BT Ethernet Connect Ireland

Technical Handbook

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Contents

1 Change History

Issue	Status	Date	Details of Change
BTCIL v.01	Final	May 2023	Branding Updates
BTCIL v.02	Final	Dec 2023	Any2Any, 100GB Etherway, Etherway Overbooking, Wire Only options and list of Data Centres

2 About this document

This Technical Handbook describes the BT Ethernet Connect service and is intended to describe the domestic product in the Republic of Ireland. This document will reference but is not intended to describe the BT Ethernet Connect Global service which is available in Ireland and across a further 70+ countries and growing.

The purpose of this document is to assist customers who seek more detailed technical information about the features, components, delivery, access options, BT Network Terminating Equipment (NTE) physical properties, BT NTE settings, service and traffic configurations and Layer 2 Protocol Handling of the BT Ethernet Connect Ireland service.

3 Service availability

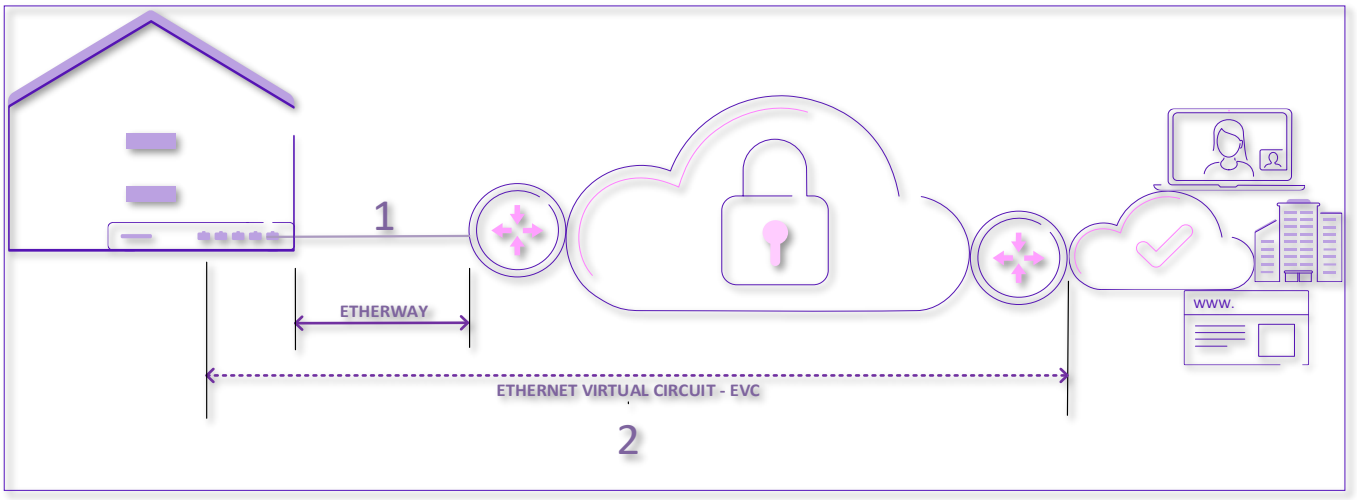
Ethernet Connect Ireland is available across the Republic of Ireland and extends internationally to 70+ countries (and growing).

4 Service description

Ethernet Connect Ireland is a premium symmetrical product with equal download and upload speeds, for example, with a 500/500 Mbps fibre connection will you get 500 Mbps of download and 500 Mbps of upload speeds. It is an Ethernet Layer 2 Virtual Private Network service, which utilises BT's next-generation network to provide connectivity between two or more sites to form a Layer 2 VPN.

