eircom wholesale

Product Description

Wholesale Symmetrical Ethernet Access (WSEA)

Document Control

Revision history

Version	Date	Revised by	Revision details
1.0	4th June 2010	eircom	Final
1.1	14th Sept 2010	eircom	Revised to reflect inclusion of traffic based class of service
1.2	3rd Oct 2011	eircom	Revised to include Class of Service changes.
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1.4	6th Jan 2012	eircom	Inclusion of WSEA logical access enhancements. Inclusion of new Class of service circuit based 100% AF Option.
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Associated documents

Title	Location
	www.eircomwholesale.ie

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Glossary

AF	Assured Forwarding
CoS	Class of Service
CIR	Committed Information Rate
C-VLAN	Customer Virtual Local Area Network
EF	Expedited Forwarding
EIR	Excess Information Rate
E-LAN	Ethernet Local Area Network
GUI	Graphical User Interface
NTU	Network Termination Unit
PIR	Peak Information Rate
PM	Process Manual
POH	Point of Handover
PSU	Power supply unit
SAB	Service Access Bandwidth
SLA	Service Level Agreement
STD	Standard Forwarding
S-VLAN	Service - Virtual Local Area Network
UG	Unified Gateway
UNI	User Network Interface
WEIL	Wholesale Ethernet Interconnection Link
WSEA	Wholesale Symmetrical Ethernet Access Product

1 Introduction

The purpose of this document is to provide a description of the eircom Wholesale Symmetrical Ethernet Access product.

This document is subject to review and will be re-issued to reflect changes as new developments are introduced which shall be communicated in accordance with agreed practices. Any specific technology mentioned in this document is current as at date of issue and is for guidance purposes only. eircom reserves the right to adapt the technology used to deliver Wholesale Symmetrical Ethernet Access.

This document is without prejudice to any future position that may be adopted by eircom in respect of Wholesale Symmetrical Ethernet Access. It should be read in conjunction with the relevant associated eircom Wholesale documents (where appropriate, reference offer, process manual and SLA).

1.1 Wholesale Symmetrical Ethernet Access Overview

Wholesale Symmetrical Ethernet Access is a product that enables an Operator to provide a physical Wholesale Symmetrical Ethernet Access circuit from an end user site to an NGN node, and to provide WSEA logical access(es) (one per available UNI port[1] on an eircom NTU) from an end user site to a nominated Operator Point of Handover (POH) via the eircom core network and a Wholesale Ethernet Interconnect Link (WEIL) as outlined in Figure 1 below. The WSEA may be provided to the nominated POH as Customer Sited Handover (CSH) or In-Building Handover (IBH)[2].

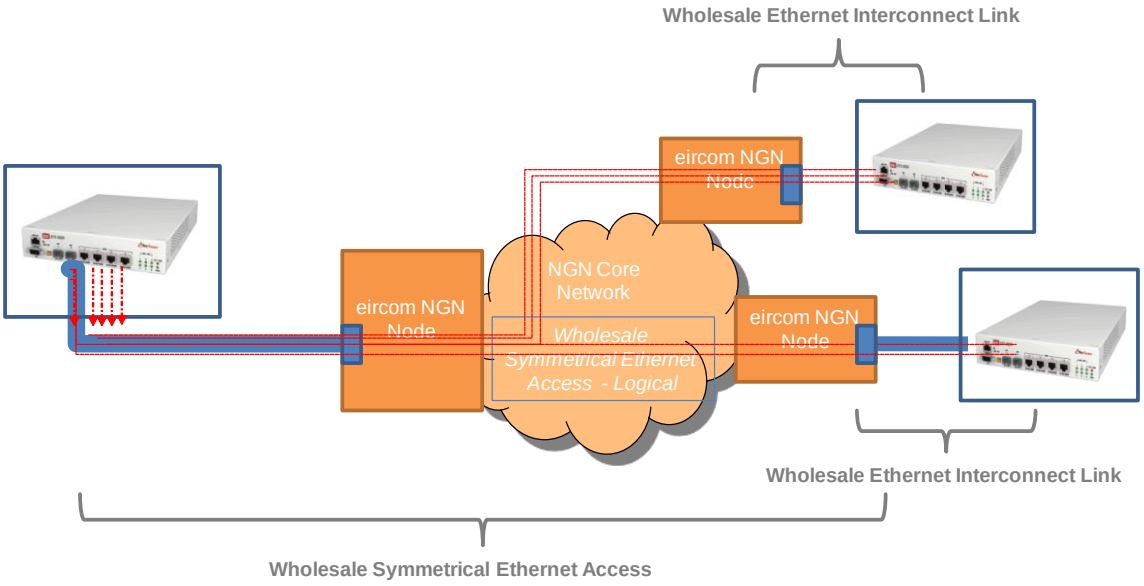


Figure 1: Wholesale Symmetrical Ethernet Fibre Access via NGN Node

[1] An Operator must select an available UNI port for each additional WSEA logical access, specifying the interface. The total bandwidth of all WSEA logical accesses cannot exceed the total bandwidth of the WSEA physical access.

[2] In-Building Handover is available to an Operator when availing of a Physical Co-location Service at the requested eircom exchange.

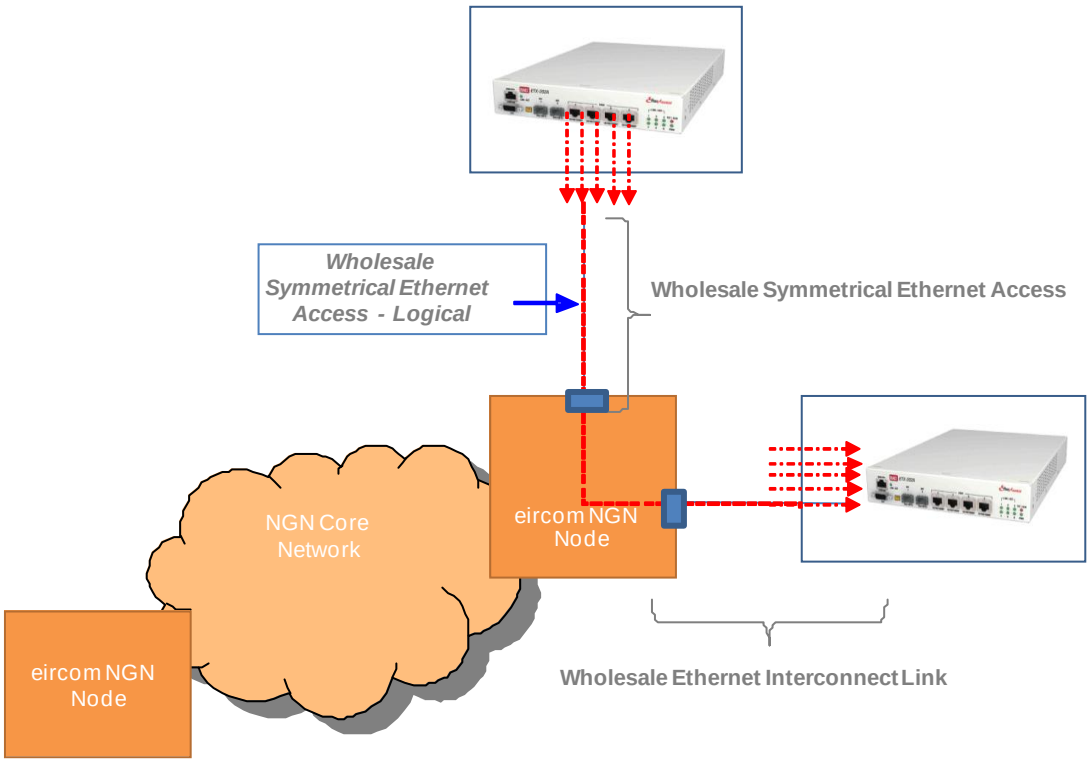


Figure 1a: Wholesale Symmetrical Ethernet Fibre Access showing WSEA and WEIL terminating on the same NGN Node.

In certain cases the Wholesale Symmetrical Ethernet Access and its associated Wholesale Ethernet Interconnect Link connection may be within the same serving exchange area and therefore may be connected to the same eircom NGN Node. Wholesale Symmetrical Ethernet Access / Wholesale Ethernet Interconnect Link connections served off the same eircom NGN Node provide the capability to configure the Wholesale Symmetrical Ethernet Access logical connection as an uncontended connection. The eircom NGN Node is a non-blocking device and therefore the Operator may inventory manage the Wholesale Ethernet Interconnect Link to ensure that it is not overbooked, i.e. that the sum of the Wholesale Symmetrical Ethernet Access bandwidths do not exceed the Service Access Bandwidth on the Wholesale Ethernet Interconnect Link (see Section 5.2. of the Technical Handbook for description of Service Access Bandwidths). In this scenario QoS is not required on the Wholesale Symmetrical Ethernet Access as the connection is uncontended and is not carried across the eircom core NGN network (Circuit based CoS *Option 5* as described in Section 6.1.1 of the Technical Handbook should be specified for these connections).

Conversely, the Operator may inventory manage the Wholesale Ethernet Interconnect Link which may result in the Wholesale Ethernet Interconnect Link being overbooked, i.e. that the sum of the Wholesale Symmetrical Ethernet Access bandwidths exceed the Service Access Bandwidth on the Wholesale Ethernet Interconnect Link (see Section 5.2. of the Technical Handbook for description of Service Access Bandwidths). In this scenario QoS may be required on the Wholesale Symmetrical Ethernet Access and the required level of circuit based class of service should be specified by an Operator.

