
Enhanced UBA

Product user guide

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Table of Contents

| | | |
|----------|--|-----------|
| 1 | INTRODUCTION | 5 |
| 2 | BENEFITS | 5 |
| 2.1 | Key benefits of Enhanced UBA: | 5 |
| 3 | ENHANCED UBA PRODUCT DESCRIPTION | 5 |
| 4 | ENHANCED UBA COMPONENTS | 7 |
| 4.1 | External termination point | 7 |
| 4.2 | Enhanced UBA access | 7 |
| 4.3 | Coverage area | 7 |
| 4.4 | Local aggregation path | 8 |
| 4.5 | Handover point | 8 |
| 4.6 | Local handover point | 8 |
| 4.7 | Remote handover point | 8 |
| 4.8 | Handover link | 8 |
| 4.9 | Backhaul | 8 |
| 5 | VARIANTS OF ENHANCED UBA | 9 |
| 6 | ENHANCED UBA FEATURES | 9 |
| 6.1 | Interleaving | 9 |
| 6.2 | Interleaving settings for Enhanced UBA O | 10 |
| 6.3 | PPPoA modem support | 10 |
| 6.4 | Tail Extension | 11 |
| 7 | SERVICE SPECIFICATION TARGETS | 11 |
| 7.1 | Exceptions to service specifications | 13 |
| 8 | AGGREGATION AND HANDOVER OF TRAFFIC | 13 |
| 8.1 | Geographic availability | 14 |
| 8.2 | Modem installation | 14 |
| 8.3 | Relationship with other products | 15 |
| 9 | HOW ENHANCED UBA WORKS | 16 |
| 9.1 | Class of service design | 16 |
| 9.2 | Enhanced UBA protocol stack | 18 |
| 9.3 | Enhanced UBA Ethernet architecture | 19 |
| 9.4 | Traffic Management | 22 |
| 9.5 | PPPoA modem support | 24 |
| 9.6 | Tail Extension | 25 |
| 9.7 | IP addressing | 26 |

| | |
|--|-----------|
| 9.8 DHCP option 82 features | 27 |
| 9.8.1 Port ID | 27 |
| 9.8.2 Port ID mismatch | 27 |
| 9.8.3 Upstream speed | 28 |
| 9.8.4 Downstream speed | 28 |
| 9.9 Service component identifiers | 28 |
| 9.10 Security | 29 |
| 9.11 Technical interfaces | 29 |
| 9.12 End customer interface | 29 |
| 9.13 End customer interface security settings | 31 |
| 9.14 Service provider interface | 31 |
| 9.14.1 Service provider interface for PPPoA modem support | 33 |
| 9.14.2 Service provider interface security settings | 34 |
| 9.14.3 Handover links cable standards | 34 |
| 10 ONBOARDING TO ENHANCED UBA | 35 |
| 10.1 Prerequisites | 35 |
| 10.2 Enhanced UBA set-up guide | 35 |
| 10.3 Coverage area mapping and remapping | 36 |
| 10.4 Mapping and remapping process service level agreement | 36 |
| 10.5 Coverage area mapping process | 37 |
| 10.6 Mapping process charge | 37 |
| 10.7 Remapping process | 37 |
| 10.8 Remapping process charge | 39 |
| 11 ORDERING | 39 |
| 11.1 Enhanced UBA service requests | 39 |
| 12 FAULTS | 41 |
| 12.1 Fault definitions | 41 |
| 12.1.1 Modem re-sync fault definition | 41 |
| 12.1.2 Service provider tier 1 testing | 42 |
| 13 PRICING | 43 |
| 13.1 Monthly rental | 43 |
| 13.2 Transaction Charges | 43 |
| 13.3 Ancilliary charges | 44 |
| 13.4 Additional services | 44 |
| 13.5 Tail Extension pricing | 44 |
| 13.6 Coverage area mapping / remapping charges | 44 |
| 13.6.1 Coverage area remapping charges | 44 |
| 14 BILLING | 45 |
| 14.1 Tail Extension billing | 45 |

| | |
|---|-----------|
| 14.2 Other Chorus services | 46 |
| 15 CONNECTION AND PREMISES NETWORKING | 46 |
| 15.1 Connection option tasks | 47 |
| 16 END CUSTOMER EQUIPMENT REQUIREMENTS | 48 |
| 16.1 Overview | 48 |
| 16.2 Key capabilities | 48 |
| 16.3 CPE requirements | 49 |

1 Introduction

With Enhanced UBA you can provide your customers with a range of own-branded, broadband enabled services and applications such as voice over internet protocol (VoIP) and internet access.

The Basic UBA variant EUBA 0 can be found described in this product user guide.

2 Benefits

2.1 Key benefits of Enhanced UBA:

- Allows simultaneous delivery of internet and real time grade IP traffic over a single broadband access.
- Is the foundational product for delivery of next generation solutions to the home, such as video conferencing, home networking and automation, video applications, improved remote working and home security - all over a single broadband access to the home.
- Is an intermediate input product that can be combined with your network (or other service) to provide differentiated solutions to your customers.
- Can be used as an alternative to the PSTN.
- Uses our Ethernet network to deliver fast broadband access.
- PPPoA modem support feature enables a smooth transition with no interruption of service for end customers moving from current generation broadband products to Enhanced UBA.
- Tail Extension feature enables you to build up a local, regional or national presence without the need to invest or manage dedicated backhaul.
- Integrated with handover links to allow you to utilise the same handover links for Enhanced UBA and High Speed Network Services (HSNS) traffic.

3 Enhanced UBA product description

Enhanced UBA is the first in a new family of Ethernet delivered next generation broadband products, designed to support the simultaneous delivery of two Class of Service (Cos) streams:

Real time grade IP traffic: delivered as a real time CoS internet grade IP traffic:
delivered as 'best efforts' CoS.

Enhanced UBA is an intermediate input service that you can combine with your own network, or other services, to provide a range of own-branded broadband enabled services and applications such as voice over internet protocol (VoIP) and internet access. It is designed to serve your customers with either single or multiple access devices such as computers, consoles or telephones.

Enhanced UBA is available to you exclusively through Chorus.

Enhanced UBA is available nationally where Chorus has deployed ADSL2+ based technology with terrestrial access and backhaul assets (i.e. it excludes services supported by satellite and/or wireless access links or backhaul links). Enhanced UBA can only be provided if your customer's line speed meets the minimum thresholds required to deliver the Enhanced UBA service.

The following diagram shows the Enhanced UBA service:

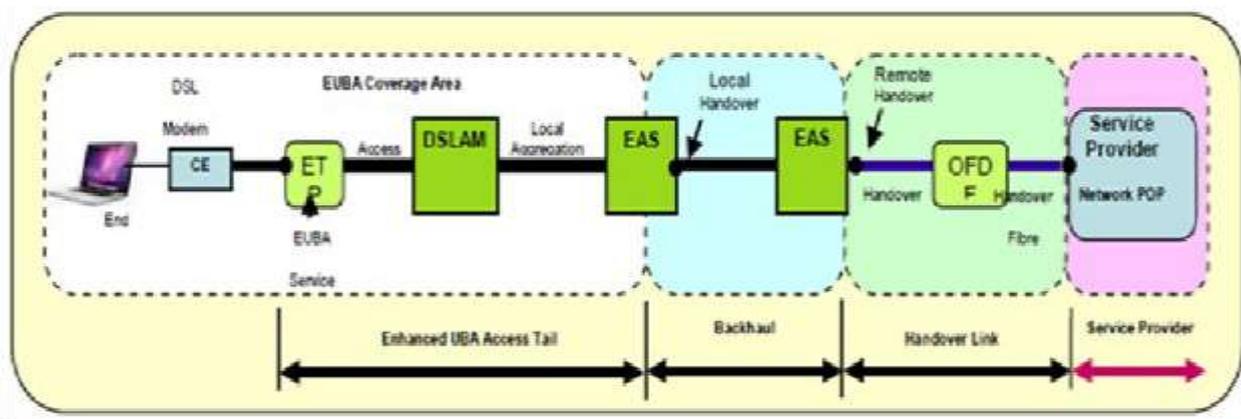


Figure 1: Enhanced UBA Service

4 Enhanced UBA components

Enhanced UBA is made up of the key components shown below:

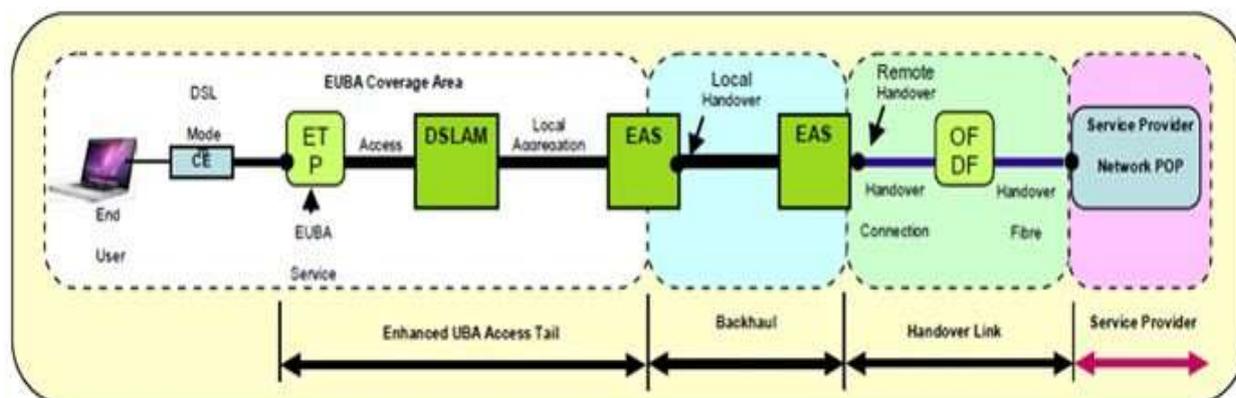


Figure 2: Enhanced UBA Service

4.1 External termination point

The ETP is the external termination point for telecommunications services at your customer's premises. Where there is no termination point external to the premises it is either the first jack on the premises wiring or the building distribution frame.

4.2 Enhanced UBA access

Enhanced UBA consists of a DSL data connection from the ETP at your customer's premises to the DSLAM at the local exchange or cabinet. While Enhanced UBA is optimised for ADSL2+, it is possible to use ADSL1 modems (see section 11 'end customer equipment requirements' for more information).

This is a bridged Ethernet connection that requires the use of 802.1q frames with a VLAN address of 10 and p-bit settings based on the class of traffic (see the section on technical interfaces for more information). Non-tagged frames will be discarded.

Per end customer traffic policies are enforced in this section of the network. Further detail on traffic management is provided in section 4.4.

4.3 Coverage area

A Coverage area is the collection of DSLAMs in a geographic area connected to a handover point. More information on Enhanced UBA coverage is available on the EUBA page of our website.

4.4 Local aggregation path

The end customer traffic from numerous DSLAMs in a coverage area is carried to the handover point over local aggregation paths.

These paths are dimensioned to support both the best efforts traffic and, separately, the real time traffic. Real time traffic is strictly prioritised both upstream and downstream to ensure that real time traffic meets your service specification targets.

4.5 Handover point

A handover point is our first Ethernet aggregation switch (EAS) within a coverage area, where all traffic within that coverage area is aggregated for handover. You will need a handover link to receive the traffic.

4.6 Local handover point

In the context of Tail Extension a local handover point is our first EAS in the coverage area in which the Enhanced UBA access tail is provided.

4.7 Remote handover point

In the context of Tail Extension a Remote handover point is an EAS located in a coverage area which is not the coverage area in which the Enhanced UBA access tail is provided.

If you don't have the ability to hand over traffic at the local handover point you can purchase Tail Extension (or another backhaul service) to take the Enhanced UBA traffic to a remote handover point that you've nominated.

4.8 Handover link

The handover link is an interface between our network and yours. Enhanced UBA traffic can be handed over only on Gigabit Ethernet interfaces.

4.9 Backhaul

If you don't have a handover link at the local handover point you can purchase Tail Extension or another backhaul service, which will terminate on a remote handover point.

Local traffic and traffic from remote coverage areas may be handed to you at the same handover point.

