Bitstream Ethernet Access (BEA)

Technical Handbook

Version Control

Version	Status	Update	Effective Date
Version 1.1		Rebranded	April 2015
V2.0	Final	This document is based on Version 1.1 Implementation of Standardised Change Control.	13/06/2017

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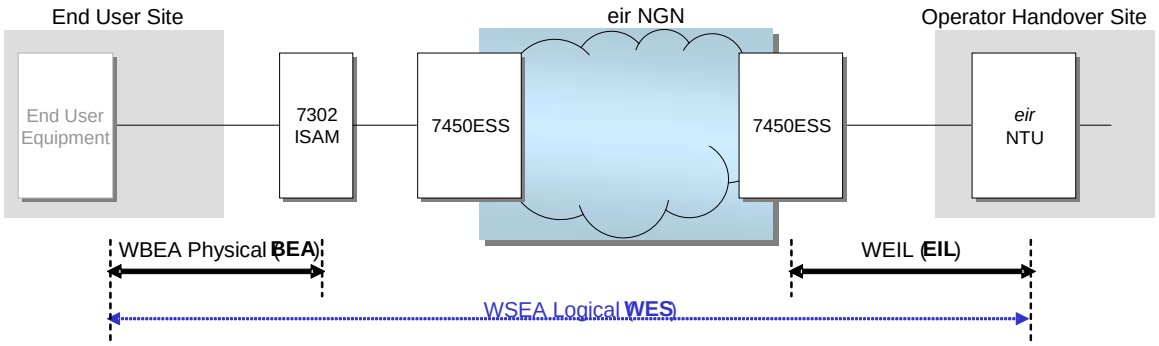

Figure 1: Bitstream Ethernet Access

The open eircom Bitstream Ethernet Access (WBEA) service consist of a number of components:

1. Bitstream Ethernet Access (BEA) provides (physical) connectivity from an End User site to the 7302ISAM.
    - WSEA Logical connection (WES) provides a (logical) E-line service between an Operator's End User site and the Operators handover site.
2. Ethernet Interconnect Link (EIL) provides (physical) connectivity from an Operator's handover site to the NGN Aggregation node.

Multiple WES connections may be aggregated within the eir NGN network and handed-over to an Operator on an EIL. Only one logical WES connection can be supported on an individual physical BEA.

2 Bitstream Ethernet Access Service

This section describes the traffic flows for the Bitstream Ethernet Access service. For simplicity, the description is based on an NTU being deployed for the EIL connection. However, as described in the previous section it is possible to have an EIL connection with no NTU.

The Bitstream Ethernet Access service will only be supported on Flexible Density 7302 ISAMs which are either:

1. Co-located with an NGN Aggregation node.
2. Connected to a NGN Aggregation node via APT
3. Connected to a NGN Aggregation node via fibre

It should also be noted that there will be no eir managed NTU deployed at the end user site for the Bitstream Ethernet Access service.

BEA (UNI) → EIL (E-NNI) Traffic Flow

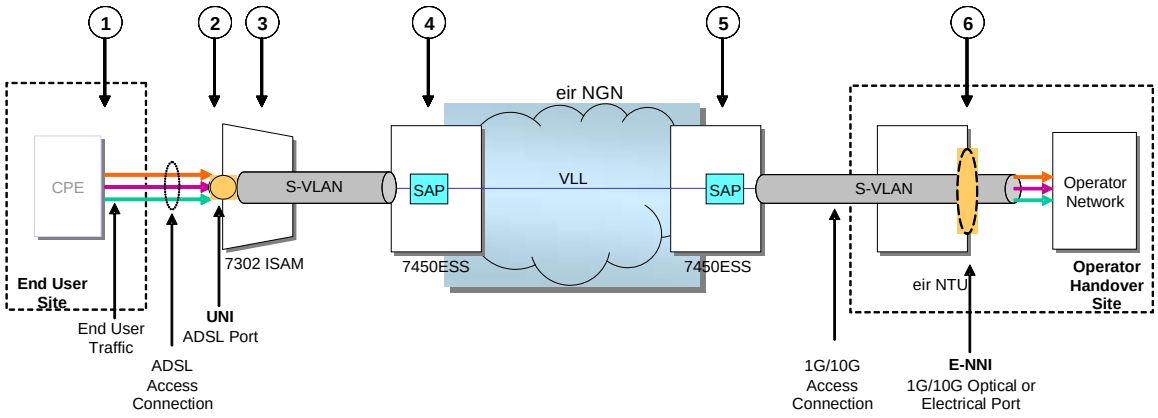

Figure 2: UNI → E-NNI Traffic Flow

The following describes how customer traffic is treated in the UNI → E-NNI direction:

1. The End User's CPE device maps the End User traffic presented on the customer-facing port onto the up-link port facing the 7302ISAM. End User traffic may be tagged or untagged. The Ethernet frames from the End User are encapsulated into ATM/AAL5 on the DSL line using RFC2684 Bridged encapsulation.