It should be noted that more than one eircom NGN Node may be installed in some serving exchange sites. These eircom NGN Nodes within the same serving exchange site will not be connected locally.

eircom's Wholesale Symmetrical Ethernet Access product is defined both at the physical and the logical level.

The physical access is the fibre connection from the eircom NTU located at an Operator's end user location to the physical port[3] on the serving eircom NGN node. The eircom network termination point is defined as the User Network Interface (UNI) port. The UNI port is located on the eircom NTU. The eircom NTU is located at the Operator's end customer premises for CSH and in the Operator's co-location rack in the same exchange as the serving NGN node for IBH.

The logical access for CSH is the connection (via the UNI port) from an Operator's end user site to an Operator's designated Wholesale Ethernet Interconnect Link (WEIL).

The logical access for IBH is the connection (via the UNI) from the NTU, located in the Operator's co-location rack in the same exchange as the serving NGN Node, to an Operator's designated Wholesale Ethernet Interconnect Link (WEIL).

An Operator can associate each WSEA logical with a different WEIL.

1.2 Key Features and Availability

The eircom Wholesale Symmetrical Ethernet Access product provides Operators with the capability to develop their own E-Line and E-LAN type services to meet their end user needs.

Key Features:

- Single mode fibre access connectivity
- Radial distance fibre reach of 4kms[4] [1000Base-LX]
- Radial distance fibre reach of 30kms[5] [1000Base-ZX]
- One WSEA logical access per UNI port (802.1Q trunk) on an eircom NTU[6]
- One S-VLAN per WSEA logical access
- Modular bandwidth growth steps
- Maximum frame size 9000 bytes
- One Wholesale Symmetrical Ethernet Access (physical access) per NTU
- C-VLAN ID preservation

Class of Service options:

- Circuit based
- Traffic based

Each Wholesale Symmetrical Ethernet Access (logical) must be associated with an Operator WEIL and associated SAB (existing or new[7])

Wholesale Symmetrical Ethernet Access is currently available at a number of locations. eircom will circulate and update a rollout plan as eircom continues to extend the Wholesale Symmetrical Ethernet Access reach capability.

The rollout plan will be made available to Operators who have signed a Leased Line Agreement for the Wholesale Symmetrical Ethernet Access product. Operators will be requested to formally nominate a designated contact point for receipt of the rollout schedule and associated updates.

[3] From a pricing perspective the physical port is currently included in the logical access
[4] 1000Base-LX - theoretical maximum distance of 10km – actual distances more likely to be 4km is subject to full survey and physical testing
[5] 1000Base-ZX - theoretical maximum distance of 70km – actual distances more likely to be 30km is subject to full survey and physical testing
[6] Maximum of 5 WSEA logical accesses per eircom NTU RAD ETX-202A
[7] Note: If new WEIL, the order must be already placed by eircom and order reference number received and referenced.

This will be provided electronically at a minimum of a quarterly basis. The rollout plan will be in workbook format and will detail:

- Currently deployed locations
- Planned locations
- The rollout plan will be e-mailed to the nominated Operator representative.

2 Product Components

The Wholesale Symmetrical Ethernet Access product provides connectivity (both physical and logical) from an Operator's end user premises to the nominated Point of Handover (POH) which may be CSH or IBH.

2.1 Wholesale Symmetrical Ethernet Access - Physical

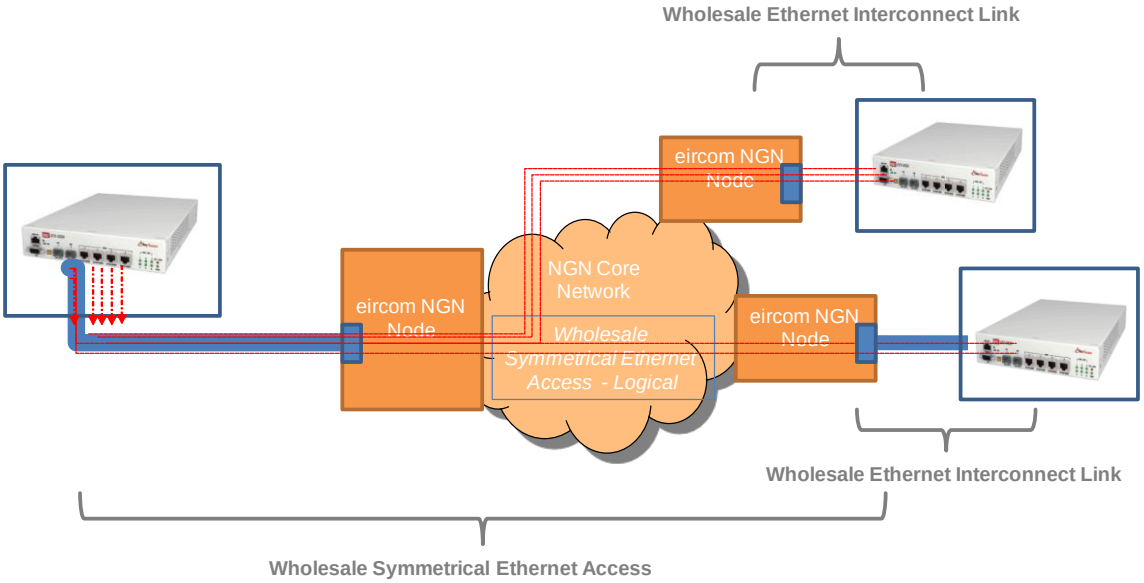


Figure 2: Wholesale Symmetrical Ethernet Physical Access

The physical access is delivered on a single mode fibre connection from the eircom NTU located at an Operator POH, which may be CSH or IBH to the physical port on the serving eircom NGN node.

All Wholesale Symmetrical Ethernet Access requests are subject to full site survey. The standard price applies where the end user's premises is served by useable eircom owned duct[8] and is within 500 metres of an available eircom access fibre which can connect to the serving eircom NGN node. eircom reserves the right to recover any additional costs incurred[9].

[8] Useable duct for fibre assumes that there is sufficient space in the duct to draw in a subduct

[9] From a pricing perspective the cost of a physical port is currently included in the logical access price

Wholesale Symmetrical Ethernet Access connections are available in the following bandwidths:

Bandwidth (Mb/s)
10
20
30
40
50
75
100
150
200
250
300
450
500
600
750
1000

Table 1: Bandwidth options (Mb/s) for Wholesale Symmetrical Ethernet Access

2.1.1 Customer-Sited Handover

The eircom physical network termination point is the User Network Interface (UNI) port on the eircom NTU located at an Operator's end user's premises. One Wholesale Symmetrical Ethernet Access logical access connection is delivered per UNI port.

The eircom NTU is a RAD ETX 202A (see Figure 3). One port (port 1) is reserved for eircom network connectivity and one optical (port 2) and four electrical ports (ports 3-6) are available for Operator use to terminate WSEA logical accesses at the Operator end user site on an eircom NTU.

If an Operator requires either different combinations of interface presentation types on the NTU or more logical services on the WSEA than the current NTU(s) can support please contact your Account Manager to discuss alternative NTU solutions.

The Operator can specify either a fibre or copper port to handoff the product. Each port is referred to as the User Network Interface (UNI) port and is configured as a 802.1Q port.

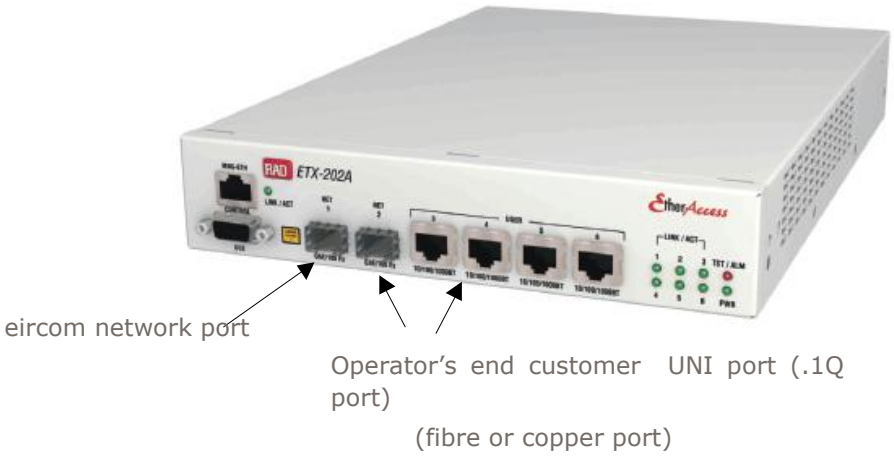


Figure 3: RAD ETX-202A

The eircom NTU specification is contained in Appendix 1. It is an Operator's responsibility to ensure that adequate facilities (space, power and correct environmental conditions) are in place at the end customer site to enable the eircom NTU to be successfully installed.