More information on Tail Extension is available in section 4.6.

More information on backhaul options is available on the secure section of Chorus's website <http://customer.chorus.co.nz/backhaul>.

5 Variants of Enhanced UBA

Enhanced UBA operates at FS/FS, which is the maximum speed that the DSLAM can support on the end customer's line (whether upstream or downstream). Actual speeds may vary, depending on factors such as CPE and wiring, your environment, volume of traffic, end customer location and network congestion.

It has four variants provided under the terms of the UBA STD:

- Best efforts only
- EUBA 0kbps
 - Best efforts
- EUBA 40kbps
 - EUBA 90kbps
 - EUBA 180kbps

The real time bandwidth allowance is designed to support industry standard VoIP codecs, including protocol overheads such as RTP, UDP, IP and Ethernet.

For example Enhanced UBA 40 is suitable for G.729 Annexes A,B,C,D,E,F,G,H,I at 10ms or higher packetisation rates. Enhanced UBA 90 is suitable for G.711 codec.

All four variants of Enhanced UBA can be provided with a voice service, such as Baseband. However, the Baseband Copper and Baseband IP services are not provided as part of the Enhanced UBA service and are as defined in the Baseband Service Description and product user guide.

6 Enhanced UBA Features

Enhanced UBA has three optional features:

6.1 Interleaving

For each Enhanced UBA variant ordered you will elect whether that connection will be provisioned with interleaving HIGH, interleaving LOW or interleaving OFF.

The default setting for Enhanced UBA is to have interleaving set on HIGH. This setting will incur an interleaving delay of downstream 16ms/upstream 0ms, as described in section 3.4.

Data interleaving is a technique defined as part of the ADSL2+ standard that increases the tolerance of line noise at the expense of some one-way packet delay. Your customers can ask you to have interleaving set on LOW or OFF.

With interleaving set on LOW or OFF there may be a reduction in latency, therefore you who offer latency sensitive applications may opt to have interleaving set to LOW or OFF. However, the service may now be more susceptible to line noise that may cause your customer to believe your service is faulty.

You'll be responsible for evaluating if the fault is attributable to interleaving being set to LOW or OFF, and if so for remedying this.

Interleaving OFF is intended to provide compatibility with Basic UBA. All three interleaving options can be used with the PPPoA modem support feature.

6.2 Interleaving settings for Enhanced UBA 0

The Enhanced UBA 0 and Basic UBA line profiles that are configurable through the interleaving settings are aligned to provide a seamless user experience and a smoother migration to next generation broadband products. The minimum line speed required to support Enhanced UBA 0 and Basic UBA is set at 64Kbps.

For Enhanced UBA 0 only - when choosing the three Interleaving settings available, HIGH, LOW and OFF, the you will get the following line profiles:

- **Interleaving HIGH** (default setting on Enhanced UBA0): When an order is placed for Enhanced UBA 0, the default setting of HIGH applied, which corresponds to a Basic UBA normal profile combination at 64Kbps line sync threshold.
- **Interleaving LOW:** If you choose interleaving LOW, you will get a Basic UBA Fast profile at 64Kbps.
- **Interleaving OFF:** If you choose interleaving OFF, you will get a Basic UBA Fast profile with 64Kbps.

Note: for EUBA 0 the LOW and OFF provide the same setting, which is aligned with Basic UBA.

6.3 PPPoA modem support

PPPoA modem support is a feature, available on all Enhanced UBA variants, that allows a modem configured for Basic UBA to be connected to an Enhanced UBA tail and deliver a

best efforts channel. For more detail on how PPPoA modem support works refer to section 4.5.

PPPoA modem support is an optional feature provided in accordance with the WSA.

6.4 Tail Extension

Tail Extension is a backhaul service that extends an Enhanced UBA access tail from the local handover point to a remote handover point that you've nominated. For more detail on how Tail Extension works refer to section 4.6.

Tail Extension is a commercial optional feature provided in accordance with the WSA and the Tail Extension Service Description.

7 Service specification targets

| Metric | Notes | Real time CoS (200 byte packet) | Internet Cos (1500 byte packet) |
|---------------------------|-------------------|---|--|
| Throughput | Kbit/s | =40kbit/s or 90kbit/s or 180kbit/s | 99.9% probability of providing to any end customer a minimum downlink average throughput of 32kbps during any 15 minute period on demand Peak to line speed |
| Interleaving delay | Milliseconds | Interleaving HIGH: Downstream 16ms/Upstream 0ms Interleaving LOW: Downstream 8ms/Upstream 0ms Interleaving OFF: Downstream 0ms/Upstream 0ms | |
| Mean one way packet delay | Interleaving HIGH | Downstream: 20ms Upstream: 4ms (excluding serialisation delay) | <1s |
| | Interleaving LOW | Downstream: 12ms | <1s |

| | | | |
|--------------------------------|-------------------|---|-------------|
| | | Upstream: 4ms (excluding serialisation delay) | |
| | Interleaving OFF | Downstream: 4ms Upstream: 4ms (excluding serialisation delay) | <1s |
| One way packet delay variation | Milliseconds | Uplink: 1ms Downlink: 1ms (excluding serialisation delay) | Unspecified |
| One way packet loss ratio | Interleaving HIGH | <0.1% | Unspecified |

These service specifications are design targets and should be used by you when developing end-to-end real time and best efforts applications. However the Enhanced UBA service will likely only form a small part of any such end-to-end application. Actual performance is not guaranteed as it is subject to external influences.

To achieve the specifications of the Enhanced UBA service the end customer's line speed must meet the minimum thresholds specified (see section 3.6). Where the end customer line quality does not meet the required line speed threshold to deliver the service, the Enhanced UBA service specifications will not apply.

The service specifications relate to the performance of the Enhanced UBA services from the ETP to the handover point on the first EAS, and exclude serialisation delays, transcoding delays, etc.

Packet delay variation is measured as: packet transfer delay (PTD) upper minus PTD min where PTD upper is the 99.9% quartile of PTD in the evaluation interval, and PTD min is the minimum PTD in the evaluation interval.

Packet loss ratio and delay variation must be evaluated over an interval of 15 minutes for all classes of service, as per our standard network practice.

Low interleaving means an interleaving setting that delivers as much error protection as possible while introducing no more than 10ms additional one way packet delay and subject to the mean one way packet delay specification for interleaving low being met.

Traffic will be policed at both an aggregate level and at an end customer level to ensure compliance with the service specification.

Depending on the Enhanced UBA Service supplied, 40kbps, 90 kbps or 180 kbps of real time traffic may be tagged per end customer. Exceeding this limit could prevent the service specifications from being achieved.

The Enhanced UBA 40kbps real time service uses a 60 byte packet metric (based on G.729A codec). The Enhanced UBA 90 and 180 kbps real time service uses a 200 byte packet metric (based on G.711 codec).

One way packet delay variations exclude serialisation delay, which is the amount of time needed to transmit a packet over the line rate. This delay is dependent on the size of the frame plus the size of any outstanding frames already being forwarded, and is proportional to the actual line speed.

7.1 Exceptions to service specifications

Where your customer's line does not meet the minimum line speed threshold required to deliver the ordered service variant the Enhanced UBA service specifications will not apply.

The presence of any of the below factors may mean your customer's peak throughput for the internet CoS is less than your line speed:

- Protocol overheads; network load.
- Constraints within either your or your customer's domains; the presence of any real time traffic.
- Capacity of the local aggregation path (LAP).
- Any constraints external to the Enhanced UBA Services.

8 Aggregation and handover of traffic

Each customer is located in a coverage area. The end customer traffic from numerous DSLAMs in a coverage area is carried to the handover point over local aggregation paths (LAP) dimensioned to support the throughput rate for Enhanced UBA of both best efforts and real time traffic.

If you do not wish to (or are unable to) collect Enhanced UBA traffic from the local handover point and would like to transport the traffic to a remote handover point where you have already established a handover link, you may do so using one of the following:

- Tail Extension feature.
- UBA Backhaul.
- Third party transport.

You can connect your network to any number of handover points throughout the country via handover links and/or any of the options above. However, in order to consume the Enhanced UBA service, you must connect to a minimum of one handover point.

It should be noted that it's not possible to deliver all unbundled services over a single handover link. While Enhanced UBA traffic can be delivered over the same handover point with other Ethernet based access tails like HSNS (using a shared service handover connection) it cannot be shared with other non Ethernet services such as Basic UBA (which are delivered over ATM based network platforms) as well as any commercial services that we've specified. Please refer to the handover link product user guide for more comprehensive information on service options.

8.1 Geographic availability

Enhanced UBA is available where Chorus has ADSL2+ coverage and the upstream line speed meets the minimum threshold required to support the requested service variant. The minimum upstream speeds will be 64kbps for Enhanced UBA 0, 256Kbps for Enhanced UBA 40 and 90, and 360 Kbps for Enhanced 180.

More information on Enhanced UBA coverage is available on the EUBA product page of our website.

Changes to coverage areas / handover points

The location of handover points and related coverage areas may change in the future as the ADSL2+ network is rolled out. Please refer to Clause 17.1.4 of the UBA STD Operations Manual for more detail on our obligation to notify changes to coverage.

Coverage area mapping for Tail Extension will need to be updated as additional coverage areas are added. Refer to section 5.3 for more information.

8.2 Modem installation

Modem installation is available with a connection and wiring order. The terms relating to Modem installation are set out in the Commerce Commission's decision, which can be found on the Commerce Commission website.

For us to complete a modem installation you will need to ensure that your customer has:

- A modem available from the approved modem list; and
- A single desktop or laptop computer with the operating system required to support the modem.

If the requirements above are in order we will organise for a technician to:

- Connect the modem and load the modem driver software.

- Enter the user ID and password supplied by you and set up your customer's email account (Microsoft Outlook, Outlook Express and Mail for Mac 9.0 and above are currently supported).
- We can also set up the internet browser and wireless network as specified by you
- If the modem does not connect we will perform basic fault finding or diagnostics in conjunction with your helpdesk.

Approved modem list

We will install modems from the approved modem list. It is available as a related resource on the UBA product pages of our website.

We have the ability to add modems to this list, to do this please supply:

- A telepermitted sample modem.
- The modem installation and technical manuals (including email and internet browser settings).
- Your helpdesk's contact details.
- Technical and operational specialists to assist us with drafting operational requirements.

8.3 Relationship with other products

Enhanced UBA can be combined with a number of Chorus input products, such as handover links, UBA Backhaul, and Commercial Colocation. You can choose to use Enhanced UBA with or without Tail Extension. Enhanced UBA traffic can also share a handover link with High Speed Network Service (HSNS).

This flexibility allows you to customise your customer's end to end service. Possible product combinations are illustrated below.