2. End User traffic is presented to the eir network at a physical port (UNI) on the 7302ISAM. Note that the UNI is defined as a customer facing port on the eir 7302ISAM for the Bitstream Ethernet Access service and therefore only one UNI can be supported per access connection.

3. The End User traffic presented at the UNI may be tagged or untagged. The End User cannot present double tagged frames at the UNI. The C-VLAN tag(if present) is carried transparently across the eir network.

4. The ADSL LT on the 7302ISAM will remove the ATM encapsulation and will add an S-VLAN to the End User Ethernet frames. The network facing port on the 7302ISAM is configured as a QinQ port. The assigned S-VLAN ID is not visible to either the End User or the Operator.

5. A service policy (i.e. CoS profile/bandwidth) is applied to the End User traffic associated with the service at the SAP on the NGN Aggregation node. The End User traffic is mapped to the appropriate Forwarding Class (FC) within the core NGN network (Please refer to Section 7.cfor the WES bandwidth options and Section 8 for a description of the CoS solution).

6. The S-VLAN serves as the service selector at the ingress of the Core NGN network. The S-VLAN tag is removed and the End User traffic is carried within a Virtual Leased Line (VLL) across the eir Core NGN network.

7. A new S-VLAN tag is added to the End User traffic at the egress of the eir Core NGN network and the appropriate service policy is applied to the End User traffic.

8. The End User traffic is passed to the eir managed NTU located at the Operator's handover site. The S-VLAN on the network-facing port is mapped to the Operator facing port on the NTU (E-NNI port). The E-NNI port is configured as an 802.1ad port. The S-VLAN ID is assigned by eircom and is used to identify the End User traffic associated with an individual WES connection. The Operator can optionally specify the S-VLAN ID presented at the E-NNI.

EIL (E-NNI) → BEA (UNI) Traffic Flow

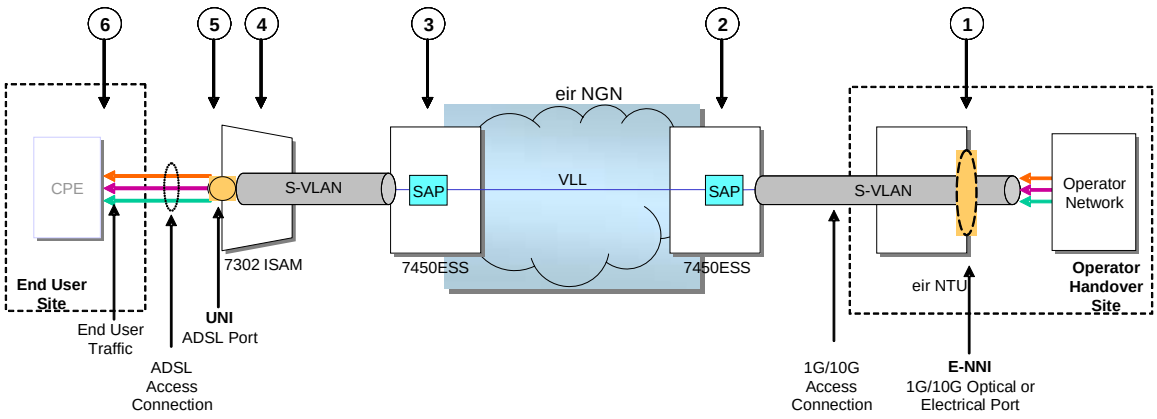

Figure 3: E-NNI → UNI Traffic Flow

The following describes how Operator traffic is treated in the E-NNI → UNI direction:

1. Operator traffic is presented to the eir network at a physical port (E-NNI) on an eir managed NTU located at the Operator's handover site. The E-NNI port is configured as an 802.1ad port. The Operator must add an S-VLAN tag, with the correct Ethertype, to their traffic prior to presentation at the E-NNI. The S-VLAN tag is assigned by eir and is associated with a logical WES connection. The Operator can optionally specify the S-VLAN ID presented at the E-NNI.

2. A service policy (i.e. CoS profile/bandwidth) is applied to the traffic associated with the S-VLAN and the Operator traffic is mapped to the appropriate Forwarding Class (FC) within the eir Core NGN network. The S-VLAN tag is removed and the Operator traffic is carried within a Virtual Leased Line (VLL) across the eir Core NGN network.

