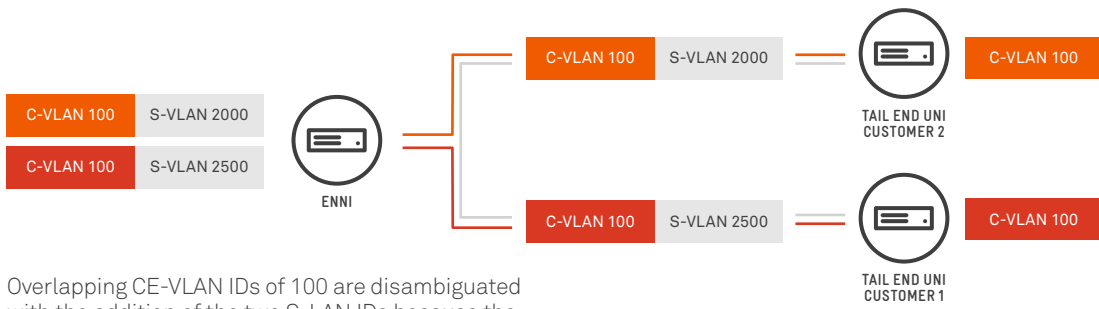
UNI 2: Terminates one multi-CoS OVC, OVC 2 (eg Premium and Priority)

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)

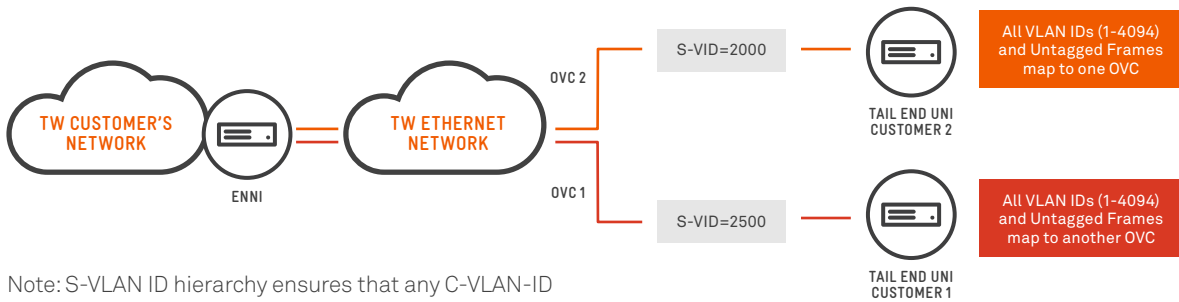
- Expedited CoS: could be VoIP traffic
- Priority CoS: could be SQL database query
- Premium CoS: could be email and file transfer
- Standard CoS: could be web browsing

Disambiguating Overlapping VLAN IDs using E-Access



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

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/Ethernet Backhaul 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 and EB products having national coverage across more than 2,000 exchange service areas – a list of which is available from Telstra Wholesale on request. We pride ourselves on our consistency, service assurance and the cost efficiencies that we can drive from our market-leading position.

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/EB services

Getting connected

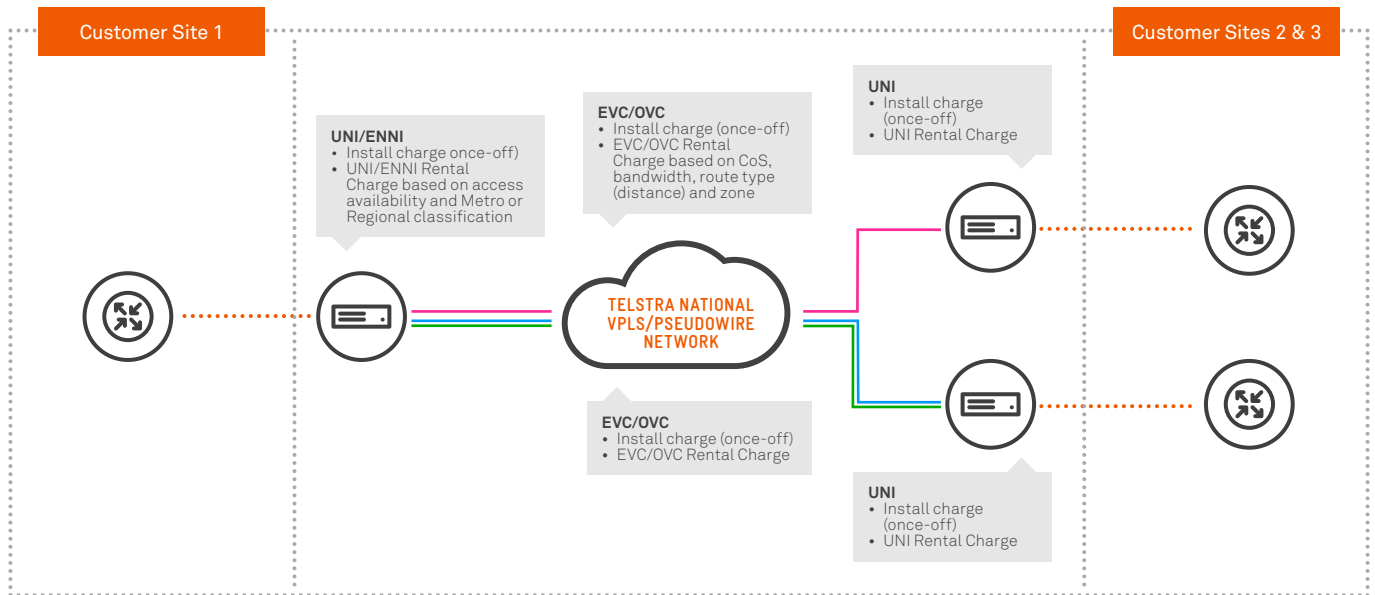
You can order EA and EB services through the standard ordering process, via LinxOnline™ Ordering (LOLO) or our business to business system LinxOnline Interaction Gateway™ (LOLIG). If you don't have access to LinxOnline™, ask your account manager to get you set up. Provisioning lead times will depend 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 soon have access to our new Quote to Activate™ Tool, an online

web browser-based tool that is available 24 hours a day, 7 days a week. Using Quote to Activate™ you can obtain preliminary price-checks and provisionally verify service availability information for prospective services.

Charges and billing

EA and EB use zone-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.

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.

More information

Documents

- Read Data sheet
 - Ethernet Access
 - Ethernet Backhaul
- Read the MEF technical specifications

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