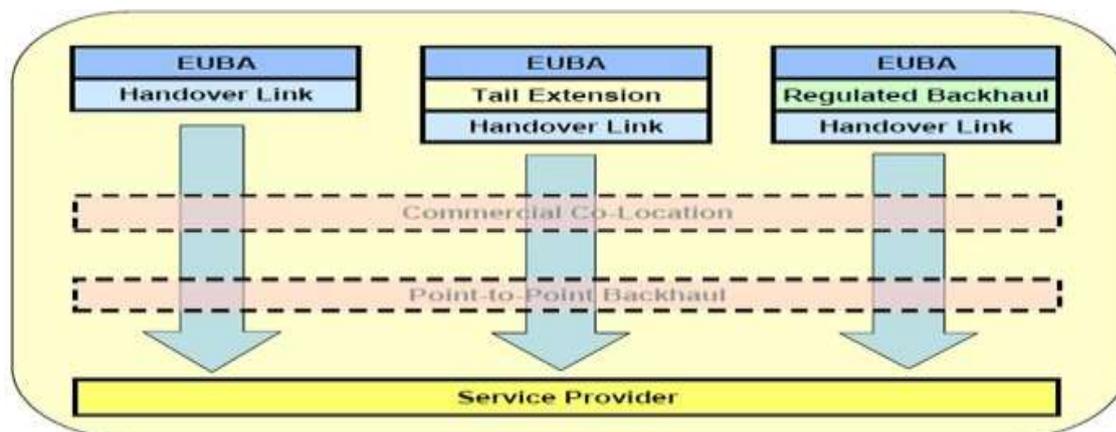


Figure 3: Enhanced UBA possible product combinations

The following diagram shows how HSNS and EUBA can be delivered over the same handover link:

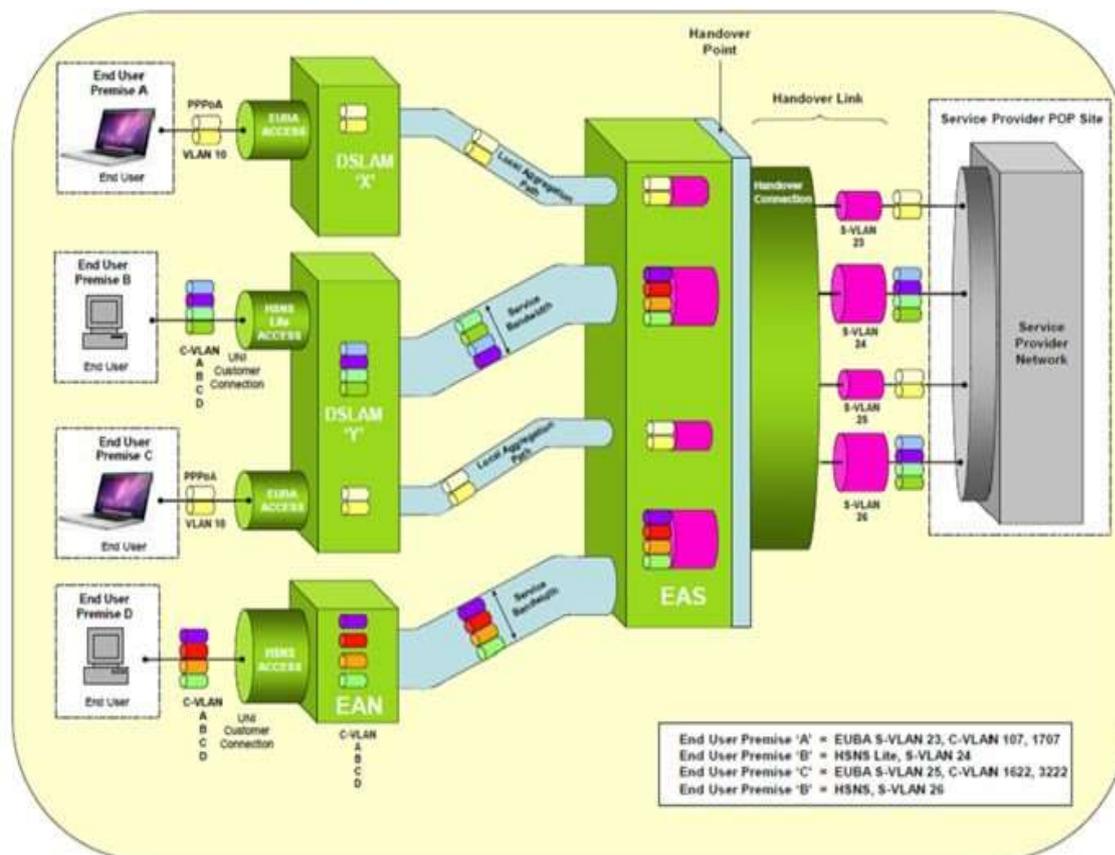


Figure 4: HSNS and Enhanced UBA delivered over the same handover links

9 How Enhanced UBA works

Enhanced UBA is a multi-class Ethernet layer 2 broadband access product with two CoS traffic profiles to support the simultaneous delivery of real time and best efforts traffic.

Enhanced UBA is delivered over a copper access and ADSL2+ technology and provides a transparent 802.1q Ethernet service between and end customer's premises and a defined handover point.

9.1 Class of service design

A key characteristic of the Enhanced UBA product is the ability to provide multiple class of service (CoS) each with your own traffic contract.

The two Enhanced UBA traffic classes have been designed in accordance with the ITU Y.1541 standard for Quality of Service (QoS) classes for telecommunication networks:

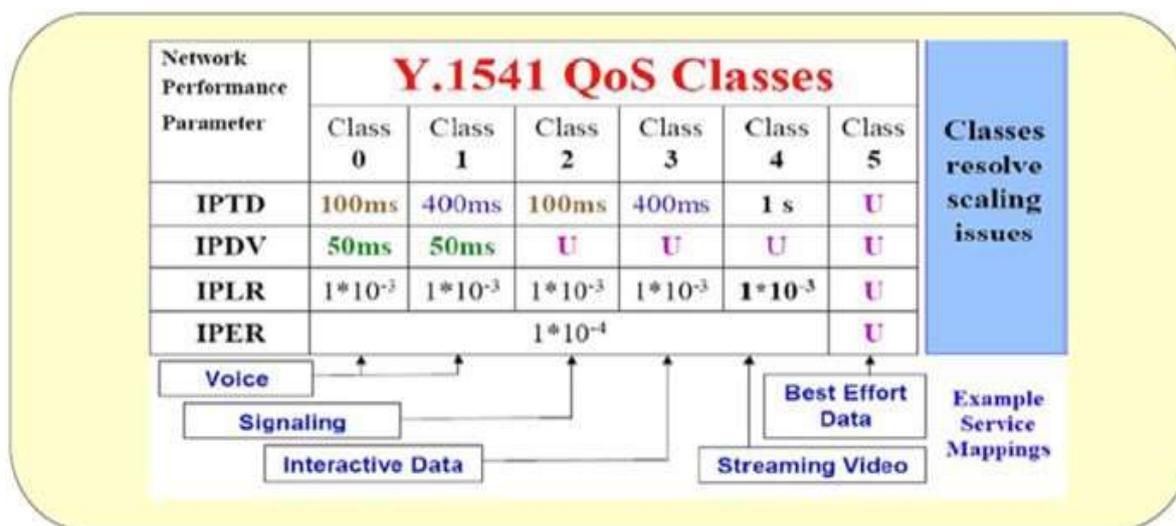


Figure 5: Quality of service classes standard

- Enhanced UBA real time is mapped to class 0, and identified by 802.1p tags of 6.
- Enhanced UBA best efforts is mapped to class 5, and identified by 802.1p tags of 0.

The Enhanced UBA CoS-based design allows for the different traffic types to be treated with different priority, and enables you to differentiate your applications across the network, as shown in the table below:

| Class | 802.1p | Description |
|--------------|--------|--|
| Best efforts | 0 | Intended to be used by internet applications that are not latency or jitter sensitive, such as browsing, email etc |
| Real time | 6 | Intended to be used by applications that have significant latency constraints, such as VoIP. |

Note: different implementations of these applications may have quite different performance results for your customer.

End-to-end performance will depend on the handover and backhaul components, your network, the end-to-end routing, the end customer environment and the actual application used.

The 802.1p marking uses three bits of an 802.1q frame to classify priority as follows:

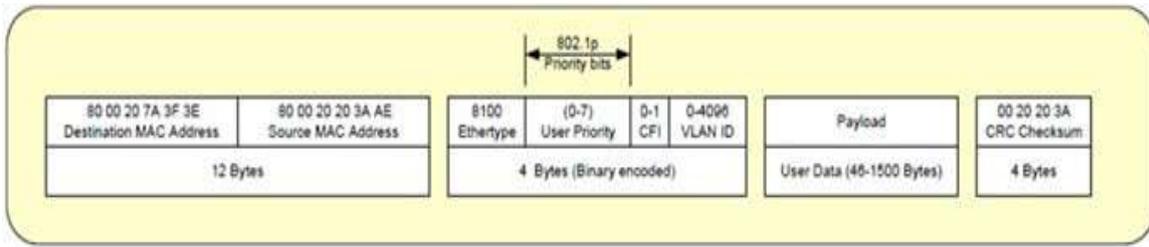


Figure 6: 802.1q frame

It's the responsibility of you or your customer to ensure traffic is tagged with the appropriate priority setting. Untagged or incorrectly tagged traffic will be discarded.

9.2 Enhanced UBA protocol stack

As illustrated in the figures below, the Enhanced UBA protocol stack is designed to support the CoS based design, specifically the simultaneous delivery of real time and best efforts traffic.

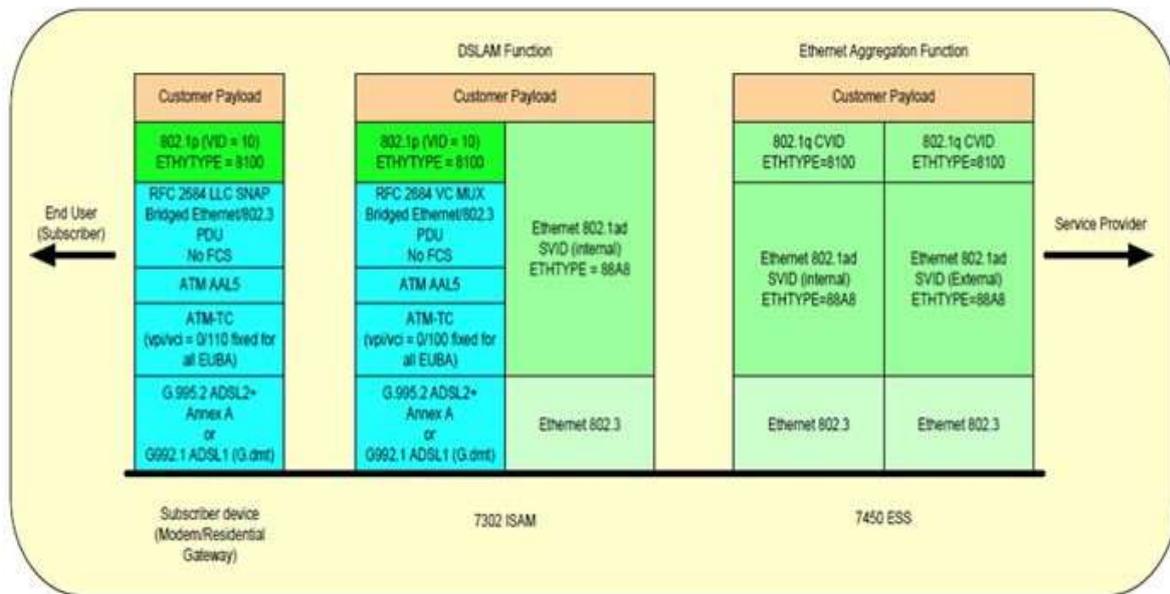


Figure 7: Enhanced UBA protocol stack

The following diagram shows how PPPoA modem support is delivered in parallel to the bridged Ethernet channel. Use of the PPPoA modem support channel is optional on all Enhanced UBA variants, but only supports best efforts traffic.