3. An S-VLAN tag is added to the Operator traffic and the appropriate service policy is applied. The assigned S-VLAN ID is not visible to either the End User or the Operator.

4. The ADSL LT on the 7302ISAM will remove the S-VLAN and add ATM encapsulation to the End User Ethernet frames.

5. Operator traffic is presented at the UNI port on the eircom 7302ISAM and inserted on the DSL line facing the End User.

6. The End User CPE will remove the ATM encapsulation and present the Ethernet frames to the End User on the customer facing ports of the CPE.

2.1 VLAN Tagging Model

This section summarises the VLAN tagging model used for the open eir Bitstream Ethernet Access service

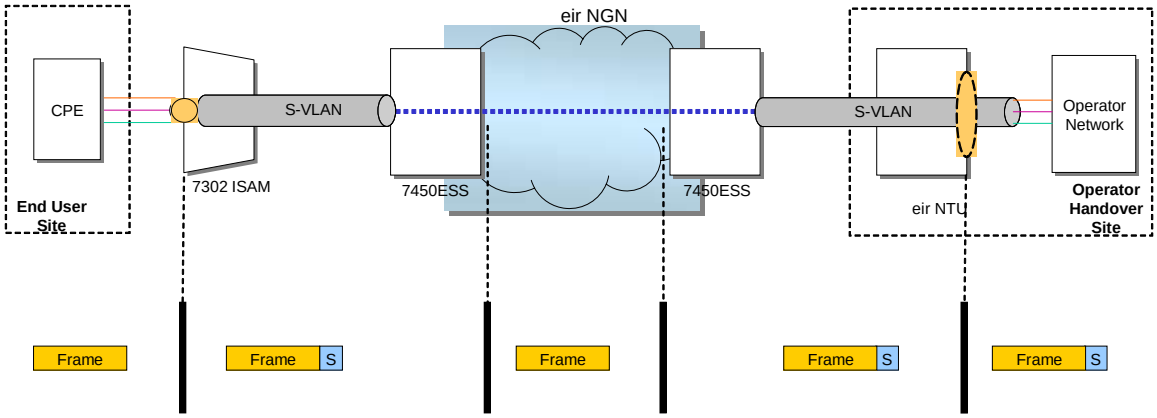

Figure 4: VLAN Tagging Model

The Operator can use the full C-VLAN ID range (i.e. 0 – 4095) to tag their end user traffic. The C-VLAN IDs are carried transparently across the eir network.

For the open eir Bitstream Ethernet Access service, S-VLAN IDs in the range 3500 – 3999 will be used on the link between the ISAM and it's associated NGN Aggregation.

Default is for eir to assign the S-VLAN ID presented at the E-NNI. The assigned S-VLAN IDs will be in the range 10 – 4000. The Operator can optionally specify the S-VLAN ID presented at the E-NNI.

2.2 BEA / WES Service Parameters

This section summarises the service parameters associated with the BEA and associated WES services:

Parameter	
MAC Address learning	Limit of 64 MAC addresses per BEA connection
Max Frame Size	1500 bytes
Max no. of WES's per UNI	1
Max number of C-VLANs per WES	4096
C-VLAN ID Preservation	Yes
C-VLAN CoS Preservation	Yes
Multicast traffic limit	No limit
Broadcast traffic limit	No limit
Unknown Unicast traffic limit	No limit

Table 1: BEA / WES Service Parameters

Protocol	Behaviour
Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP)	Discarded
PAUSE (802.3x)	Discarded
Link Aggregation Control Protocol (LACP)	Discarded
Marker Protocol	Discarded
Authentication (802.1x)	Discarded
All LANs Bridge Management Group Block of Protocols	Discarded
Generic Attribute Registration Protocol (GARP) Block of Protocols	Discarded
Cisco Discovery Protocol (CDP)	Discarded
Cisco VLAN Trunking Protocol (VTP)	Discarded
OAM CFM/Y1731 PDUs	Discarded

Table 2: Layer 2 Control Protocol Processing

2.3 BEA Bandwidth Profiles

A range of non-rate adaptive (fix rate) bandwidth profiles are supported on the Bitstream Ethernet Access service:

Downstream Speed (Kbps)	Upstream Speed (Kbps)	Interleaving (Downstream)	Interleaving (Upstream)	Prequal Limit
16000	1216*	High	Low	14dB
12288	2048*	High	Low	15dB
10240	1536*	High	Low	21dB
8192	2048*	High	Low	18dB
8192	1024*	High	Low	21dB
6144	672	High	High	35dB
4096	512	High	High	40dB
2048	384	High	Low	50dB
1024	256	High	High	56dB