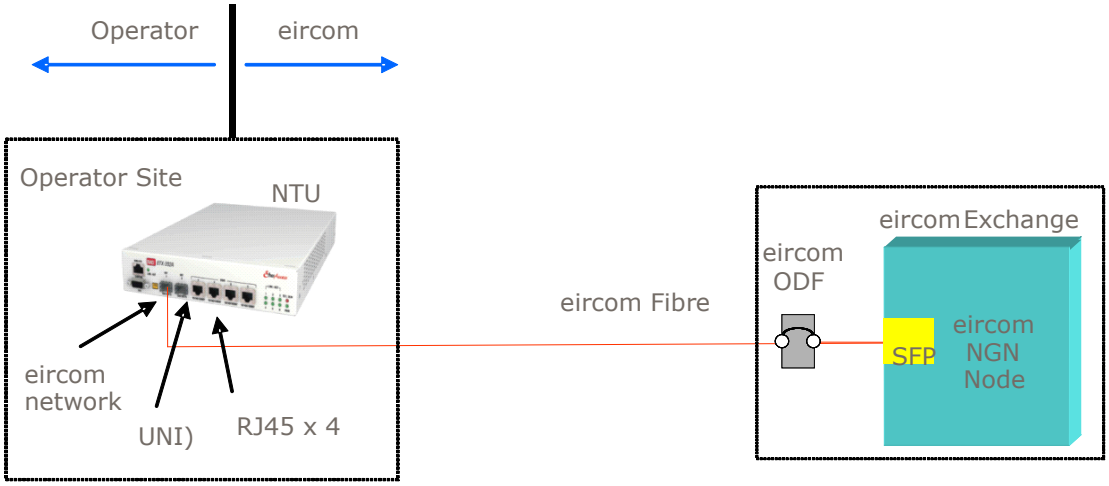


Figure 4: Customer Sited Handover

2.1.2 In-Building Handover (IBH)

The eircom physical network termination point for a WSEA IBH is the user network interface (UNI) at the point of handover to an Operator. For a WSEA IBH, a fibre cable is installed between an Operator footprint and a serving eircom NGN Node.

WSEA IBH is available to an Operator currently availing of the eircom Physical Co-location Service at the requested eircom exchange.

The physical Co-location operational processes that support the interactions between eircom and an Operator for the delivery of serviced accommodation in an eircom exchange are outlined in the "Process Manual for eircom Physical Co-location Service". The physical network termination point is the User Network Interface (UNI) port on the eircom NTU located in an Operator co-location rack. The eircom NGN Node will connect to an optical patch panel installed in the Operator co-location rack.

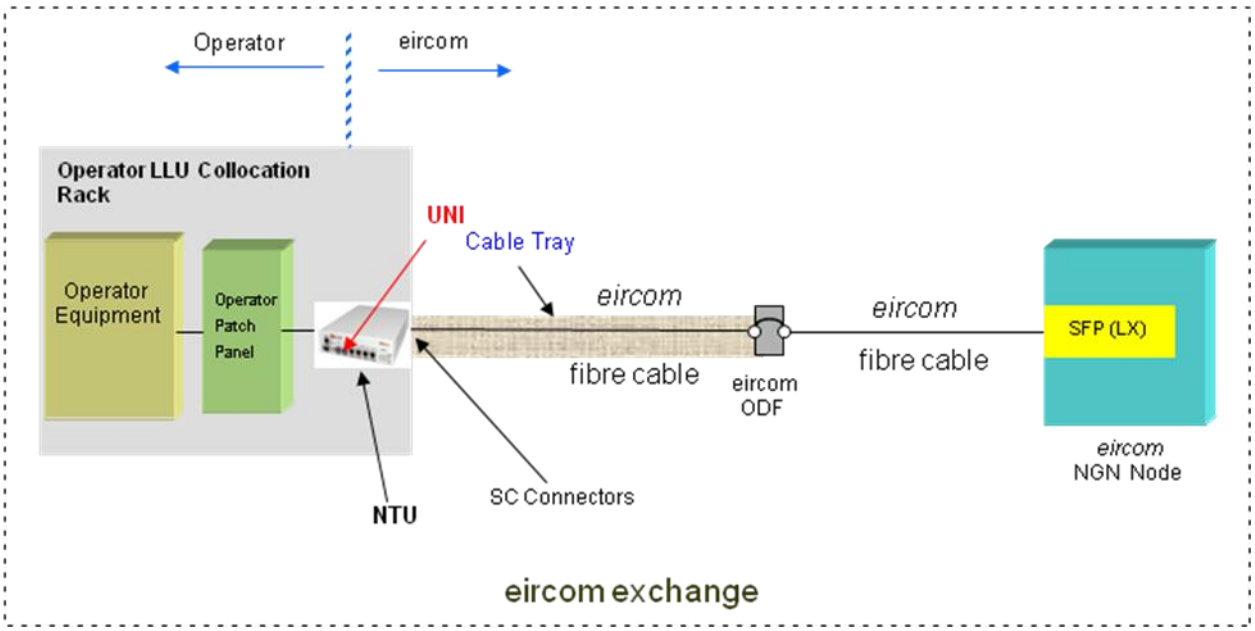


Figure 5: WSEA In-Building Handover

2.2 Wholesale Symmetrical Ethernet Access (WSEA) – physical access diversity

WSEA physical access diversity enables the Operator to order a secondary diverse WSEA physical circuit between the eircom NTU located at the end user site to a physical port on a serving eircom NGN node. An Operator can switch traffic from the primary WSEA physical circuit to the diverse WSEA physical circuit in the event of a fault occurring on the primary WSEA physical circuit. This provides Operators and their end users with a level of access resilience on WSEA physical circuits.

The physical access is delivered on a dual fibre from the eircom network to an Operator POH located at an Operator's handover site, which will always be Customer Sited Handover (CSH) for WSEA physical diversity. WSEA physical diversity will not be offered on WSEA IBH circuits.

All WSEA physical access diversity requests are subject to a full site surveyprior to order.

Following completion of the survey order the Operator will be informed of the results of the survey indicating what diversity options are available.

The standard price applies where an Operator's premises is served by useable eircom owned duct[10] and is within 500 metres of an available eircom access fibre which can connect to the serving eircom NGN Node

The same SFP (small form-factor pluggable) type should be installed at both ends of the fibre pair. Connectivity will not be established if there are different SFP's installed in an Operator CE port.

There are two diversity options available on WSEA physical circuits. The two options are outlined below:

2.2.1 WSEA physical access diversity- Option A Dual NTU/Single NGN Node/Dual Fibre/Dual Duct

Two separate WSEA physical circuits are implemented between two eircom NTUs located at the end user site to two physical ports on the same serving eircom NGN node. Both WSEA circuits are active and both fibre paths are located in separate ducts.

The Operator controls the failover between the two WSEA physical circuits through the use of Operator CPE which ensures switchover from one WSEA physical circuit to the other in the event of a failure occurring on one WSEA physical circuit.

It is the responsibility of the Operator to provide CPE with the relevant functionality which ensures that should a fault occur on either WSEA physical circuit all traffic will be re-routed onto the other WSEA physical circuit.

[10] Useable duct for fibre assumes that there is sufficient space in the duct to draw in a subduct

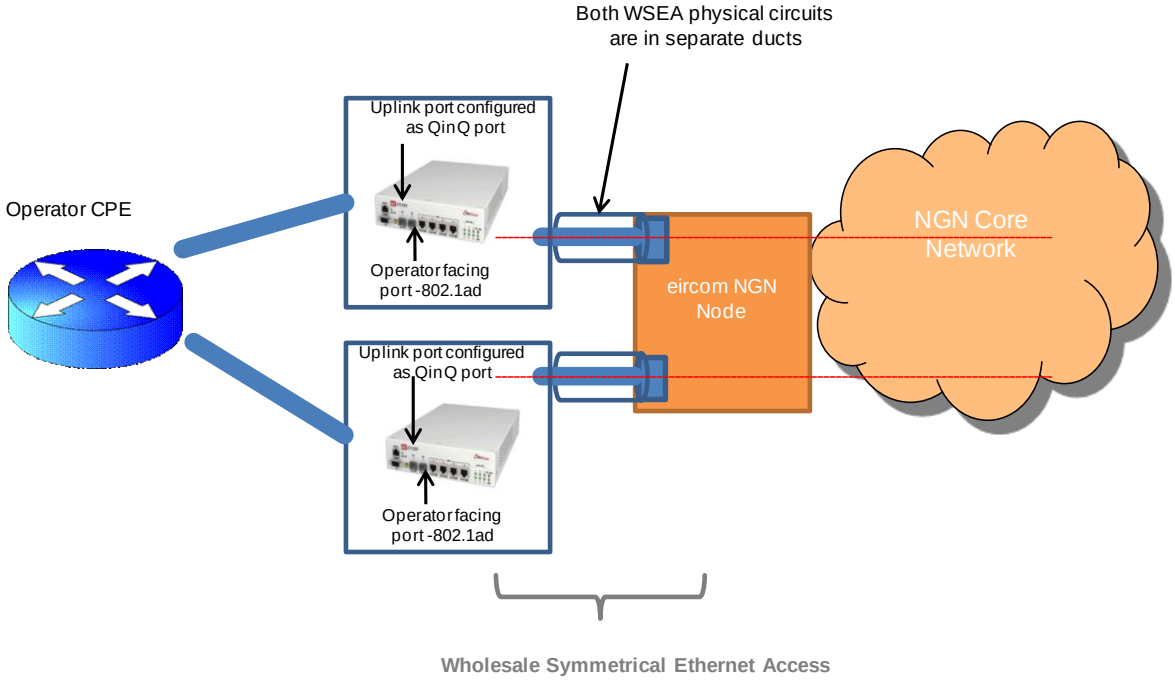


Figure 6: Figure 6 – WSEA access physical diversity – Dual NTU / Single NGN Node

2.2.2 WSEA physical access diversity- Option B Dual NTU/Dual NGN Node/Dual Fibre/Dual Duct

This option provides the highest level of resilience. Two separate WSEA physical circuits are implemented between two eircom NTUs located at the end user site to two physical ports on two separate serving eircom NGN nodes.