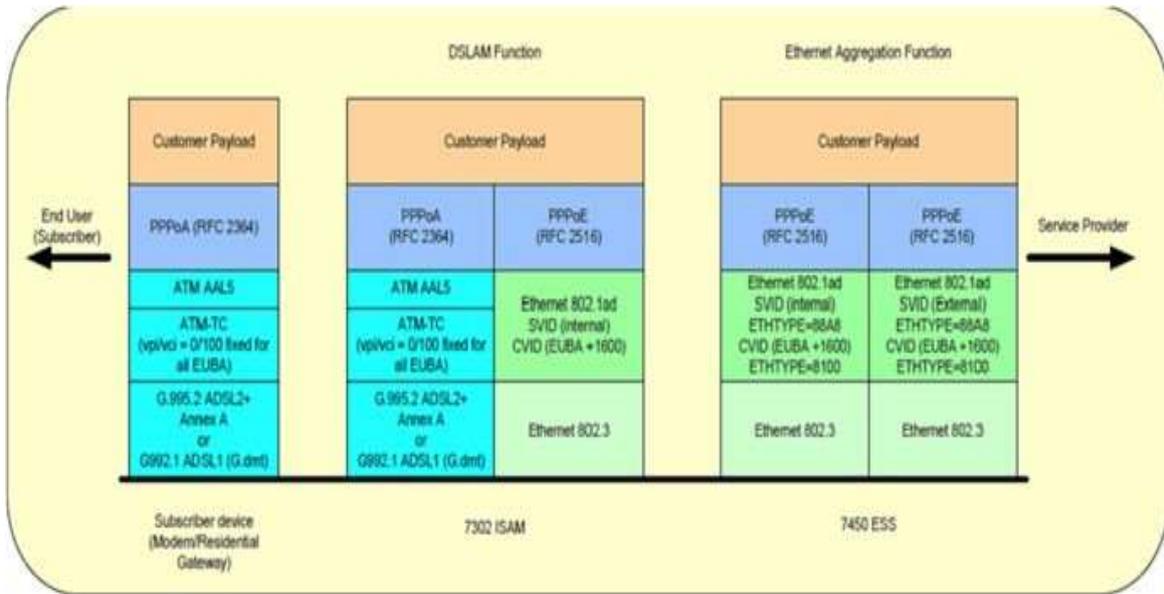


Figure 8: Enhanced UBA protocol stack with PPOA modem support

9.3 Enhanced UBA Ethernet architecture

Enhanced UBA is an Ethernet service with a VLAN based architecture. Each Enhanced UBA access tail connection is carried over dedicated VLANs from your customer’s premises to the handover point, as below:

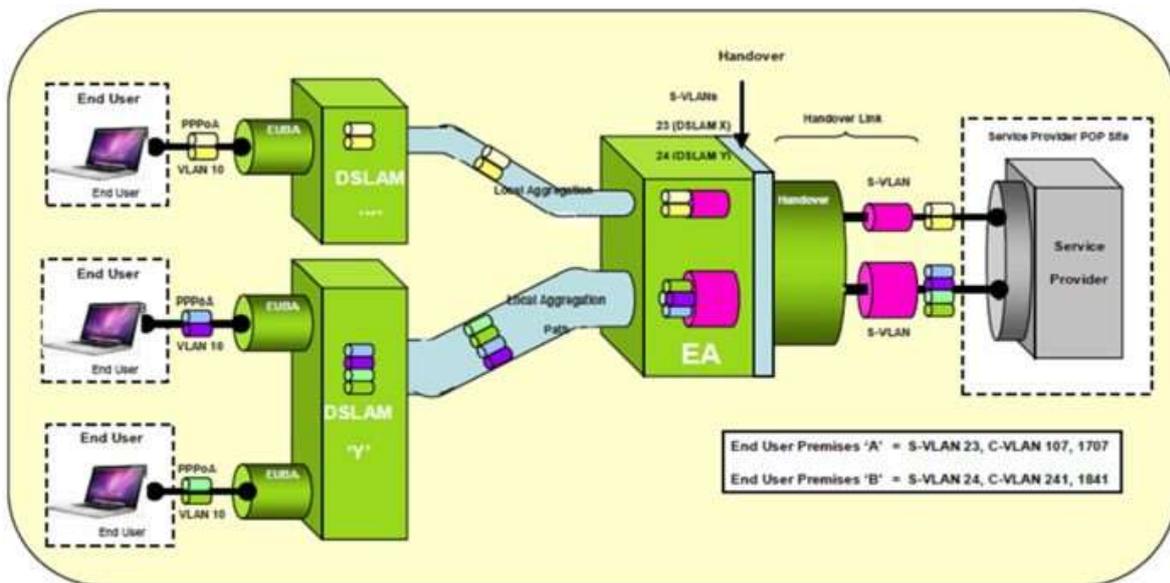


Figure 9: Enhanced UBA Ethernet viewpoint

The Enhanced UBA Ethernet architecture has been designed as follows:

- Two ATM PVCs over ADSL2+ provide two channels as follows:
 - VPI/VCI 0/110 Bridged Ethernet supporting a single 802.1q VLAN ID of 10.
 - VPI/VCI 0/100 PPPoA session. The DSLAM converts the PPPoA traffic into PPPoE, tags it as best efforts, and inserts it into a separate dedicated VLAN from the DSLAM to your network.
- These channels will share the same traffic contract, i.e. do not add.
- At your end the Ethernet VLANs are identified by a unique assigned 802.1ad service VLAN ID/customer VLAN ID combination, see below for further information on VLAN IDs.
- Our network will translate the 802.1q VLAN ID to the 802.1ad identifiers.
- The Enhanced UBA VLAN will support both best efforts traffic and real time traffic as long as that traffic is tagged correctly. Incorrectly marked traffic, including no markings at all, will be discarded.

If you or your customer exceeds the specified real time traffic contract for the service variant chosen, then the excess traffic is randomly discarded and service performance targets will no longer be met.

If you or your customer sends best efforts traffic that exceeds the specified traffic contract over the Handover Connection, LAP, or backhaul bandwidth, then this traffic will be queued and finally randomly discarded – however real time traffic will not be affected. Best efforts applications should expect this behaviour under network congestion.

Note: the best efforts contract is shared between both channels. The following Ethernet protocols are supported on Enhanced UBA:

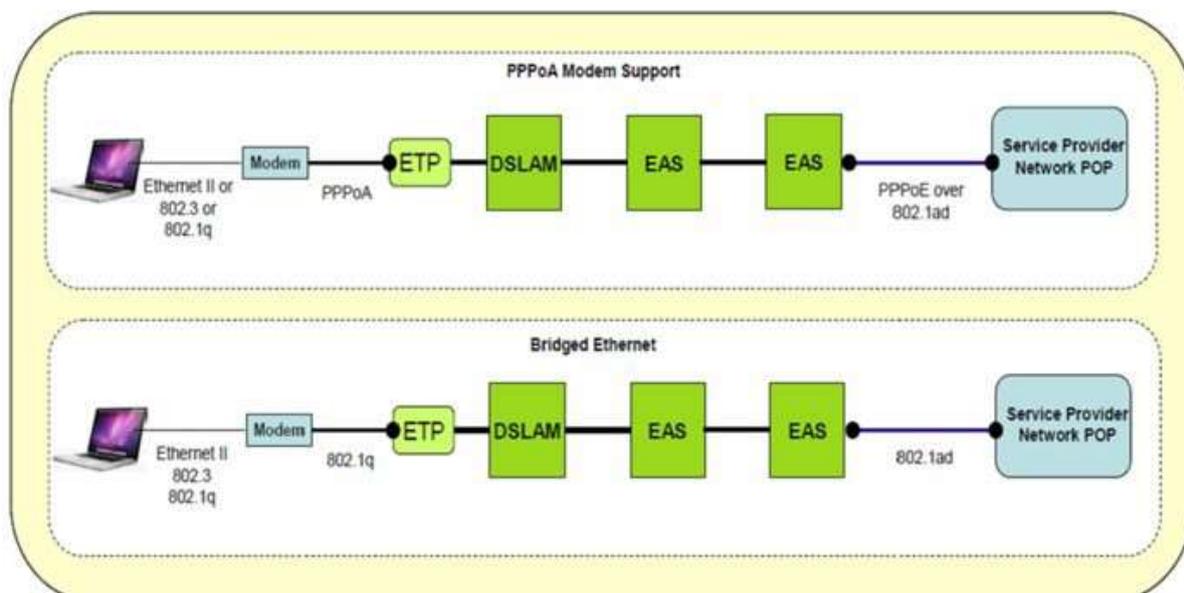


Figure 10: Enhanced UBA Ethernet protocols

Your customer's LAN is normally Ethernet II or 802.3 but if they have devices that can priority tag traffic then 802.1q can be used.

If their LAN is not using 802.1q then the modem or gateway must tag the traffic according to the appropriate class of traffic.

The figure below shows the format of the Ethernet frames for tagging Enhanced UBA traffic:

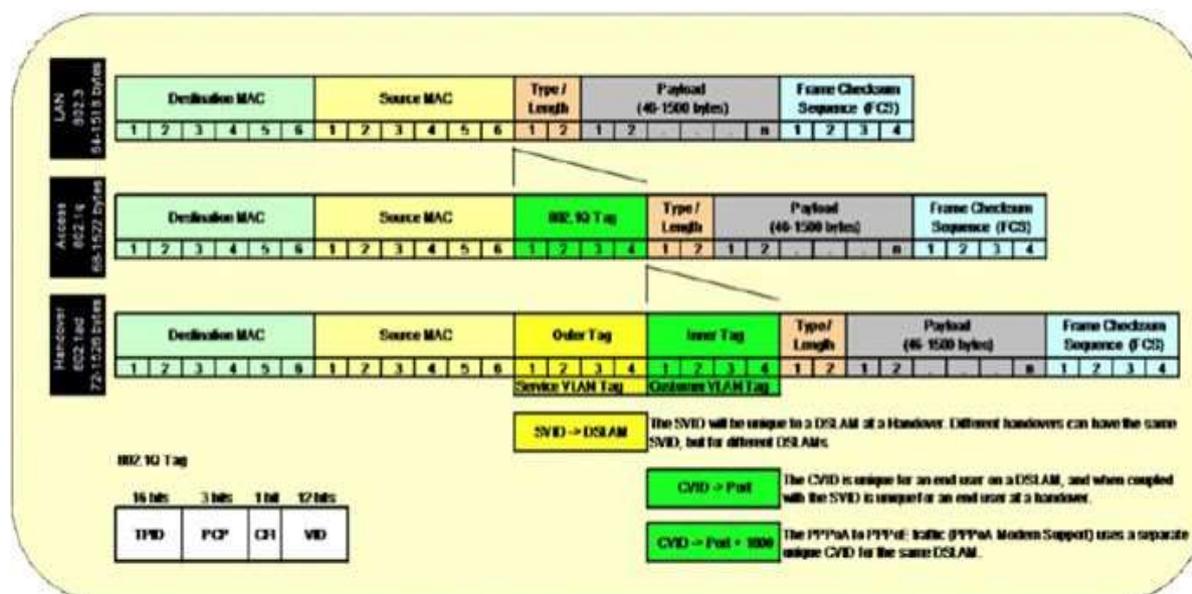


Figure 11: Enhanced frames format

Tag protocol identifier (TPID) is a 16 bit field containing the Ethertype. This is set to 0x8100 for 802.1q frames. For 802.1ad frames the inner tag is set to 0x8100 and the outer set to 0x88a8.

Priority code point (PCP) is a 3-bit field that refers to the 802.1p priority. This is assigned the values of 0 for best efforts or 6 for real time.

Canonical format indicator (CFI) is set to 0.

The VLAN identifier (VID) is a 12 bit field identifying the VLAN. This is set as follows:

- Access (802.1q) - VLAN is set to 10
- Handover (802.1ad) - VLANs are determined by us where:
 - The service VID (S-VID) is unique to a Chorus DSLAM within that coverage area(s) supported at that handover.
 - The customer VID (C-VID) is unique to a port on that Chorus DSLAM. One C-VID is used for the bridged Ethernet channel, and a second (offset from the first by 1600) is used for the PPPoA modem support channel.

Note: across multiple handovers for the same service provider there may be replication of S-VIDs on different handovers.