Table 3: Non Rate Adaptive (Fix rate) BEA Bandwidth Options (kbit/s)

* Requires ITU G.992.5 Annex M support

2.4 BEA Access - WES Bandwidth Profiles

The actual service bandwidth (WES bandwidth) available to the End User will be approximately 85% of the ADSL profile speed

The following tables show the WES bandwidths associated with the different BEA bandwidth profiles:

MSC (ADSL) Downstream Speed (Kbps)	MSC (ADSL) Upstream Speed (Kbps)	EVC Downstream Speed (Kbps)	EVC Upstream Speed (Kbps)
16000	1216*	13600	1030
12288	2048*	10400	1740
10240	1536*	8700	1300
8192	2048*	6900	1740
8192	1024*	6900	870
6144	672	5200	570
4096	512	3400	430
2048	384	1700	320
1024	256	870	210

Table 4: Non Rate Adaptive BEA - WES Bandwidths

* Requires ITU G.992.5 Annex M support

The WES bandwidth profile will be applied on the SAP on the NGN Aggregation node associated with the BEA connection as well as on the SAP on the NGN Aggregation node associated with the EIL connection. A symmetrical QoS profile will be deployed on the SAP associated with the BEA connection which will be referenced from the effective downstream bandwidth.

3 Class of Service (CoS)

This section describes the basic Class of Service (CoS) design for the Wholesale NGN Ethernet products.

There are three forwarding classes, or network queues, used within the eir Core NGN network for the Wholesale NGN Ethernet products: the Expedited Forwarding (EF) class, the Assured Forwarding (AF) class, and standard/best effort (STD) class.

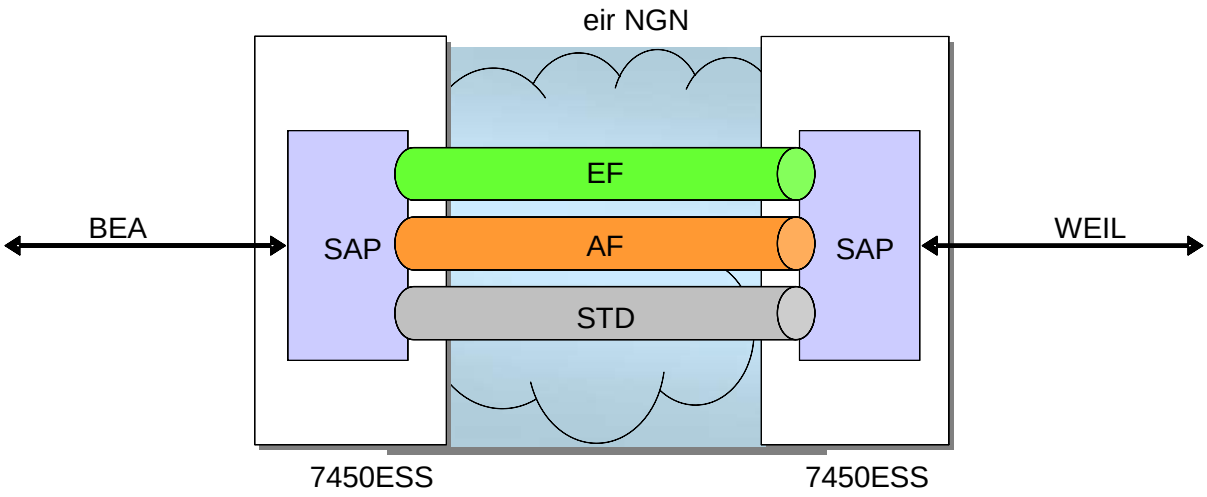

Figure 5: Network Forwarding Classes / Queues

The Expedited Forwarding class is serviced before the Assured Forwarding class and is intended to be used for real-time delay-sensitive traffic. There is a committed information rate (CIR) associated with the Expedited Forwarding class. End User traffic which exceeds the configured CIR will be dropped at the ingress of the eir Core NGN network.

The Assured Forwarding Class is serviced before the Standard Forwarding class and is intended for business applications which require priority access to the available bandwidth over standard applications. There is a committed information rate (CIR) and peak information rate (PIR) associated with the Assured Forwarding class. The Assured Forwarding class provides the ability to classify ingress traffic as either in-profile or out-of-profile based upon the traffic arrival rate. A queue is considered to be in-profile if the rate at which the queue is being serviced is less than its configured CIR. A queue is considered out-of-profile if the rate at which the queue is being serviced is greater than its CIR, but less than its PIR. After the profile state of the packet is determined at network ingress, the profile state of the packet influences the packets queuing priority and drop preference.