Both circuits are active; the Operator controls the failover between the two WSEA physical circuits through the use of Operator CPE which ensures switchover from one WSEA physical circuit to another in the event of a failure occurring on one WSEA physical circuit.

It is the responsibility of the Operator to provide CPE with the relevant functionality which ensures that should a fault occur on either WSEA physical circuit all traffic will be re-routed onto the other WSEA physical circuit.

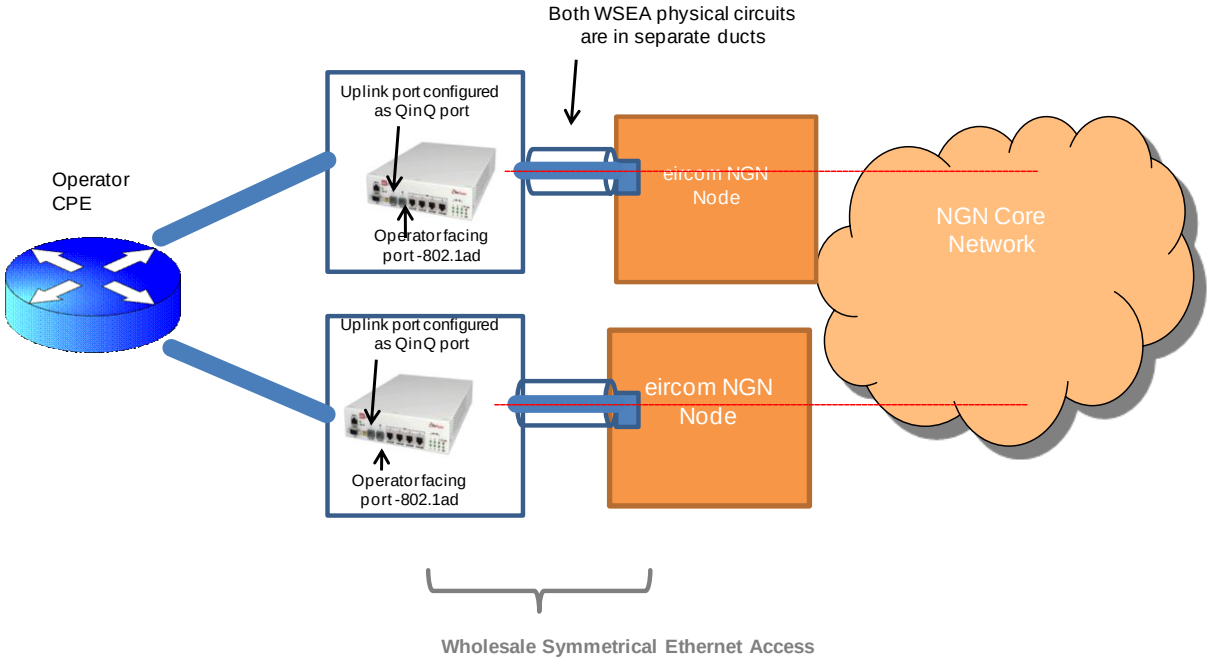


Figure 7: Figure 7 - WSEA physical access diversity – Dual NTU / Dual NGN Node

2.3 Wholesale Symmetrical Ethernet Access – Logical

The physical Wholesale Symmetrical Ethernet Access connection supports one WSEA logical connection via each UNI port (optical or electrical) on an eircom NTU from an Operator's end user site to the Operator nominated POH which can be CSH or IBH.

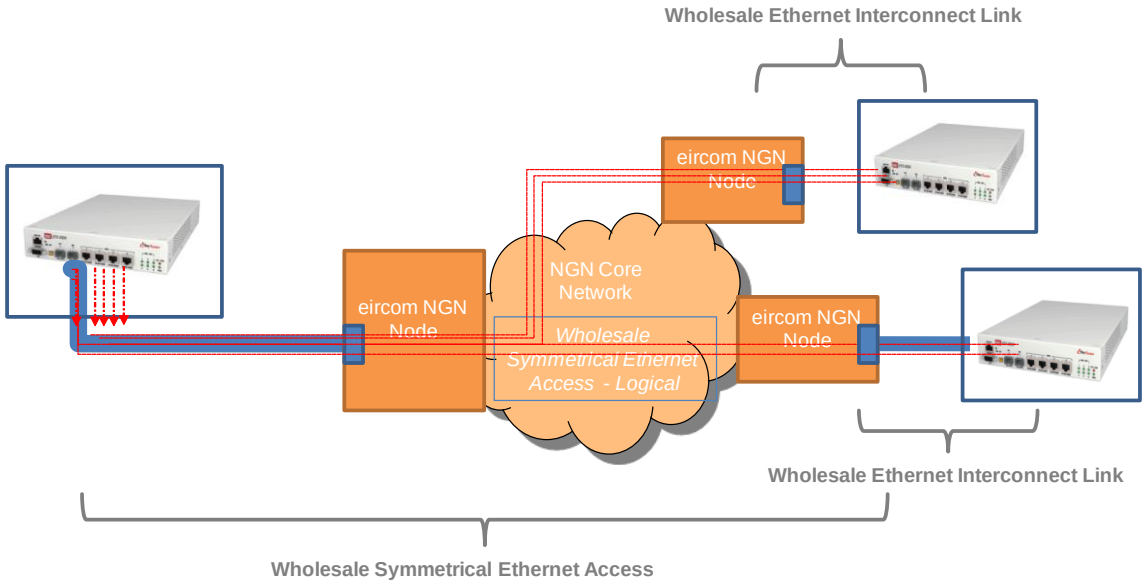


Figure 8: Wholesale Symmetrical Ethernet Access – logical

2.3.1 Customer Sited Logical Connection

The logical connection preserves C-VLAN (if present) from the end user site and presents it on an Operator WEIL at the Point of Handover where 802.1Q support is provided on the eircom NTU.

An Operator, when ordering a CSH Wholesale Symmetrical Ethernet Access, will be required to specify the Service Access Bandwidth (SAB) on their relevant Wholesale

Ethernet Interconnect Link (WEIL) to which an Operator wishes to have each WSEA logical connection mapped.

An Operator must ensure that their relevant Wholesale Ethernet Interconnect Link (WEIL) and associated Service Access Bandwidth (SAB) are appropriately configured to support Wholesale Symmetrical Ethernet Access (WSEA) connections.

An Operator has the capability to manage and prioritise its Wholesale Symmetrical Ethernet Access end user's traffic by applying the relevant Class of Service (CoS) to each WSEA logical access provided per UNI port on an eircom NTU. Please refer to Appendix 4 (Example 1) for a worked example.

2.3.2 In-Building Handover Logical Connection

The logical connection preserves C-VLAN (if present) from the UNI and presents it on an Operator WEIL at the Point of Handover where 802.1Q support is provided on the eircom NTU.

An Operator, when ordering WSEA IBH, will be required to specify the relevant Service Access Bandwidth (SAB) on the relevant Operator Wholesale Ethernet Interconnect Link (WEIL) to which an Operator wishes to have the logical connection mapped.

An Operator must ensure that their Wholesale Ethernet Interconnect Link (WEIL) and associated Service Access Bandwidth (SAB) are appropriately configured to support Wholesale Symmetrical Ethernet Access (WSEA) connections.

An Operator has the capability to manage and prioritise its Wholesale Symmetrical Ethernet Access end user's traffic by applying the relevant Class of Service (CoS) to each WSEA logical access provided per UNI port on an eircom NTU. Please refer to Appendix 4 (Example 1) for a worked example.

2.4 Class of Service

The Operator end user traffic can be marked as circuit based or traffic based CoS. Class of Service utilises two defined values that determine how the traffic will be prioritised and delivered.

These are:

- Committed Information Rate (CIR)

  This is the maximum capacity of the bandwidth selected for the end user site that will be guaranteed to be delivered.

- Peak Information Rate (PIR)

  This is the maximum capacity of burstable traffic which is capable of being delivered. The difference between the PIR and CIR is referred to as Excess Information Rate (EIR) and there is a possibility that this traffic may be dropped in the eircom network.

eircom guarantees that the Committed Information Rate selected by an Operator will be transmitted across the eircom network. All other traffic will be delivered on a "best effort" basis.

Class of Service options effectively work on a per hop basis and maps an end user's traffic into specific network queues (Expedited Forwarding [EF], Assured Forwarding [AF], Standard). This is used to prioritise traffic within the end user access and then map to core eircom network queues to allow for an end to end Class of Service.

It is an Operator's sole responsibility to nominate the Operator WEIL and SAB where the end user traffic is to be delivered and to manage the capacity of their WEIL and associated parameters.

2.4.1 Circuit based Class of Service

Circuit based class of service manages an Operator's traffic on a per WSEA logical access basis. The traffic is mapped into the eircom core network queues based on the Class of Service selected.

eircom will not inspect an Operator's end user's traffic markings, if applied, but transport the traffic across the eircom core network transparently, therefore preserving an Operator/end user traffic classification (C-VLAN preservation).

eircom will apply the Class of Service requested by an Operator on the Wholesale Symmetrical Ethernet Access logical access to all traffic on the logical connection (via the UNI port).

Only one Class of Service can be applied to each Wholesale Symmetrical Ethernet Access logical access at a time.