9.4 Traffic Management

The Enhanced UBA service specifications for real time and best efforts traffic are managed through our network through a number of traffic management techniques, as shown below:

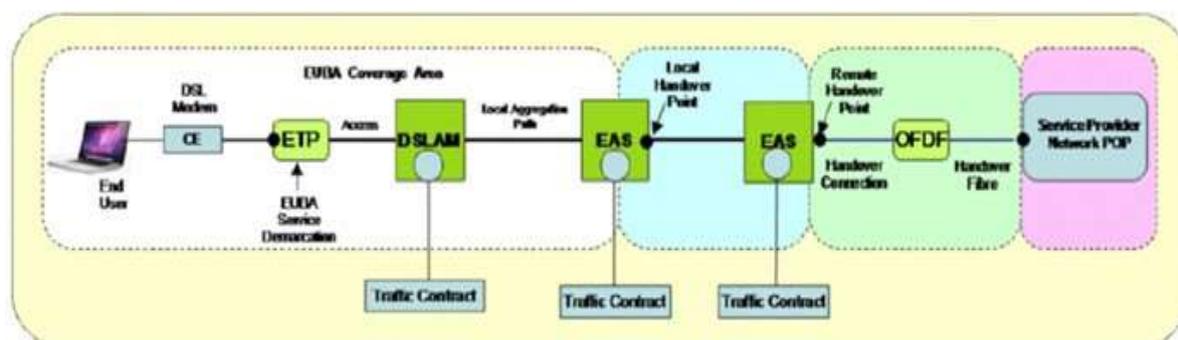


Figure 12: Ethernet frames format

The following techniques are applied to manage the Enhanced UBA traffic across the Chorus network:

| | Traffic flow/CoS | DSLAM | First data switch | Handover switch |
|-------------------|------------------|---|---|--|
| Downstream | Best efforts | Per user None (line speed) Aggregated None | Per user None Aggregated Round robin weighted Shaped to greater of: LAP bandwidth 45kbps x Σ tails | Per user None Aggregated Policed at LAP per DSLAM |
| | Real time | Per user Policer – plan Burst rate – 3312 Aggregated None | Per user None Aggregated Strict prioritisation | Per user None Aggregated CIR = Σ tails |
| Upstream | Best efforts | Per user None Aggregated None | Per user None Aggregated Round robin weighted Shaped to LAP bandwidth | Per user None Aggregated None |

| | | | |
|-----------|---|--|---|
| Real time | Per user Policer = plan Burst rate = 3312 Aggregated Strictly prioritised | Per user None Aggregated CIR = \sum tails | Per user None Aggregated Strict prioritisation |
|-----------|---|--|---|

Notes:

- If traffic is handed over at the first EAS then the first EAS will implement both the first EAS and the handover traffic contracts.
- There is limited buffering in the DSLAM. If more traffic is sent to an end user than your line-speed can support, then excess traffic will be discarded (similar to being policed). TCP throttling is designed to cope with this, but may affect end customer experience. Also, any usage counters in your domain will not be aware of these dropped packets.

The policing profile for real time traffic includes two parameters:

| | |
|-----------------------------------|--|
| Committed information rate | The throughput needed to support the basic service, including an allowance for layer 3 headers and assumes a 200 bytes packet. Codecs with different packet sizes may see a slightly different throughput |
| Burst size | In order to allow the accommodation of signalling traffic ion the real time traffic flow a burst allowance has been defined to allow 2 full length frames and a 200 byte VoIP packet to be sent without discard. |

At an aggregate level the Enhanced UBA traffic is managed as following:

- All real time traffic is aggregated per service provider and strictly prioritised over the local aggregation path.
- All real time traffic is policed per destination DSLAM to the aggregate of the purchased real time traffic contract for that service provider for that DSLAM.
- All best efforts traffic is aggregated and shaped to the LAP bandwidth (the greater of 24 Mbps or 45kbps times the number of end customers on that DSLAM).
- All best efforts traffic is policed per destination DSLAM on ingress at Handover Connection to the LAP bandwidth for that DSLAM, i.e. you cannot send more traffic to a DSLAM than the maximum best efforts LAP bandwidth to that DSLAM

This best efforts aggregated traffic contract is shown in the figure below:

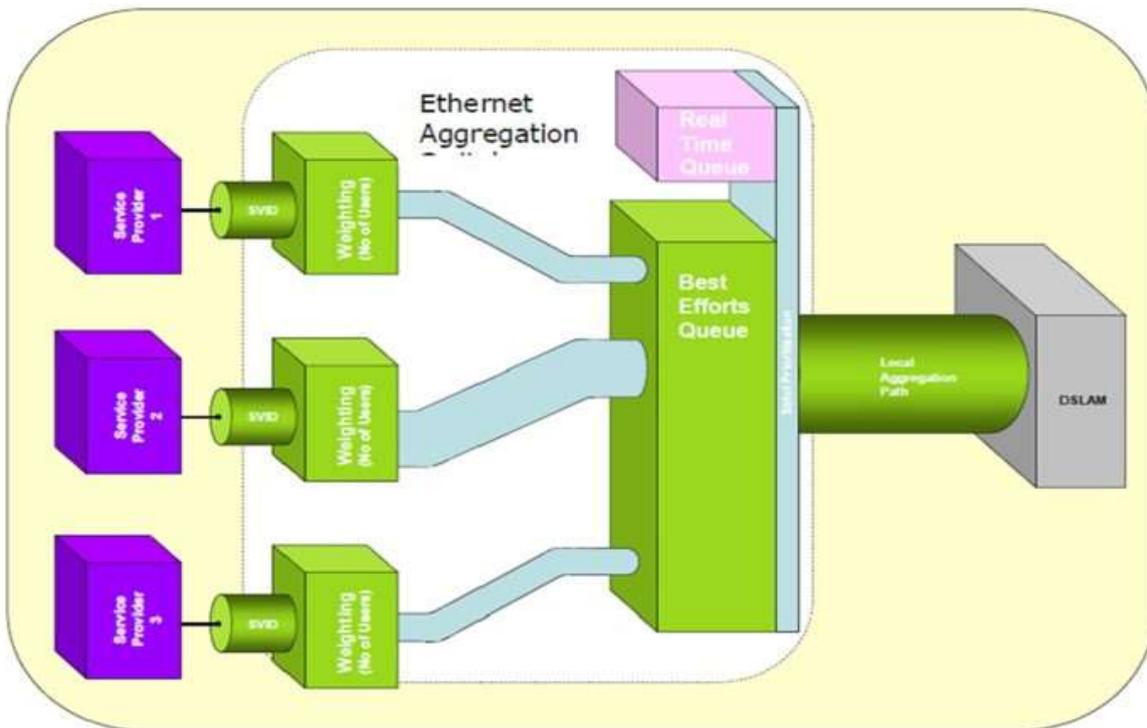


Figure 13: Best efforts aggregate traffic contract

9.5 PPPoA modem support

PPPoA modem support is a feature that allows a modem configured for Basic UBA to be connected to an Enhanced UBA tail and deliver a best efforts channel.

The diagram below shows how the PPPoA modem support feature will be supported on all Enhanced UBA variants:

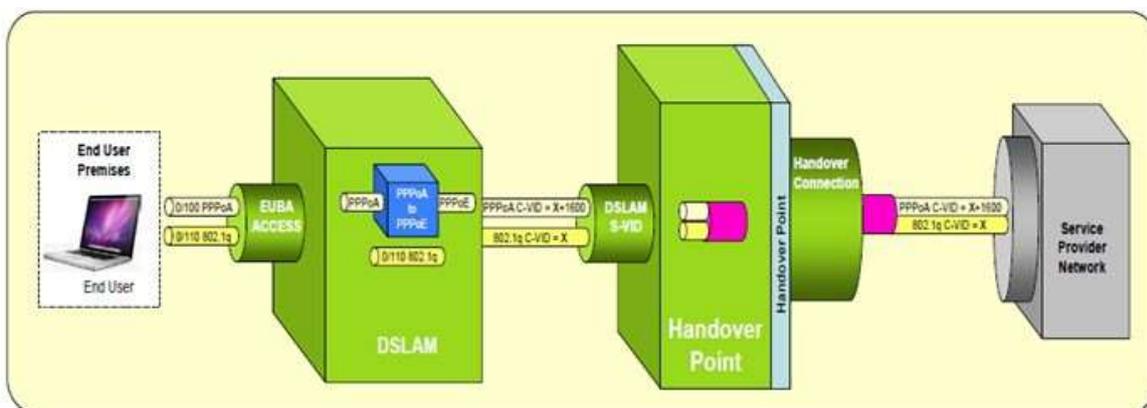


Figure 14: PPPoA modem support

End customers will be provided with two separate channels to access Enhanced UBA:

Channel 1 (Enhanced UBA): EoA VPI/VCI is 0/110

- Carries RFC2684 Ethernet over ATM (EoA)
- Uses the existing Enhanced UBA VPI/VCI combination to differentiate it from the PPPoA channel Fully compliant with the UBA Standard Terms Determination, supports 802.1q across the access and 802.1ad towards the Handover Connection
- The service provider interface specification is 100% compatible with Enhanced UBA. The end customer interface specification is 100% compatible with Enhanced UBA.

Channel 2 (PPPoA modem support): PPPoA VPI/VCI is 0/100

- Supports PPPoA connectivity over ADSL access.
- Uses the DSLAM to convert PPPoA to PPPoE over a dedicated 802.1ad VLAN. Uses the existing VPI/VCI allocation, e.g. VPI/VCI 0/100 for PPPoA modems.
- The service provider interface specification is 100% compatible with Enhanced UBA.
- The end customer interface specification is 100% compatible with current generation broadband products such as Basic UBA.
- All traffic on channel 2 will be marked and treated as best efforts in the transport network, regardless of your Enhanced UBA plan.

Additional characteristics:

- The two channels will be delivered to the same handover link.
- The channels will not 'add', i.e. the end customer cannot get twice the best efforts performance by using both channels simultaneously.
- The ATM PVC (vpi/vci) allocation of 0/100 is retained to allow compatibility with Basic UBA
- Channel 2 will be delivered over the handover using a separate VLAN id offset by 1600. For example if channel 1 for an end customer is delivered as VLAN 5/206 then channel 2 would have a VLAN id of 5/1806.

9.6 Tail Extension

Tail Extension is a backhaul service that extends an Enhanced UBA access tail from the local handover point to a remote handover point that you've nominated.

The following diagram shows how Tail Extension works:

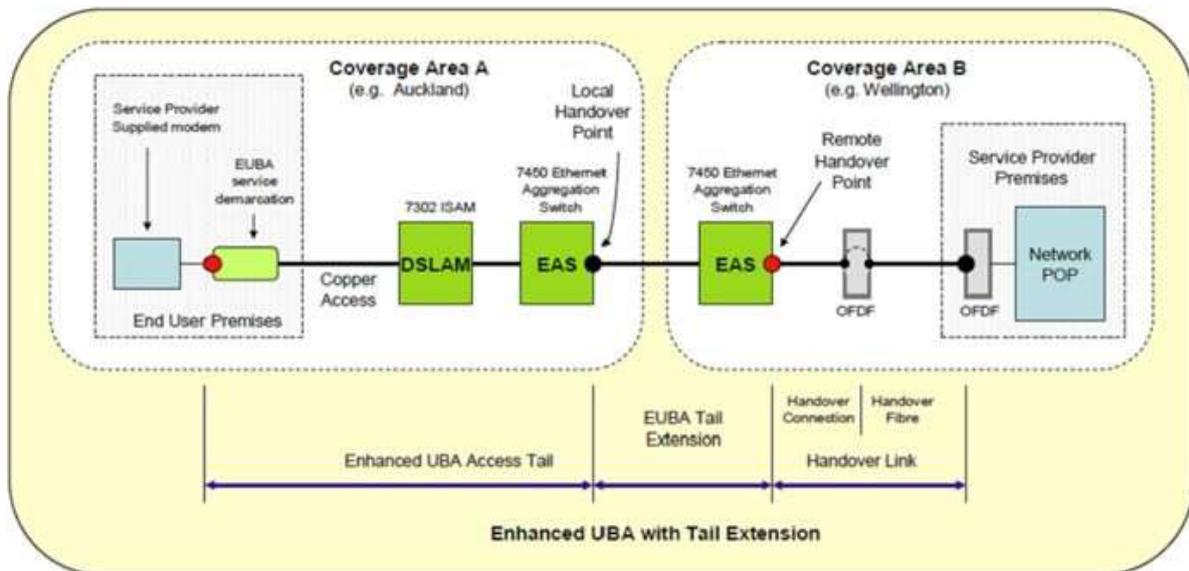


Figure 15: Tail Extension

- Available for all Enhanced UBA variants: EUBA0, EUBA40, EUBA90, and EUBA180.
- Is configured to seamlessly reflect the service attributes of the Enhanced UBA access tail e.g. bandwidth. Available nationally where we've deployed Enhanced UBA.
- Will be pre-configured per coverage area via the coverage area mapping process. You will map each coverage area to a nominated terminating service i.e. handover link or other backhaul service, located at a handover point. More information can be found in section 5.3.
- Only one terminating service type can be mapped per coverage area, i.e. Christchurch = P2P backhaul, Dunedin = handover link
- When an Enhanced UBA access tail is ordered within a coverage area which is mapped to a remote handover link, then Tail Extension will be used to extend the Enhanced UBA access tail to the remote handover point.
- Multiple individual Enhanced UBA access tails from separate coverage areas can be aggregated and presented to you at the same handover point.
- Tail Extension is presented to you via a Gigabit Ethernet handover link.
- Incurs a Tail Extension monthly charge based on 8 backhaul steps A-H, which is applied in addition to the Enhanced UBA access monthly rental charge. More information can be found in section 8.5.