The Standard forwarding class is used for carrying all remaining traffic. This remaining traffic generally uses protocols that are capable of maintaining some form of connectivity during congestion.

For the Wholesale NGN Ethernet products the End User traffic is mapped to the appropriate forwarding class on ingress to the eir Core NGN network for both the SEA and EIL connections.

3.1 Traffic-based QoS

The End User marks the 802.1p bits in their Ethernet frame headers with traffic-based QoS. End User traffic is mapped to a forwarding class at the ingress of the eir Core NGN network based on the 802.1p markings. The End User 802.1p CoS markings will be carried transparently across the eir network and will not be re-marked by eircom.

Bitstream Ethernet Access (BEA) connections will be offered with the following Traffic based CoS options:

	EF	AF	Queuing
Option 1	0%	0%	All traffic mapped to Standard Queue
Option 2	5%	0%	5%l traffic mapped to EF queue
Standard Class	10%	0%	10% traffic mapped to EF queue

Table 5: BEA Traffic-based CoS Options

4 BEA Interface Specification

This section describes how services will be delivered using a copper based access mechanism between the End User site and the 7302ISAM using ADSL2+ technology. The services will be delivered to the End User site over copper pairs and terminated on a CPE

device which will not be managed by eir (the End User/Operator is responsible for providing the ADSL modem/router). The access circuit will be terminated on the MDF in the eir Exchange and will be jumpered to a port on the 7302ISAM.

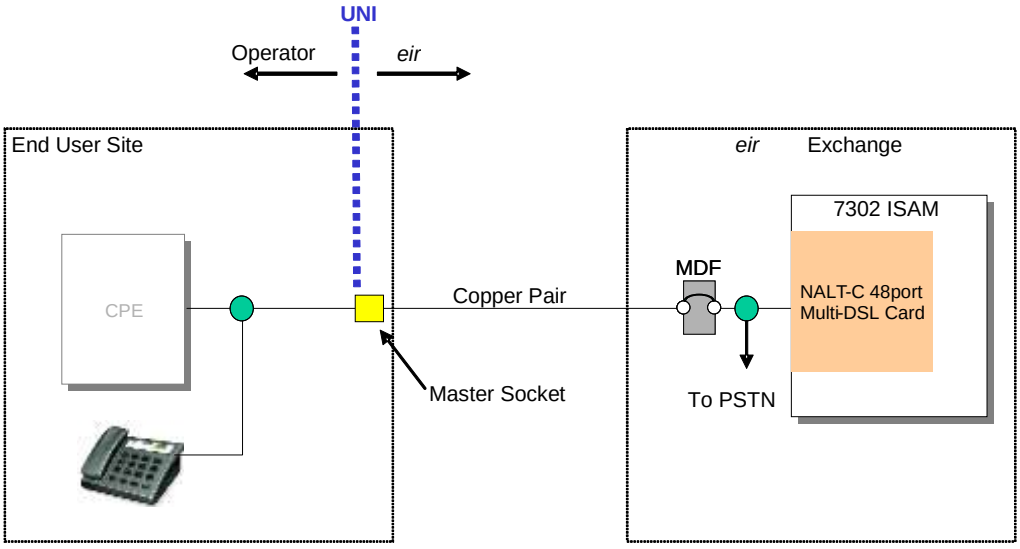

Figure 6: Bitstream Ethernet Access

The eir service demarcation point will be a master socket installed in the End User site.

The ADSL modem/router maps the End User traffic presented on the customer-facing port onto the up-link port facing the 7302ISAM. End User traffic may be tagged or untagged. The Ethernet frames from the End User are encapsulated into ATM/AAL5 on the DSL line using RFC2684 Bridged encapsulation. There is only one ATM PVC provisioned on the ADSL connection. In order to support service multiplexing (if required) the End User's ADSL modem/router must have the capability to map multiple C-VLANs onto a single ATM PVC.

ADSL Annex A Standard	ITU G.992.1
ADSL2+ Annex A Standard	ITU G.992.5 Annex A
ADSL2+ Annex M Standard	ITU G.992.5 Annex M
Encapsulation	ATM RFC2684 bridged encapsulation
VPI	8
VCI	35

Table 6: BEA UNI Interface Specification

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Version 1.1		Rebranded	April 2015
V2.0	Final	This document is based on Version 1.1 Implementation of Standardised Change Control.	13/06/2017