Table 2 outlines the six different circuit based Class of Service options offered by eircom. The percentage values in Table 2 refer to the percentage of the bandwidth selected by the Operator for that end user site. The maximum class of service bandwidth column in Table 2 details the maximum bandwidth that can be ordered for the end user access based on the circuit based Class of Service option selected i.e. if a circuit based Class of Service option 1 has been selected the maximum bandwidth that can be ordered is 300Mb/s.

Please refer to Appendix 2 for worked examples of circuit based Class of Service.

Circuit based Class of Service Options	Committed Information Rate	Peak Information Rate	Queue	Maximum Class of Service Bandwidth*
Option 1	CIR=100%	PIR=100%	All traffic is mapped into the Expedited Forwarding queue	<=300Mb/s
Option 2	CIR=50%	PIR=100%	All traffic is mapped into the Assured Forwarding queue	<=1Gb/s**
Option 3	CIR=10%	PIR=100%	All traffic is mapped into the Assured Forwarding queue	<=1Gb/s**
Option 4	CIR=5%	PIR=100%	All traffic is mapped into the Assured Forwarding queue	<=1Gb/s**
Option 5	CIR=0%	PIR=100%	All traffic is mapped into the Standard queue	<=1Gb/s
Option 6	CIR=100%	PIR=100%	All traffic is mapped into the Assured Forwarding queue	<=1Gb/s**

Table 2: Circuit-based CoS

* Note: maximum Class of Service bandwidth per WSEA physical connection

** Note: The Class of Service Bandwidth with a CIR of 100% or less Assured Forwarding (AF), at speeds >600Mb/s is available at certain NGN / Reach Nodes only. See the latest version of the NGN Rollout plan for a list of these locations.

100% AF or less, up to and including 600Mb/s, is available at all other location, with the exception of APT Nodes where the limit is 300 Mb/s.

At APT nodes where a customer is moved to a dedicated fibre the Class of Service Bandwidth with a CIR of 100% AF or less, up to and including 600Mb/s, is available.

2.4.2 Traffic Based Class of Service

Traffic based class of service manages an Operator's traffic on a traffic basis. The traffic is mapped into the eircom core network queues based on the Class of Service selected.

An Operator's end user traffic may have 802.1p markings (1-7). This may be done by an Operator via their own edge node and the CPE deployed at their end user site. Each of these markings is mapped into one of three queues. Traffic markings 7, 6, 5 and 4 are mapped into the Expedited Forwarding (EF) queue. Traffic markings 3 and 2 are mapped into the Assured Forwarding (AF) queue. Traffic marked 1 is mapped into the Standard Forwarding queue.

An Operator must specify the bandwidths (expressed in percentages) for the Expedited Forwarding and Assured Forwarding queues as part of the Wholesale Symmetrical Ethernet Access order, for each WSEA logical access.

Traffic Based Class of Service Policy Map Name	**Policy Maps (allocation and allowed values)**		
802.1p Class of Service	7/6/5/4	3/2	1
Queue	Expedited Forwarding	Assured Forwarding	Standard Forwarding
Class of Service Bandwidth	**A** %	**B** %	*
Maximum Class of Service Bandwidth	300 Mb/s*	1Gb/s*/**	
CIR / PIR	CIR = **A** % PIR = CIR	CIR = **B** % PIR = WSEA B/W	CIR = 0 % PIR = WSEA B/W

Table 2.1: Traffic based Class of Service

*Note: the total maximum class of service percentage of A % and B % of the combined WSEA logical accesses cannot exceed 1Gb/s per WSEA Physical with a max A % of 300Mb/s.

** Note: The Class of Service Bandwidth with a CIR of 100% or less Assured Forwarding (AF), at speeds >600Mb/s is available at certain NGN / Reach Nodes only. See the latest version of the NGN Rollout plan for a list of these locations.

100% AF or less, up to and including 600Mb/s, is available at all other location, with the exception of APT Nodes where the limit is 300 Mb/s.

At APT nodes where a customer is moved to a dedicated fibre the Class of Service Bandwidth with a CIR of 100% AF or less, up to and including 600Mb/s, is available.

The **A** percentage value in the table above refers to the CIR for the EF queue. For EF traffic, the CIR value equals the PIR value and hence EF traffic will not be allowed to burst above the **A** percentage value specified above for a Wholesale Symmetrical Ethernet Access connection.

The **B** percentage value in the table above refers to the CIR for the AF queue. For AF traffic the PIR value equals the bandwidth specified for the Wholesale Symmetrical Ethernet Access connection. Therefore AF traffic can burst up to the maximum bandwidth of the Wholesale Symmetrical Ethernet Access connection but only the **B** % value specified in the table above will be committed bandwidth.

Standard traffic can burst up to the maximum bandwidth of the Wholesale Symmetrical Ethernet Access connection. There is no CIR associated with the Standard queue.

It is important to note that the sum of the A % and B % cannot exceed 95% of the relevant Wholesale Symmetrical Ethernet Access bandwidth.

The A percentage and B percentage must be expressed in percentage increments as follows:

Percentage	EF/AF Mix	Increment
1-5%	EF only	1%
5%	EF and AF	
10-20%	EF and AF	10%
25%	Fixed option	EF=50% AF=25%
30-50%	EF and AF	10%
55%	Fixed option	EF=20% AF=55%
55%	EF only	
60-70%	EF and AF	10%
75%	Fixed option	EF=0% AF=75%
80-90%	EF and AF	10%
95%	Fixed option	EF=95% AF=0%

Table 2.2: EF and AF Percentage

See Appendix 5 for details of the available permutations.

The following planning ratios are used for capacity management purposes in the eircom NGN core network.

Traffic Type	Planning Ratio
Expedited Forwarding	1:1
Assured Forwarding – in profile	1:1
Assured Forwarding – out of profile	5:1
Standard	5:1

Table 3: Planning Ratios for Capacity Management on eircom NGN network

3 Commercial

3.1 Pricing

Prices are published in the Network Price List on www.eircomwholesale.ie.

3.2 Terms and Conditions

Terms and conditions are published in the Leased Line Reference Offer on the eircom Wholesale website at www.eircomwholesale.ie.

An Operator must have signed a Leased Line Agreement, specifically Service Schedule 014.

In-Building Handover (IBH) is available to an Operator in accordance with the Physical Co-location Service as defined in the eircom Network Pricelist, and Service Schedule 014, when provided from an eircom exchange.

3.3 Service Responsibility

3.3.1 eircom Responsibility

eircom has responsibility for the provision, repair and maintenance of the WSEA from the eircom NGN Node to the Point of Handover (POH) as defined in the product description for either CSH or IBH.

3.3.2 Operator Responsibility

For the purpose of providing a WSEA CSH the Operator is responsible for connecting from the NTU to its own equipment, and for any end-to-end testing of their service. The Operator must ensure that a suitable environment is provided for the NTU to ensure that adequate space, power, environmental conditions and general facilities (as outlined in Appendix 1) are available to install the NTU.

In addition the Operator must enable access to its handover location for eircom to install, maintain or cease the NTU. The Operator is responsible for any services that use the Wholesale Symmetrical Ethernet Access Product. The Operator must also review and manage its bandwidth requirements, and request capacity in a timely manner from eircom.

For the purpose of providing a WSEA IBH an Operator must request a Physical Change (as defined in the License Agreement) as per 5.2.1 of the process manual for eircom Physical Co-location Service.

4 Service Management

There are a number of processes that support this product from the initial forecasting and quotation through to billing as outlined in Figure 5.

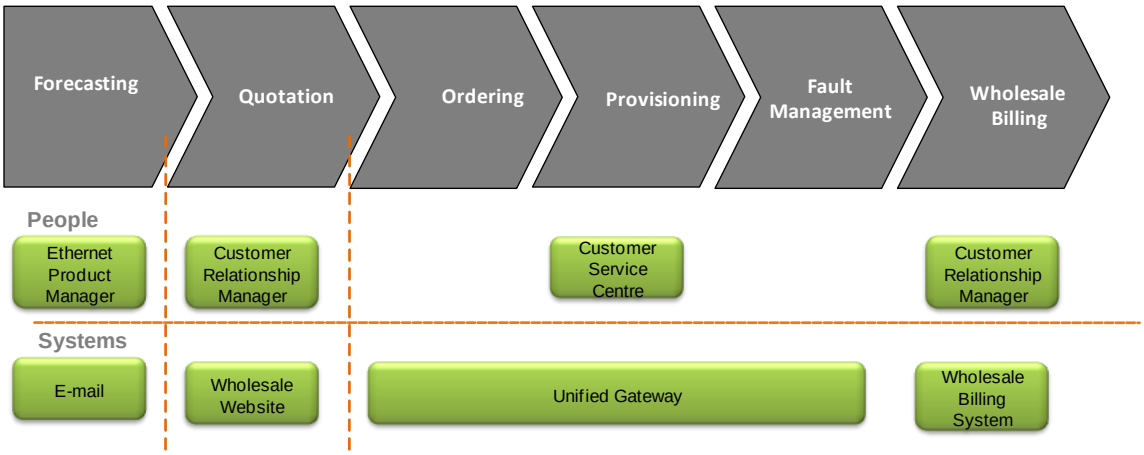


Figure 9: Process, people and systems overview

Prior to requesting the service the Operator may find product information on the eircom Wholesale website, www.eircomwholesale.ie or discuss their requirements with their Customer Relationship Manager/Account Manager.