9.7 IP addressing

Enhanced UBA is an Ethernet Layer 2 tail service optimised to carry real time and best efforts IP traffic. All Layer 3 IP characteristics and features, including IP addressing, are your responsibility.

Examples of mechanisms that might be used by you to allocate IP addresses to end customers are:

- PPP over Ethernet (PPPoE). This would be supported by many legacy and current generation devices utilised to deliver Basic UBA services, as well as many L2TP gateways. However, you must ensure these devices support priority-tagging and 802.1Q VLAN marking of the Ethernet frames.
- DHCP. This will allocate an IP address to one or more devices at the end customer premises. A maximum of 4 MAC addresses, and thus four Ethernet devices, are permitted on each DSL line.
- Static allocation, i.e. a dedicated IP interface per VLAN with permanently assigned IP addresses and routes (or advertised routes).

9.8 DHCP option 82 features

Enhanced UBA contains a DHCP pass-through feature whereby specific information is inserted by the network into DHCP requests and is then available to you. This information is stored in the DHCP option 82 format as per RFC 4243.

The following information is included:

9.8.1 PORT ID

The Port ID is a representation of the physical port the end customer is connected to in the Chorus network. The format of the Port ID is:

Where:

- A mnemonic in the format of ABC-DSLAM-XX.
- ABC is the exchange name where the DSLAM resides, e.g. NAE for Naenae or 'POY_CW' for a cabinet off Ponsonby exchange.
- XX is a numeric identifier to distinguish between different DSLAMs in the same exchange.

9.8.2 PORT ID MISMATCH

A data mismatch has been identified in the Port ID returned in the OO&T order request for the service. This includes an off-set of two for one of the components.

For example:

DHCP Option 82: WTH-DSLAM-07 atm 1/1/09/12:0.110

OO&T: WTH-DSLAM-07:1-1-7-12

The OO&T port ID will be unique but include an offset of 2. A fix for this mismatch is under development.

This Port ID is independent of the ASID or SVID/CVID (VLAN identifiers) although there will only be a 1:1:1 mapping between these values.

The Port ID is returned in the OO&T order request for the service.

Port IDs will change if the physical port changes, e.g. under some fault conditions, change addresses and cabinetisation (when the end customer is moved to a new DSLAM).

9.8.3 UPSTREAM SPEED

Sub-option 0x82 will convey the actual upstream data rate, i.e. the DSL synchronisation rate from the ETP to the DSLAM, coded in steps of 1000bps.

9.8.4 DOWNSTREAM SPEED

Sub-option 0x82 will convey the actual downstream data rate, i.e. the DSL synchronisation rate from the DSLAM to the ETP, coded in steps of 1000bps.

9.9 Service component identifiers

Port IDs, service IDs and VLAN IDs are used for interaction between us and you:

| ID | What is it used for | Visibility to SP | When does it change |
|--------------------------|--|--|--|
| Access service ID (ASID) | Reference to service instance | Included in provisioning service order Reference for new orders Reference for billing Reference for assure | New service Change address Transfer |
| VLAN IDs (SVID, CVID) | Unique VLAN at Ethernet handover so you can send and receive traffic | Included in provisioning service order. Handover Connection | New service Change address (new DSLAM) Change handover Connection Networks restructure. Cabinetisation |
| DSLAM port ID | Unique ID to identify physical port. Can be used for security | Included in provisioning service order. Inserted automatically into DHCP option 82 requests Also inserted in PPPoE | New service Change address (new DSLAM) Change |

Note: the DSLAM port ID will only be inserted into PPPoE PADI packets if a modem is using the PPPoA modem support feature. It will not be inserted into PADI packets over the bridged Ethernet channel.

9.10 Security

Each Enhanced UBA channel is delivered to the Service Provider as a dedicated VLAN and while traffic is aggregated, it is not possible for data to 'leak' between end customers.

Since each end customer uses the same 802.1q VLAN, which is then translated into a unique VLAN within the Chorus network, it is not possible for an end customer to spoof a neighbour's VLAN.

The Port ID is inserted by Chorus' network and cannot be altered by the end customers. It can be therefore used by you as an additional level of security to verify that traffic is coming from a particular end customer, e.g. to prevent 'spoofing'.

9.11 Technical interfaces

This section describes the technical interface specifications needed to connect end customer or service provider equipment to our Enhanced UBA service, as shown below:

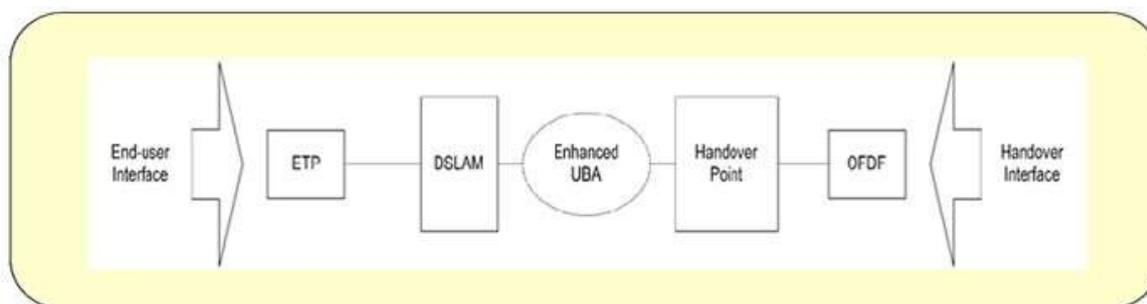


Figure 16: Technical interfaces

9.12 End customer interface

Enhanced UBA is delivered as bridged Ethernet over ATM over an ADSL2+ copper interface to the ETP at the end customer premises (or, if appropriate, the building distribution frame).

You must make your own arrangements with your customer for the purchase and installation of all required CPE and wiring (e.g. ADSL2+ modems and in-line filters) to use the service. Either you or your customer must ensure that Telepermit requirements are adhered to.

The end customer interface requires the following interface specifications:

| | |
|----------|---|
| Ethernet | The maximum Ethernet (layer 2) frame size accepted and transmitted will be 1522 bytes ¹ . End customers and access seekers should not use packet sizes that will require fragmentation at the handover point. This size will |
|----------|---|

| | |
|----------|--|
| | <p>deliver a maximum 1500 byte IP packet from the end customer, or a 1492 byte IP packet carried over PPPoE. Note: that PPPoE is optional.</p> <p>802.1 q (VLAN) settings: VLAN ID of 10 is required</p> <p>802.1 p (Ethernet priority flags) settings: Best effort-class frames are tagged '0'. Real-time-class frames are tagged '6'.</p> |
| ATM | RFC 2684 bridged Ethernet over VPI/VCI 0/110. |
| Physical | <p>ADSL or ADSL2+ (refer to PTC 273: 2007)</p> <p>ADSL conforming to ITU-T G.992.1 (G.dmt) ADSL2+ conforming to G.992.5</p> <p>ADSL 2+ is preferred. Service may be sub-optimal if using ADSL 1 only.</p> <p>Some DSLAM ports may be capable of supporting G.992.3 (ADSL2) modems but this mode should not be used as support cannot be guaranteed.</p> <p>Premises wiring is described in section 10.</p> |

1 This is the maximum frame size that the ISAM can support.

The end customer interface for PPPoA modem feature requires the following interface specifications:

| | |
|-----------------|---|
| IP | MTU 1492B |
| PPP | <p>Compression (LCP PCOMP) – Off</p> <p>PPP address & control filed compression (LCP PCOMP) – Off</p> <p>Magic number – enabled</p> <p>MRU – 1500B</p> <p>Authentication Protocol – PAP</p> <p>Multilink PPP – controlled by service provider</p> |
| ATM | <p>PPP over ATM (PPPoA_ (RFC 2364) with VC multiplexed encapsulation.</p> <p>VPI/VCI 0/100</p> |
| Physical | <p>ADSL or ADSL2+ (refer to PTC 273: 2007)</p> <p>ADSL conforming to ITU-T G.992.1 (G.dmt)</p> <p>ADSL2+ conforming to G.992.5</p> |

ADSL 2+ is preferred. Service may be sub-optimal if using ADSL 1 only.

Some DSLAM ports may be capable of supporting G.992.3 (ADSL2) modems but this mode should not be used as support cannot be guaranteed.

Premises wiring is described in section 10.

9.13 End customer interface security settings

The following rules will be applied at the interface between the end customer and our network:

- Incorrect ATM VPI/VCI marked traffic discarded
- Incorrect ATM encapsulated traffic will be discarded. Only LLC-SNAP-Bridged shall be passed frames not tagged with Ethertype x8100 will be discarded
- Incorrect VLAN marked traffic discarded
- Traffic with incorrect 802.1P settings discarded Untagged traffic discarded
- Double tagged traffic discarded
- Frames in excess of 1526 bytes discarded.

Note: the 1526 byte frame size includes the SVID inserted by the DSLAM for transport across the local aggregation path. Therefore, any 802.1q frames larger than 1522 bytes will be discarded.

9.14 Service provider interface

The Enhanced UBA service is handed over to you via an Ethernet handover link. Handover links can be provided by either you or by us. See the handover links product user guide for additional interface specifications and setup information.

Each Enhanced UBA instance related to an end customer access connection is delivered to you as a unique VLAN. Layer 3 aspects, such as IP addressing, are solely within your control.

You must establish a handover link at a minimum of one handover point before you're able to connect any Enhanced UBA end customers. A handover link is required to hand over Enhanced UBA traffic to you.

A handover link is made up of two parts:

- **Handover Connection** – from the handover point to the main optical fibre distribution frame (MOFDF) in the exchange where the handover point is located

- **Handover fibre** – which runs from the MOFDF to your equipment. Refer to the Handover Connection product user guide for more information.

Our handover link is a single service that includes both the Handover Connection and the Handover fibre.

For your handover link, we provides the Handover Connection. This connects to the Handover fibre you’ve supplied, or a third party on your behalf.

Your interface requires the following interface specifications:

| | |
|-----------------|--|
| Ethernet | <p>The maximum Ethernet (layer 2) frame size accepted and transmitted will be 1526 bytes². End customers and access seekers should not use packet sizes that will require fragmentation at the handover point. This size will deliver a maximum 1500byte IP packet to the end customer, or a 1492 byte IP packet carried over PPPoE. Note: PPPoE is optional.</p> <p>802.1 AD settings (Virtual LAN IDs)</p> <p>Each end customer will be delivered over Ethernet with a unique stacked VLAN ID of the following format:</p> <p>Inner tag (Ethertype = 8100) = customer virtual LAN ID (C-vid)</p> <p>Outer tag (Ethertype = 88A8) = service virtual LAN ID (S-vid)</p> <p>Outer tag can be set to 0x8100 on request, for compatibility with Cisco QnQ equipment; refer to handover links product user guide for more details.</p> <p>The C-vid/S-vid combination is unique to an end customer on the same handover. One C-vid/S-vid combination will map to one end customer.</p> <p>It may not be unique among multiple handover points</p> <p>C-vid/S-vid parameters will be assigned by us as part of the fulfil process.</p> <p>802.1 p (Ethernet priority flags) settings:</p> <p>Internet-class frames are tagged in 802.1 p as: '0'.</p> <p>Voice-class frames are tagged in 802.1 p as: '6'.</p> <p>MAC Addresses:</p> <p>00005E-000000 and 00005E-0000FF</p> <p>It is recommended that a random address within this range is used. This MAC address only needs to be unique to a particular handover link. HSNS traffic, even if on the same handover link, is unaffected by this limitation.</p> |
|-----------------|--|

Physical

GigE interface.

Additional information is provided in the 'handover links cable standards' section 3.11.2.

This is the maximum frame size that the ISAM can support.