Ordering, Provisioning and Maintenance processes are supported by the Unified Gateway and the eircom Wholesale Customer Contact Centre. After provision of the WSEA any queries regarding billing should be directed to the Operators Customer Relationship Manager/Account Manager.

Each of these processes are outlined in further detail below.

4.1 Forecasting

Operators are requested to provide forecasts on a rolling 12 months basis via a standard form with confirmation of these forecasts on a rolling quarterly basis to the Ethernet Product Manager.

Please see section 2 Forecast of the WSEA Process Manual for an explanation of the forecasting process.

4.2 Quotation process

The Operator can request quotes for the service via the quotation tool (Web GUI) identifying:

- Nominated handover point (WEIL) location
- Nominated handover type - IBH/CSH
- Local serving exchange
- End customer site location
- Bandwidth
- Class of Service

eircom will provide a quote with an indicative price, subject to full site survey, for the requested WSEA.

All WSEA physical access diversity requests are subject to a full site survey. The results of the survey detail what diversity options are available to the Operator and the price of each option.

4.3 Ordering, Provisioning and Assurance

The Ordering, Provisioning and Maintenance processes will be supported by the Unified Gateway (UG) which will be used to log orders and report faults for the product via the UG web GUI.

The UG is an order management and fault handling system designed to be the primary interface between eircom and an Operator.

Operators will be able to enter all the necessary data via structured on line screens for both ordering and fault reporting. Once all the data has been entered an order or fault can be submitted. The UG will accept and validate the relevant orders and faults and will provide appropriate notifications in response. Order and fault status updates through to completion will then be provided back to the Operator and can be viewed via the order and fault tracking screens.

Service assurance on a fibre provided for an Operator on a WSEA IBH, will be provided by eircom, It is the responsibility of an Operator to prove any fault from an Operator network to the point of handover (POH). If the fibre cable needs to be replaced, it will be funded by an Operator.

4.3.1 Ordering the Service

An Operator may place an order for the product via the Unified Gateway[11]. There are a number of product rules that the Operator must observe before requesting the service:

Order for the Wholesale Ethernet Interconnect Link (including Service Access Bandwidth) must either be ordered or delivered

An Operator must nominate the relevant Service Access Bandwidth via the eircom circuit reference to which the end customer traffic shall be connected

An Operator is responsible to ensure that by ordering these they do not:

- breach the rules of the WEIL
- exceed the WSEA physical capacity
- exceed the WSEA maximum Class of Service rules
- An Operator should check that the Service Access Bandwidth nominated to map the end customer traffic to, has suitable settings to support the requested bandwidth and Class of Service
- For WSEA physical access diversity circuits a survey must have been completed prior to ordering. The survey reference number must be referenced in the relevant input field when placing the order.

A WSEA CSH order will provide connectivity from the Operators end customer premises to the eircom network. The physical order will require the installation of fibre and an NTU at the Operator end customer premises. Once the physical delivery is completed the logical component shall be delivered. This element of the order enables provision of the logical component according to the CoS and bandwidth nominated by the Operator, and references both the WSEA physical and nominated SAB to which the service is to be delivered.

A WSEA IBH order will provide connectivity from the eircom network to an Operator's nominated In-Building Handover point located within an eircom exchange. The WSEA physical connectivity will require preparation and installation of eircom fibre and equipment within the same eircom exchange as the serving eircom NGN Node.

Before placing the order on the UG an Operator must have a Co-location footprint in place in compliance with the Process Manual for eircom Physical Co-location Service. On request, (QIB Order Type) eircom will undertake to assess the work that is required to prepare the

[11] Orders for additional WSEA logical accesses must be placed via the eircom manual order form – see the WSEA Industry Process Manual for further details.

eircom exchange facility for an In-Building Handover and provide a quotation for an Operator for the WSEA.

eircom will install (PIB Order Type) the physical connectivity of the WSEA from the POH to the eircom NGN Node within the same eircom exchange in line with the order for the WSEA.. The QIB and PIB order processes are outlined in the "Process Manual for Physical Co-Location".

Please refer to section 4 of the WSEA Industry Process Manual for further detail on order placement on the UG.

4.3.1.1 Delivery Timelines

Wholesale Symmetrical Ethernet Access orders are delivered using fibre which is subject to survey and availability. Orders may be classified as standard or non-standard or as a project.

Please refer to section 2 of the WSEA SLA for further details.

4.3.1.2 Confirmation of Delivery

An order is deemed to be complete on provision of the Wholesale Symmetrical Ethernet Access logical component which establishes the connection between the user network interface (UNI) and the nominated WEIL POH.

The Operator will also be advised once their order is completed. The order status throughout the life of the order will also be available for the Operator to track on the UG[12].

4.3.2 Other orders – change, move, cancel or cease

Following the delivery of the Wholesale Symmetrical Ethernet Access the Operator can request changes to the service, move the service, for example to another comms room or cease the service.

The changes that can be requested for the service are:

- Change bandwidth
- Change Class of Service
- Change associated SAB – ie move WSEA logical to a different SAB

The following move order can be requested:

- Move Wholesale Symmetrical Ethernet Access – physical

If an Operator wishes to cancel a Wholesale Symmetrical Ethernet Access order before it is delivered this order must be placed prior to installation of the service commencing.

Please refer to section 4 of the Process Manual for further detail on change order process, move order, cancel and cease processes.

4.3.3 Fault Management

Please refer to section 5 of the WSEA Process Manual for further details on fault management.

4.3.3.1 Logging a fault

A fault for this service is logged via the UG after the Operator has proven the fault out of their network. The Operator should log the fault against the relevant Wholesale Symmetrical Ethernet Access (logical) circuit reference number.

For WSEA IBH, an Operator must prove the fault out of their network and beyond to the eircom POH, the NTU, before logging a fault on the UG.

[12] Orders for additional WSEA logical accesses must be placed via the eircom manual order form

4.3.3.2 Fault handling process

Please refer to section 5 of the WSEA Process Manual for the fault handling process for this service. The status of a fault can be tracked throughout its lifecycle via the UG web GUI by the Operator. Only those faults relating to the Operator will be visible to them.

Service shall be deemed to have been restored when the fault condition is resolved on the eircom network and service availability is restored, notification will be provided by eircom via the UG to the Operator.

4.4 Billing

There are connection and rental charges associated with the access product which cannot commence until the associated Wholesale Ethernet Interconnect Link is in place. Once the order is completed and the Wholesale Symmetrical Ethernet Access is commissioned billing shall commence. Billing shall be carried out on a monthly basis in advance and the service shall be identified on the bill.

In the event that an Operator has a query regarding the bill they should contact their Wholesale Customer Relationship Manager/Account Manager.

5 Supporting Documentation

Further information on eircom Wholesale processes and supporting information may be found at www.eircomwholesale.ie

- Wholesale Symmetrical Ethernet Access Process Manual
- Wholesale Symmetrical Ethernet Access SLA
- Wholesale Ethernet Interconnect Link Product description

Appendix 1 – NTU Specification

An Operator must ensure that adequate space, power and correct environmental conditions are available for the installation of the NTU as outlined in Table AP1-1.

Space		Height	Width	Depth
	Single PSU	43.7mm	215mm	300mm
Power		Power		Power Consumption
		AC		18.5W (max)
Operating Temperature		$0 - 50^0$C		

Table AP1-1: NTU space and power requirements

Table AP1-2 outlines the specification and number of customer interface ports that are available on the NTU illustrated in Figure 3.

Port type and number	GBIC	Connector	Cable type
1x fibre base User interface port	SFP (mini-GBIC), 1000BaseSX (<500m) Or SFP (mini-GBIC), 1000BaseLX (<10km)	LC LC	MMF SMF
4 x copper based User interface port	1000Base-T	RJ-45	Cat5

Table AP1-2: End customer interface ports specification

Key NTU Features:

- Single PSU unit (default) supplied with 19” rack mounting kit
- Dual PSU option is available (43.7H x 44W x 24D)
- Default port interface presentation is electrical RJ45 (on ports 3-6)
- Port duplex mode: Auto negotiation (default) or 10M / 100M full duplex
- Port interface presentation can be changed to optical LC (on port 2):
- Options are 1000BaseSX (default) or 1000BaseLX
- Port duplex mode: Auto negotiation (default) or 1000M full duplex

Appendix 2 – Circuit Based Class of Service – Worked Examples

The examples below are for illustration purposes only

Circuit based Class of Service Options	Committed Information Rate	Peak Information Rate	Maximum Service Bandwidth *
Option 1 (EF Queue)	CIR=100%	PIR=100%	<=300Mb/s
Option 2 (AF Queue)	CIR=50%	PIR=100%	<=1Gb/s**
Option 3 (AF Queue)	CIR=10%	PIR=100%	<=1Gb/s**
Option 4 (AF Queue)	CIR=5%	PIR=100%	<=1Gb/s**
Option 5 (BE Queue)	CIR=0%	PIR=100%	<=1Gb/s
Option 6 (AF Queue)	CIR = 100%	PIR = 100%	<=1Gb/s**

Table AP2-1: Circuit-based CoS

* Note: maximum Class of Service bandwidth per WSEA physical connection

** Note: The Class of Service Bandwidth with a CIR of 100% or less Assured Forwarding (AF), at speeds >600Mb/s is available at certain NGN / Reach Nodes only. See the latest version of the NGN Rollout plan for a list of these locations.

100% AF or less, up to and including 600Mb/s, is available at all other location, with the exception of APT Nodes where the limit is 300 Mb/s.

At APT nodes where a customer is moved to a dedicated fibre the Class of Service Bandwidth with a CIR of 100% AF or less, up to and including 600Mb/s, is available.

Example 1

An Operator wishes to provide their end customer with Symmetrical Ethernet Access with a bandwidth of 10Mb/s with circuit based Class of Service option 1 (CIR=100%; PIR=100%).

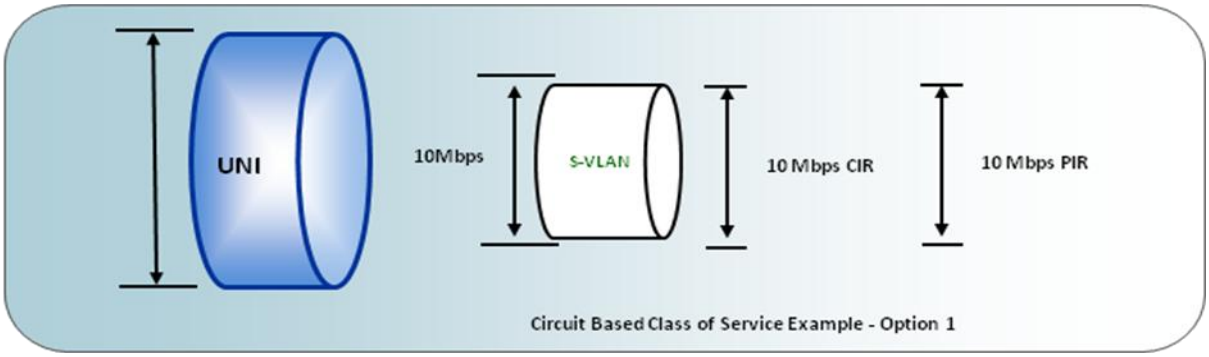


Figure AP2-1: Worked example Circuit based class of Service option 1

The guaranteed bandwidth (CIR) is 100% i.e. 10Mb/s.

The burstable bandwidth (PIR) is 100% i.e. 10Mb/s.

Thus the Operator's end customer is guaranteed that 10Mb/s of their traffic will always be delivered.

For example :

End User Traffic Input	CIR	Excess	Network Input	Traffic Dropped

10Mb/s.	10Mb/s.	0 Mb/s.	10Mb/s.	0

Table AP2-2: Worked example Circuit based class of Service option 1

However, should there be traffic in excess of 10Mb/s this **WILL** be dropped at entry point to the eircom network.

For example:

End User Traffic Input	CIR	Excess	Network Input	Traffic Dropped
11MBs.	10Mb/s.	1Mb/s.	10Mb/s.	1Mb/s

Table AP2-3: Worked example Circuit based class of Service option 1

Example 2

An Operator wishes to provide their end customer with Wholesale Symmetrical Ethernet Access with a bandwidth of 10Mb/s with circuit based class of service option 2 (CIR=50%; PIR=100%).

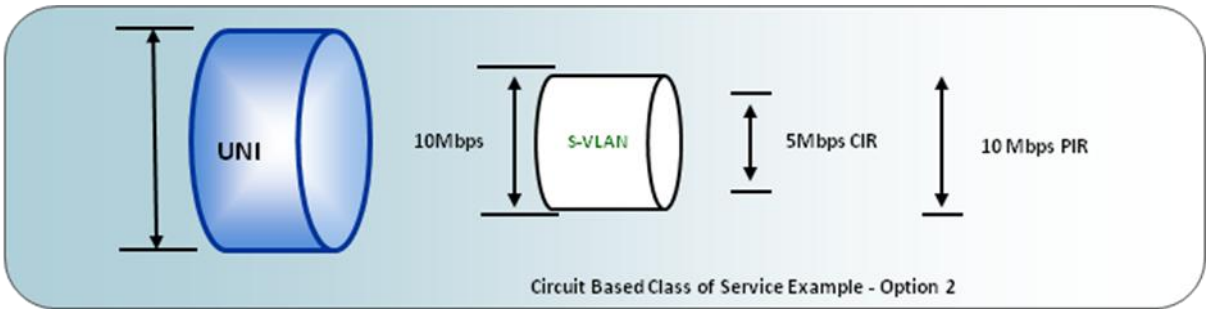


Figure AP2-2: Worked example Circuit based class of Service option 2

The guaranteed bandwidth (CIR) is 50% of 10Mb/s i.e. 5Mb/s.

The burstable bandwidth (PIR) is 100% i.e. 10Mb/s.

Guaranteed Bandwidth (CIR) will always be delivered and the difference between this and the burstable bandwidth (PIR), (referred to as excess in tables below) will be delivered when possible.[13]

Therefore in this example an Operator's end user is guaranteed that 5Mb/s of their traffic will always be delivered.

End User Traffic Input	CIR	Excess	Network input	Traffic Dropped
8MBs.	5Mb/s.	3Mb/s.	8Mb/s. 5Mb/s guaranteed, 3Mb/s delivered when possible	0

Table AP2-4: Worked example Circuit based Class of Service option 2

However, should there be traffic in excess of 10Mb/s this **WILL** be dropped at the entry point to the eircom network as outlined in table AP2-5.

End User Traffic Input	CIR	Excess	Network input	Traffic Dropped
11MBs.	5Mb/s.	6Mb/s.	10Mb/s. 5Mb/s guaranteed, 5Mb/s delivered when possible	1Mb/s

Table AP2-5: Worked example Circuit based Class of Service option 2

[13] However, the excess may be dropped if at that point in time there is insufficient capacity to transport it

Appendix 3 – Traffic Based Class of Service Worked Examples

Example 1

An Operator wishes to provide their end customer with Symmetrical Ethernet Access with a bandwidth of 10 Mb/s with Traffic Based Class of Service where A % = 10% and B % = 10%.

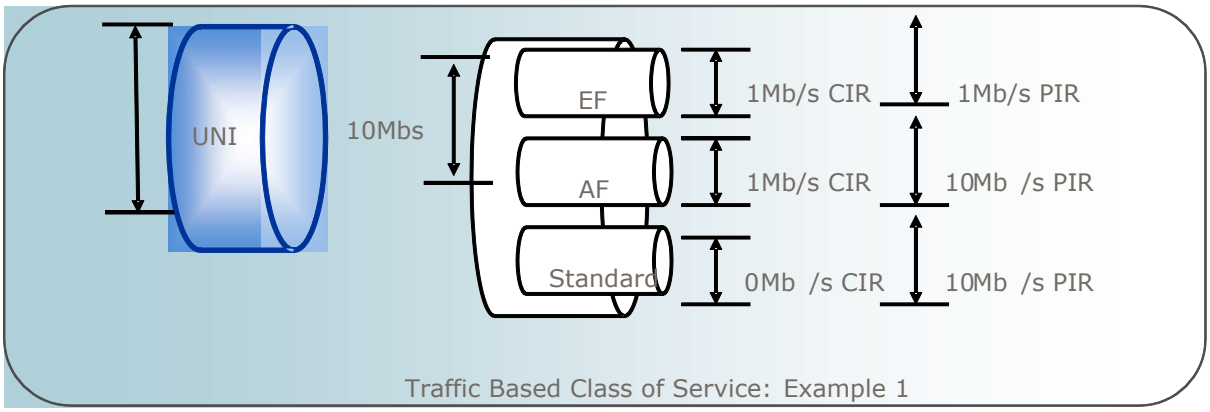


Figure AP3-1: Worked example Traffic based Class of Service

Therefore in this example an Operator's end user is guaranteed that 1 Mb/s of their EF and 1 Mb/s of their AF traffic will always be delivered and there is a potential to deliver up to 10 Mb/s.

Traffic Based Class of Service Policy Map Name	Policy Maps (allocation and allowed values)		
802.1p Class of Service	7/6/5/4	3/2	1
Queue	Expedited Forwarding	Assured Forwarding	Standard Forwarding
CIR	1 Mb/s	1 Mb/s	0 Mb/s
PIR	1 Mb/s	10 Mb/s	10 Mb/s

Table AP3-1: Traffic Based Class of Service – worked example

Guaranteed Bandwidth [CIR] will always be delivered, but should the traffic be in excess of 10 Mb/s this will be dropped at the entry point to the eircom network.

Example 2

An Operator wishes to provide their end customer with Symmetrical Ethernet Access with a bandwidth of 100 Mb/s with Traffic Based Class of Service where A % = 95 % and B % = 0 %.

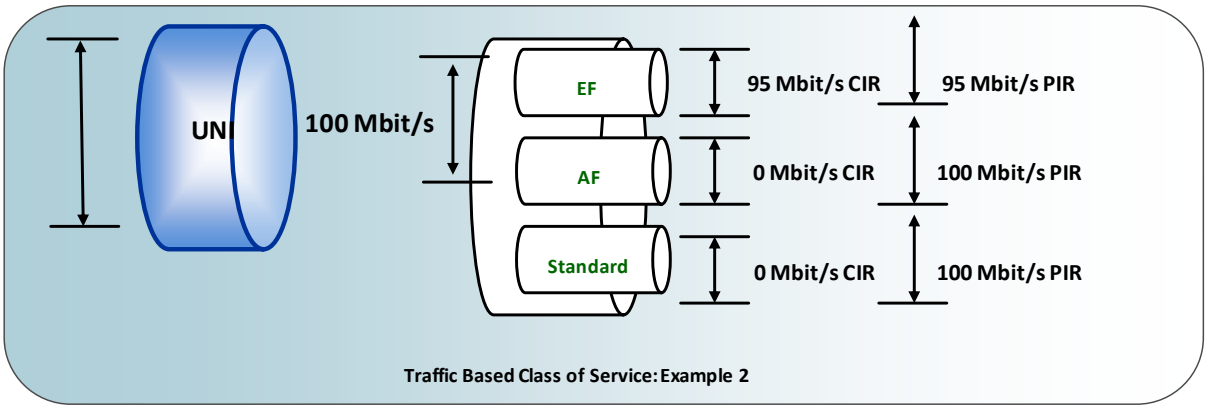


Figure AP3-2: Worked example of Traffic based Class of Service

Therefore in this example an Operator's end user is guaranteed that 95 percent of their traffic will always be delivered and there is a potential to deliver 100 Mb/s.