9.14.1 SERVICE PROVIDER INTERFACE FOR PPOA MODEM SUPPORT

End customers using the PPPoA modem support feature require the following interface specifications:

| | |
|-----------------|--|
| IP | MTU of 1492 Bytes |
| PPP | PPP compression (LCP PCOMP) – Off PPP address & control filed compression (LCP PCOMP) – Off Magic number – enabled MRU – 1500B Authentication protocol – PAP Multilink PPP – controlled by service provider |
| Ethernet | Enhanced UBA port ID (identical to DHCP option 82 insert) - inserted as the first vendor attribute in the PPPoE active discovery initiation (PADI). MTU 1526 Bytes Jumbo frames to support PPPoE and 1500B IP packet. 802.1 AD settings (Virtual LAN IDs) Each end customer will be delivered over Ethernet with a unique stacked VLAN ID of the following format: Inner tag (Ethertype = 8100) = customer virtual LAN ID (C-vid) Outer tag (Ethertype = 88A8) = service virtual LAN ID (S-vid) Outer tag can be set to 0x8100 on request, for compatibility with Cisco QnQ equipment, refer to Handover product user guide for more details. The S-vid/C-vid combination for PPPoA is the same as for Ethernet, offset by 1600. |

For example, if channel 1 for an end customer is delivered as VLAN 5/206 then channel 2 would have a VLAN id of 5/1806.

It may not be unique among multiple handover points.

The S-vid/C-vid returned in OO&T is for the main Ethernet channel, not PPPoA modem support.

802.1 q (VLAN) settings: assigned by Chorus

802.1 p (Ethernet priority flags) settings: Best effort-class frames are tagged '0'.

MAC Addresses:
00005E-000000 and 00005E-0000FF

Note: the handover MTU may be set higher than 1526 bytes for multi-service compatibility but any frame larger than 1526 bytes will be discarded.

Physical

Gig E interface
Shared with non-PPPoA modem support traffic

9.14.2 SERVICE PROVIDER INTERFACE SECURITY SETTINGS

The following rules will be applied at the interface between your network and ours:

- Incorrect VLAN S-VID marked traffic discarded.
- Frames not tagged with Ethertype x88A8 will be discarded [unless QnQ is configured]. Incorrect .1P traffic discarded.
- Untagged traffic discarded. Single tagged traffic discarded.
- Traffic is policed to the LAP rate for each destination DSLAM's BE traffic. Traffic is policed to the sold rate for each destination DSLAM's RT traffic.

9.14.3 HANDOVER LINKS CABLE STANDARDS

We've outlined the cable standards for optical fibre handover links connected to our Handover Connections below.

Cable specification

GigE interface:

For handover links <15km

1000BASE – LX 1310nm over single mode fibre

For handover links <40km

1000BASE-ZX 1550nm over single mode fibre

For handover links >40km

Handled on an exception basis

Cable standards

The preferred lead-in cable is the fire-retarded eight fibre mono tube that can be run directly to the MOFDF.

Alternatively an eight fibre building cable can be used but runs of this to outside access joints should be limited to less than 300m.

If more than eight fibres are required then standard outside plant cables can be used, but must not be run more than 10 metres inside a building without being converted to a fire retarded cable.

For additional information refer to the handover links product user guide.

10 Onboarding to Enhanced UBA

10.1 Prerequisites

The following prerequisites must be in place prior to you placing an order for an instance of Enhanced UBA:

- Formally request service under the STD
- Meet a financial bond pre-requisite
- Copper access at the end customer premises
- Established at least one handover link at a handover point to allow us to handover Enhanced UBA traffic
- Complete coverage area mapping
- Help desk level 1 support
- Online Order and Tracking (OO&T) capability in place
- Online Fault Management (OFM) capability in place
- Any other criteria set out in the UBA STD for Enhanced UBA 40kbps, 90kbps and 180kbps;
- Any other criteria required by Chorus.

10.2 Enhanced UBA set-up guide

The Enhanced UBA set-up guide is a checklist to guide you through the steps required to set-up Enhanced UBA for the first time. Each step in the checklist refers to this product user guide for more detail. The Enhanced UBA set-up guide is available on our website.

10.3 Coverage area mapping and remapping

Before you can request Enhanced UBA you must complete coverage area mapping. Coverage area remapping occurs when you request changes to the coverage area mapping implemented.

The following business rules apply:

- You must map each coverage area where Enhanced UBA is required to a nominated terminating service such as a handover link or other backhaul service.
- If the mapping for a coverage area is left blank, then no Enhanced UBA access service will be available for that coverage area.
- Only one terminating service type can be mapped per coverage area
- When an Enhanced UBA access tail is ordered within a coverage area that is mapped to a remote handover link, then Tail Extension will be used to extend the Enhanced UBA access tail to the remote handover point.
- If you require a new handover link for mapping or remapping purposes, this must be ordered and installed prior to submitting the mapping or remapping order.
- When a new coverage area is added, you must submit a mapping order to map the new coverage area to a terminating service, otherwise no service will be available from the new coverage area.
- A coverage area cannot be mapped to a secondary handover link.

Once the mapping process is complete there is no need for you to indicate on each Enhanced UBA access tail order what backhaul is required. The mapping table will complete this step for you.

10.4 Mapping and remapping process service level agreement

The target Service Level Agreement (SLA) for coverage area mapping and remapping process is 12 working days from date of acceptance of the mapping/remapping order to completion of the order. Our Data Provisioning team will discuss a target completion date with you once the order has been received.

10.5 Coverage area mapping process

The mapping process is completed as a pre-provisioning activity prior to any Enhanced UBA access tails being provisioned and when new coverage areas are added to Enhanced UBA.

To initiate the mapping process you should contact your Service Delivery Manager (SDM) and request the coverage area mapping spreadsheet shown below:

| | A | B | D |
|---|----------------------------|------------------------------|---|
| 1 | <Service Provider Name> | Run <date> <time> | |
| 2 | Enhanced UBA Coverage Area | Handover Link or Backhaul ID | |
| 3 | ALEXANDRA | IDA100909878 | |
| 4 | ASHBURTON | IDA100909878 | |
| 5 | BLenheim | IDA100802777 | |
| 6 | etc | | |

Figure 17: Coverage area mapping spreadsheet example

Note: Grey text indicates read-only columns.

The mapping spreadsheet lists all Enhanced UBA coverage areas and asks you to either specify a handover link ID, of the remotely located handover link you wish the access traffic to be mapped to, or a backhaul ID of the backhaul service you wish the traffic to be mapped to for each coverage area.

Once completed, you must submit the mapping order using the OO&T generic order form, with the spreadsheet as an attachment. The attachment can be in.xls, .csv, .pdf, .txt, .zip or .doc format. More information on how to submit the mapping order is available in the OO&T user guide.

Our Data Provisioning team will process the order and set-up the mappings you defined in the mapping spreadsheet.

10.6 Mapping process charge

There is no charge to complete the initial coverage area mapping process. However, any subsequent requests will be billed as per the price list set out under the UBA STDs.

10.7 Remapping process

Remapping occurs when you want to change your existing coverage area mapping. This could be caused by the addition of a new handover link or replacement of Tail Extension with another backhaul service.

The following scenarios are considered to be valid and in scope for the coverage area remapping process:

| Existing Terminating Services | New Terminating Services |
|-------------------------------|--------------------------|
| Handover link | Handover link |
| Handover link | Primary UBA Backhaul |
| Handover link | Secondary UBA Backhaul |
| Primary UBA Backhaul | Handover link |
| Secondary UBA Backhaul | Handover link |
| Secondary UBA Backhaul | Secondary UBA Backhaul |

The following scenarios are not in scope as current business rules for UBA Backhaul specify that you can only connect a coverage area to one primary link.

| Existing Terminating Services | New Terminating Services |
|-------------------------------|--------------------------|
| Primary UBA Backhaul | Primary UBA Backhaul |
| Primary UBA Backhaul | Secondary UBA Backhaul |
| Secondary UBA Backhaul | Primary UBA Backhaul |

To initiate the remapping process you should contact your SDM and liaise with them to confirm requirements. The SDM will request the Enhanced UBA mapping spreadsheet shown below:

| | A | B | C |
|---|----------------------------|------------------------------|----------------------------------|
| 1 | <Service Provider Name> | Run <date> <time> | |
| 2 | Enhanced UBA Coverage Area | Handover Link or Backhaul ID | New Handover Link or Backhaul ID |
| 3 | ALEXANDRA | IDA100909878 | IDA100909878 |
| 4 | ASHBURTON | IDA100909878 | IDA100802777 |
| 5 | BLENHEIM | IDA100802777 | IDA100802777 |
| 6 | etc | | |

Figure 18: Coverage area remapping spreadsheet example

Note: Grey text indicates read-only columns.

The remapping spreadsheet provides an up to date listing of coverage area mappings (either handover link or backhaul) that you have in place and asks you to specify the new handover link ID or backhaul ID you wish the traffic to be mapped to for each coverage area.

Once completed, the remapping order is submitted using the OO&T generic order form, with the spreadsheet as an attachment. The attachment can be in .xls, .csv, .pdf, .txt, .zip or .doc format. More information on how to submit the mapping order is available in the OO&T user guide.

An outage occurs for end customer connections that require remapping to a new terminating service, so the remapping process is planned and managed with you to minimise impact on your customers. Within the remapping order, you can request your preferred completion date and time.

Our Data Provisioning team will action the order and liaise with you directly to confirm a project plan for the work, and a cutover date and time based on the work requested. During provisioning you must provide a test resource to confirm during remapping activity that each step in the remapping process has completed successfully.

Upon successful testing of the remapping order our Data Provisioning team will notify the SDM and faults (to support any faults that may be caused by the remapping order) that the order is complete.

10.8 Remapping process charge

The SDM will apply the remapping design charge and access remapping fee as per the Chorus Price List. For more information see section 8.6, coverage area remapping charges.

11 Ordering

11.1 Enhanced UBA service requests

You will forward an order to Chorus Provisioning using OO&T. The order will be processed and advised as per our current processes. Enhanced UBA will be handed-over to you at the handover point in the end customer coverage area, unless backhaul is requested from that coverage area.

If you request Enhanced UBA that cannot be delivered because there is no service coverage then this request will be rejected.

Request types include:

- New connection transfer
- Change plan
- Move address
- Relinquishment
- Prequalification

You'll be able to ascertain whether your customer's premises are able to be provisioned with Enhanced UBA by requesting a pre-qualification check.

The purpose of prequalification is to ensure services being ordered for locations can be delivered so that the service specification targets are met. This not only reduces unnecessary cost, but will improve the end customer experience by providing a degree of certainty that a particular service can be delivered.

Prequalification works by analysing the following information:

- Technical analysis of recorded cable characteristics based on gauge, length and other factors. This is translated into an expected dB loss level at 160 kHz.
- The minimum specifications for the Enhanced UBA variant.
- Exchange/cabinet capability, e.g. does the exchange have ADSL2+ DSLAMs.

The following table shows the maximum attenuation for Enhanced UBA variants, and the respective derived minimum speeds:

| Service variant | Minimum speed up/down | Max attenuation |
|------------------------|------------------------------|------------------------|
| EUBA 0 | - | 56.4 dB |
| EUBA 40 | 288 / 2048 kbps | 56.4 dB |
| UBA 90 | 288 / 2048 kbps | 56.4 dB |
| EUBA 180 | 430 / 2048 kbps | 48.7 dB |

Prequalification is based on best knowledge of the line characteristics and is not a guarantee of success. Factors that may affect the accuracy of a prequalification result include:

- Incorrect records. While we use the most accurate information available, occasionally there will be incomplete or inaccurate information.
- House wiring. Some houses have poor wiring characteristics that may be suitable for voice but have a negative impact on broadband performance, e.g. an end customer who has installed additional jack-points. This impact can be mitigated by installing splitters.
- External noise sources. Unfortunately these may be hard to predict prior to installation.

The minimum speed allows for:

- Real time traffic allowance
- Minimum best efforts traffic of 32 kbps when Real time bandwidth is consumed, or 256kbps when it is not.
- ATM and Ethernet header overheads.

12 Faults

Enhanced UBA faults must be reported to Chorus via OFM.

We will diagnose and repair any faults in the Chorus Network. You're responsible for diagnosis and repair of any fault on your customer's premises and within your own network.

You must conduct fault pre-diagnosis to establish that the fault is not within your responsibility prior to reporting the fault to us.