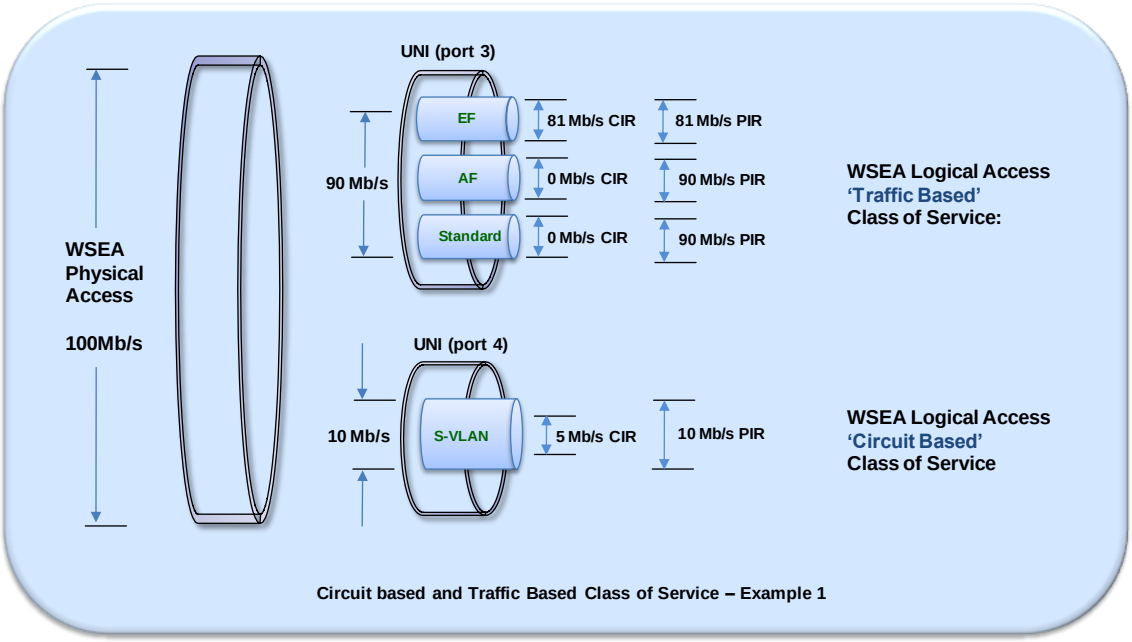
Traffic Based Class of Service Policy Map Name	Policy Maps (allocation and allowed values)		
802.1p Class of Service	7/6/5/4	3/2	1
Queue	Expedited Forwarding	Assured Forwarding	Standard Forwarding
CIR	95 Mb/s	0 Mb/s	0 Mb/s
PIR	95 Mb/s	100 Mb/s	100 Mb/s

Table AP3-2: Traffic Based Class of Service – worked example

Should the Operator's end user's traffic be in excess of 100 Mb/s, this will be dropped at the entry point to the eircom network.

Appendix 4 – Traffic Based and Circuit Based Class of Service on a WSEA

An Operator wishes to provide two logical services for an end customer using Wholesale Symmetrical Ethernet Access physical connection with a bandwidth of 100 Mb/s. In addition the Operator wishes to use a different Class of Service for each logical service on each UNI port; 'Traffic Based' Class of Service where EF% = 90 % and AF % = 0 % and 'Circuit Based' Class of Service where Option 2 is selected (see Table AP2-1: Circuit-based CoS)



Circuit based and Traffic Based Class of Service – Example 1

Example 1

In the diagram, Example 1 above, an Operator's end customer will have committed traffic of 81Mb/s (90% of EF traffic = 81Mb/s CIR) on port 3 and 5Mb/s (50% of 10Mb/s = 5Mb/s CIR) of committed traffic on port 4. It is possible to have burstable bandwidth on port 3 and port 4, however there is no support to share bandwidth across multiple ports. Therefore, if there is no traffic on port 4 the traffic on port 3 is limited to a PIR of 90Mb/s.

Therefore an Operator's end customer is guaranteed that 50% of their traffic on port 4 and 90% of their traffic on port 3 will always be delivered.

Should the Operator's end customer traffic be in excess of 100 Mb/s, this will be dropped at the entry point to the eircom network. The Operator is responsible to ensure that the end customer traffic does not exceed the physical WSEA capacity

Guaranteed Bandwidth (CIR) will always be delivered and the difference between this and the burstable bandwidth (PIR), (referred to as excess in tables below) will be delivered when possible.[14]

[14] However, the excess may be dropped if at that point in time there is insufficient capacity to transport it

Traffic Based Class of Service - Policy Map Name		Policy Maps (allocation and allowed values)	
802.1p Class of Service	5/4	3/2	1
Queue	Expedited Forwarding	Assured Forwarding	Standard Forwarding
CIR	81 Mb/s	0 Mbt/s	0 Mb/s
PIR	81 Mb/s	90Mb/s	90 Mb/s

Table AP4-1: Traffic Based Class of Service – worked example

End User Traffic Input	CIR	Excess	Network input	Traffic Dropped
10Mb/s.	5Mb/s	5Mb/s	10Mb/s 5Mb/s guaranteed, 5Mb/s delivered when possible	0

Table AP4-2: Worked example Circuit based Class of Service option 2

End User Traffic Input	CIR	Excess	Network input	Traffic Dropped
12Mb/s.	5Mb/s	7Mb/s	10Mb/s. 5Mb/s guaranteed, 5Mb/s delivered when possible	2Mb/s

Table AP4.3: Worked example Circuit based Class of Service option 2

Appendix 5 – Traffic Based Class of Service and Bandwidth Permutations

				Availability														
	EF	AF	Std	10 Mb	20 Mb	30Mb	40 Mb	50 Mb	75 Mb	100 Mb	150 Mb	200 Mb	250 Mb	300 Mb	450 Mb	500 Mb	600 Mb	750 Mb	1000 Mb
Option 1	0%	0%	100%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 2	0%	5%	95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 3	0%	10%	90%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 4	0%	20%	80%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 5	0%	30%	70%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 6	0%	40%	60%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 7	0%	50%	50%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 8	0%	60%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 9	0%	70%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 10	0%	75%	25%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 11	0%	80%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 12	0%	90%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 13	1%	0%	99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 14	2%	0%	98%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 15	3%	0%	97%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 16	4%	0%	96%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 17	5%	0%	95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 18	5%	5%	90%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 19	5%	10%	85%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 20	5%	20%	75%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 21	5%	30%	65%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 22	5%	40%	55%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 23	5%	50%	45%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 24	5%	60%	35%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 25	5%	70%	25%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 26	5%	80%	15%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 27	5%	90%	5%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 28	10%	0%	90%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 29	10%	5%	85%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 30	10%	10%	80%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 31	10%	20%	70%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 32	10%	30%	60%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 33	10%	40%	50%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 34	10%	50%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 35	10%	60%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 36	10%	70%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 37	10%	80%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 38	20%	0%	80%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 39	20%	5%	75%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 40	20%	10%	70%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 41	20%	20%	60%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 42	20%	30%	50%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 43	20%	40%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 44	20%	50%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 45	20%	55%	25%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 46	20%	60%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 47	20%	70%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 48	30%	0%	70%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 49	30%	5%	65%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 50	30%	10%	60%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 51	30%	20%	50%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 52	30%	30%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 53	30%	40%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 54	30%	50%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 55	30%	60%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Option 56	40%	0%	60%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 57	40%	5%	55%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 58	40%	10%	50%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 59	40%	20%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 60	40%	30%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 61	40%	40%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 62	40%	50%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Option 63	50%	0%	50%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 64	50%	5%	45%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 65	50%	10%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 66	50%	20%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 67	50%	25%	25%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 68	50%	30%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 69	50%	40%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 70	55%	0%	45%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 71	60%	0%	40%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 72	60%	5%	35%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 73	60%	10%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 74	60%	20%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 75	60%	30%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Option 76	70%	0%	30%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 77	70%	5%	25%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 78	70%	10%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 79	70%	20%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 80	80%	0%	20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 81	80%	5%	15%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 82	80%	10%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 83	90%	0%	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 84	90%	5%	5%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Option 85	95%	0%	5%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					

Note: The Class of Service Bandwidth with a CIR of 100% or less Assured Forwarding (AF), at speeds >600Mb/s is available at certain NGN / Reach Nodes only. See the latest version of the NGN Rollout plan for a list of these locations.

100% AF or less, up to and including 600Mb/s, is available at all other location, with the exception of APT Nodes where the limit is 300 Mb/s.

At APT nodes where a customer is moved to a dedicated fibre the Class of Service Bandwidth with a CIR of 100% AF or less, up to and including 600Mb/s, is available.