For Tail Extension, faults will either be logged against the Enhanced UBA access tail or a handover link. For more details please refer to the Premises Networking – Assure Activities Service Description.

12.1 Fault definitions

The following fault definitions provide guidance on when a broadband connection is considered to have a fault. The definitions do not cover all causes of a fault.

12.1.1 MODEM RE-SYNC FAULT DEFINITION

By using the online service performance management tool (eSPM), you can run your own tests - refer to the line quality diagnosis (LQD).

- This is a test on an individual customer line to check the performance (in terms of the modem synchronisation speeds, noise margin and various other parameters) and stability (the frequency with which the customer modem spontaneously resynchronises) of the copper line connected to a DSL port in the Chorus access network.
- An LQD will show results for 1 or more points in time. Typically these points may be 15 minutes apart.
- The stability, with respect to DSL lines, refers to the frequency with which the customer's modem spontaneously resynchronises because of deterioration of the copper line.

For further information on the LQD test please refer to the eSPM user guide.

If the number of spontaneous re-syncs is more than shown in the table below, then a fault should be logged with the Chorus Assure Team for further investigation.

You can always opt to request a self-service truck roll via OFM to by-pass the Chorus Assure Team investigation process.

If the number of re-syncs is less than the number shown in the table below, you should advise your end user that there is no apparent fault with the network and your service is performing satisfactorily.

| LQD test length | LQD spontaneous resyncs |
|------------------------|--------------------------------|
| 24 Hours | > 10 |
| 12 Hours | > 6 |
| 6 Hours | > 4 |
| 2 Hours | > 3 |

There could still be issues with the network that multiple end users could experience when the modem re-syncs are less than 10 in a 24 hour period. For example Power feeding into a DSLAM).

The following is recommended for service testing by your customer during tier 1 support process, before a fault is logged:

1. Isolate any environment factors where possible that may have caused the modem to re-sync. (e.g. modem has close proximity with other electronic equipment causing frequency interference)
2. Is there any 'cluster' pattern during certain periods of the day that the modem re-syncs more than other times of the day?

12.1.2 SERVICE PROVIDER TIER 1 TESTING

We recommend you conduct the following end customer service testing during tier 1 support process before a fault is logged:

1. Request end user to perform a minimum of 4 tests within a 48 hour period (www.speedtest.net).
2. Only 1 PC connected.
3. Connected via Ethernet or USB is preferable. (if using wireless, make sure wireless connection is working and running properly).
4. Any peer to peer (P2P) or FTP programs are not running at the time of the speed test being performed which may slow down the results.
5. End customer's PC has been checked re firewalls, virus, or other malicious software.
6. Normal CPE checks to be performed. e.g. reset router, router not plugged into an external lead back to the jackpoint.

7. Has your customer exceeded the download limit you've set and the experience is now limited to dial up speed.
8. Test to be performed at different time of the day (peak 6pm to midnight vs. off peak).
9. Trace routes to local New Zealand servers.
10. Check the line via ESPM and make sure the customers connect rates are normal.
11. To log a fault for low data throughput, you must provide evidence that the above tier 1 tests have been carried out and supply the associated test results for investigation.

Note: this may be need to be done making reference in the subject line to the specific ticket number.

13 Pricing

The following list details the major pricing components for Enhanced UBA. This list is illustrative only; for the binding terms relating to these pricing components including the price please refer to the UBA STD Price List or the price list as set out on the Chorus website.

13.1 Monthly rental

- Enhanced UBA monthly rental.
- Tail Extension monthly rental (see section 8.6 for more detail).

13.2 Transaction Charges

- Connection
- Connection & wiring
- Connection & wiring and modem
- Wiring only
- Move address
- Transfer (between you)
- Relinquishment
- Interleaving toggle
- Exception to BAU order
- Bulk order
- Coverage area
- Remapping (design charge and charge per end customer)
- Change plan

13.3 Ancilliary charges

- Pre-qualification
- No fault found
- Abortive end customer site visit
- Cancellation of order
- A pre-truck roll cancellation charge applies to orders cancelled before a truck roll is confirmed i.e. before 3:00pm on the day before the RFS date.
- A post-truck roll cancellation charge applies to orders cancelled after a truck roll is confirmed i.e. after 3:00pm on the day before the RFS date.

13.4 Additional services

In addition, backhaul and handover link charges will apply.

13.5 Tail Extension pricing

Tail Extension monthly rental charge is charged per Enhanced UBA access tail and is in addition to the Enhanced UBA access tail monthly rental charge. The Tail Extension charge is based on a backhaul step between the coverage area of the local handover point and the coverage area of the remote handover point. There are 8 backhaul steps from A-H, which are assigned to each coverage area to coverage area combination on the Tail Extension backhaul step matrix. Pricing and allocation of backhaul steps to different locations is based on our cost to deliver the service.

Where the handover ID of the handover link is located at the same exchange as the Enhanced UBA access tail, then Tail Extension step A will be applied. This will result in a \$0 charge for Tail Extension monthly charge.

The Tail Extension monthly rental charges are detailed in CSA and the Tail Extension backhaul step matrix is available on request from your account manager.

13.6 Coverage area mapping / remapping charges

There is no charge for setting up coverage area mapping when you're setting up consume Enhanced UBA, or when mapping is required when we add coverage areas to Enhanced UBA.

13.6.1 COVERAGE AREA REMAPPING CHARGES

There are two remapping charges that are applied when you request your coverage area mapping be changed:

- **Remapping design charge** - for the design plan to reconfigure the affected network elements to map to the new handover point. Basis for determining the

charge is the estimated equipment, time and materials incurred to design and implement a remapping including network rebuild design and network changes

- **Access remapping fee** - changes to each Enhanced UBA service connection to correctly map and charge for the new handover point. This is a per end customer charge as the size of the remapping work is directly related to the number of end customers. Therefore the charge reflects the cost to map each end customer.

These charges are applied by the Service Delivery Manager once the remapping has been completed and are detailed in the Chorus Services Agreement price list.

14 Billing

Enhanced UBA will be billed as a Chorus service as per existing services currently offered to you by Chorus. If you're using electronic billing, the billing details for Enhanced UBA will be presented on your electronic bill.

14.1 Tail Extension billing

Tail Extension will introduce an additional line item which will appear under the existing Enhanced UBA.

Access monthly rental charge.

The table below details what will appear on the bill for each Tail Extension step:

| Step | Bill description | Frequency |
|------|--------------------------------|--------------------|
| A | Tail Ext step A monthly rental | Monthly in advance |
| B | Tail Ext step B monthly rental | Monthly in advance |
| C | Tail Ext step C monthly rental | Monthly in advance |
| D | Tail Ext step D monthly rental | Monthly in advance |
| E | Tail Ext step E monthly rental | Monthly in advance |
| F | Tail Ext step F monthly rental | Monthly in advance |
| G | Tail Ext step G monthly rental | Monthly in advance |
| H | Tail Ext step G monthly rental | Monthly in advance |

Note: The Tail Extension billing description does not include a reference to the Enhanced

UBA plan name i.e. Enhanced UBA 40kbps. The charges for Tail Extension will appear on the you bill under the Enhanced UBA access tail access service identifier (ASID); therefore sorting an electronic bill by ASID will ensure that the Enhanced UBA access tail is associated with the appropriate Tail Extension charge.

Tail Extension monthly rental charge will be reviewed in the following scenarios:

- **Change plan** – Tail Extension will be updated to reflect the change of plan.
- **Move address** – If Tail Extension applies at the new address, the correct charge will be applied.
- **Relinquishment** – all Tail Extension charges will be relinquished at the same time as the Enhanced UBA access tail.
- **Bulk change** – if the Tail Extension step has changes as a result of remapping, the Tails Extension charges will be updated.

Tail Extension monthly rental charges will be pro-rated on a daily basis to reflect:

- A new connection during the billing period
- The impact of a change during the billing period e.g. Enhanced UBA plan change or Tail Extension step change.

14.2 Other Chorus services

Handover link, UBA Backhaul and other Chorus services, where purchased, will be listed separately and billed as separate services.

Any billing enquiries should be advised to the billing representative or your account manager.

15 Connection and Premises Networking

There are four charges UBA installation. The charges are based on the function that we'll have to perform in order to get an installation completed.

1. New connection without site visit (remote connection) – This connection charge applies where a technician is not required to visit either your customer's premises or the exchange/cabinet in order to provision the UBA service.
2. New connection without site visit (but exchange/cabinet visit required) - This connection charge applies where a site visit to the end customer premises is not required, but a visit to the exchange/cabinet is required to make a port connection. This connection charge also includes any administrative charges associated with the new connection without site visit (remote connection) charge

3. New connection (with site visit)- The new connection (with site visit) applies where a technician is required to visit the end customer premises in order to connect the external termination point. The new connection (with site visit) charge also includes any charges associated the new connection without site visit (exchange/cabinet visit required).
4. If there is a connection and wiring requested additional wiring charges will apply.

For more details please refer to the UBA final review on the Commerce Commission website.

15.1 Connection option tasks

| Tasks carried out <u>as required</u> for each connection option | Connection only | Connection and wiring | Connection, wiring and modem | Wiring only |
|--|------------------------|------------------------------|-------------------------------------|--------------------|
| Confirm that correct POTS and DSLAM ports are allocated | ✓ | ✓ | ✓ | |
| Break down any intacts | ✓ | ✓ | ✓ | |
| Rearrange pair gain end customers | ✓ | ✓ | ✓ | |
| Provide ADSL jumper to existing POTS/Baseband | ✓ | ✓ | ✓ | |
| Run any other jumpers | ✓ | ✓ | ✓ | |
| Install/connect POTS/Baseband if associate | ✓ | ✓ | ✓ | |
| Conduct functional tests of ADSL | ✓ | ✓ | ✓ | |
| Connect wiring in STP and install low pass splitter | | ✓ | ✓ | ✓ |
| Install jack point for broadband and any premises wiring | | ✓ | ✓ | ✓ |
| Convert any 3-wire systems to 2-wire systems | | ✓ | ✓ | ✓ |
| Confirm PC meets minimum requirements | | | ✓ | |
| Install and configure broadband modem | | | ✓ | |
| Install and configure Ethernet adapter to PC | | | ✓ | |

Install and configure the wifi devices

Set up wifi security

Install and configure web browser and email client

Resolve any hardware or software conflicts

Train the end customer



16 End customer equipment requirements

16.1 Overview

The end customer equipment required for Enhanced UBA utilises bridged Ethernet over ATM. The detailed technical specifications are described in section 4.11.

An equipment guide is available on our website.

16.2 Key capabilities

Generally these capabilities are provided by the modem or gateway device, but this is not mandated. You need to consider the entire end customer value proposition when determining what functions reside in the gateway.

| | |
|--------------------------------|---|
| Bridged Ethernet | This sets up an Ethernet segment from the end customer equipment to the Service Provider Ethernet edge. |
| Traffic classification* | All Ethernet traffic must be tagged using 802.1q (VLAN id of 10) and 802.1p (CoS of '0' for best efforts, and '6' for real time. Your customer's equipment must be able to classify traffic as appropriate |

ADSL2+

ADSL2+ recommended (VPI/VCI 0/110)
ADSL allowed.

* The modem needs to be able to classify upstream traffic as either real time or best efforts and mark each frame with an appropriate 802.1p setting. Traffic that is not marked as best efforts ('0') or real time ('6') will be discarded.

16.3 CPE requirements

Changes to CPE when moving from Basic UBA to Enhanced UBA

| Function | Basic UBA end customer equipment parameter | Enhanced UBA end customer equipment parameter |
|-----------------------|--|---|
| ADSL support | ADSL, ADSL2+ | ADSL2+ preferred ADSL allowed |
| Layer 2 session | Single PPOA session per end customer Single ATM PVC (0/100) | Bridged Ethernet Single VLAN ID (10) Single ATM PVC (0/110) |
| IP address allocation | Allocated by service provider L2TP network server (LNS) | Not mandated. Options include: DHCP PPPoE Static addressing |
| LAN support | Typically provided through network address translation | Can support up to 4 Ethernet devices, although most common scenario would be to support one gateway device. |