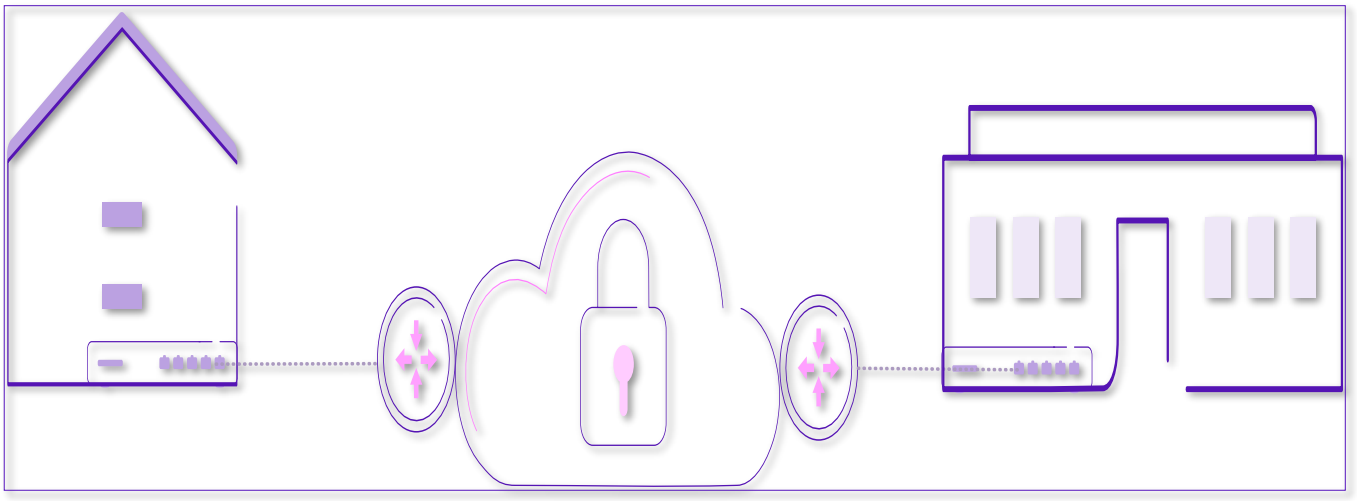
4.1 Service Topologies

The topology of the L2-VPN can be point-to-point (Ethernet Private Line - EPL) or hub and spoke (Ethernet Virtual Private Line - EVPL) or Any2Any (Ethernet Local Area Network - E-LAN). The service is comprised of two fundamental building blocks: "Etherway" and "EVC" (Ethernet Virtual Circuit).

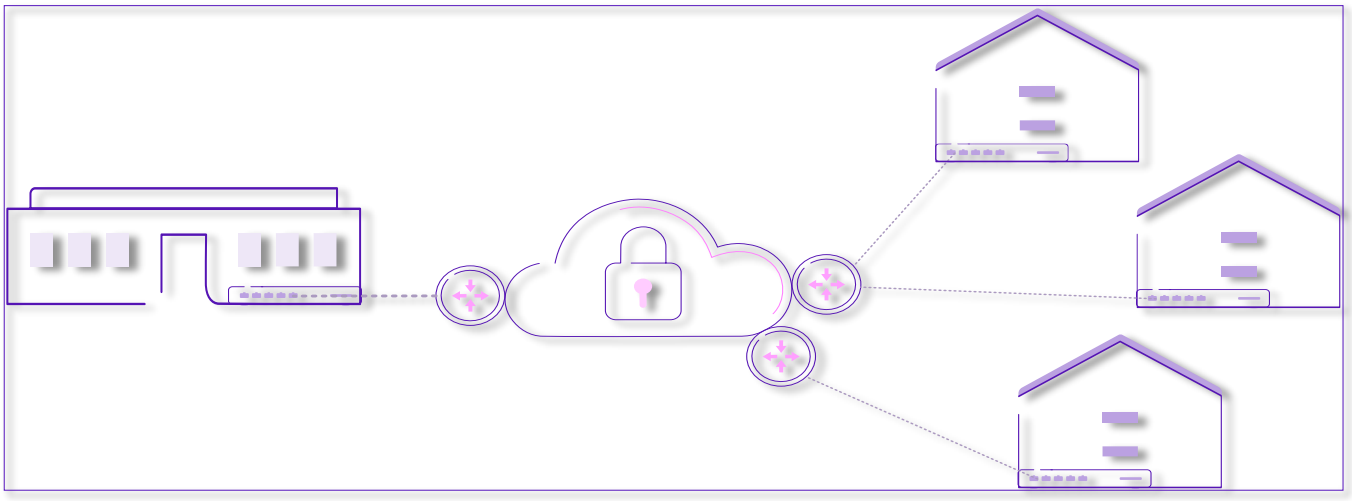


1. Physical – Etherways are access circuits that link a customer site to the nearest BT Point of Presence (PoP).
2. Logical – EVCs are the data transmission path from one customer site to another.

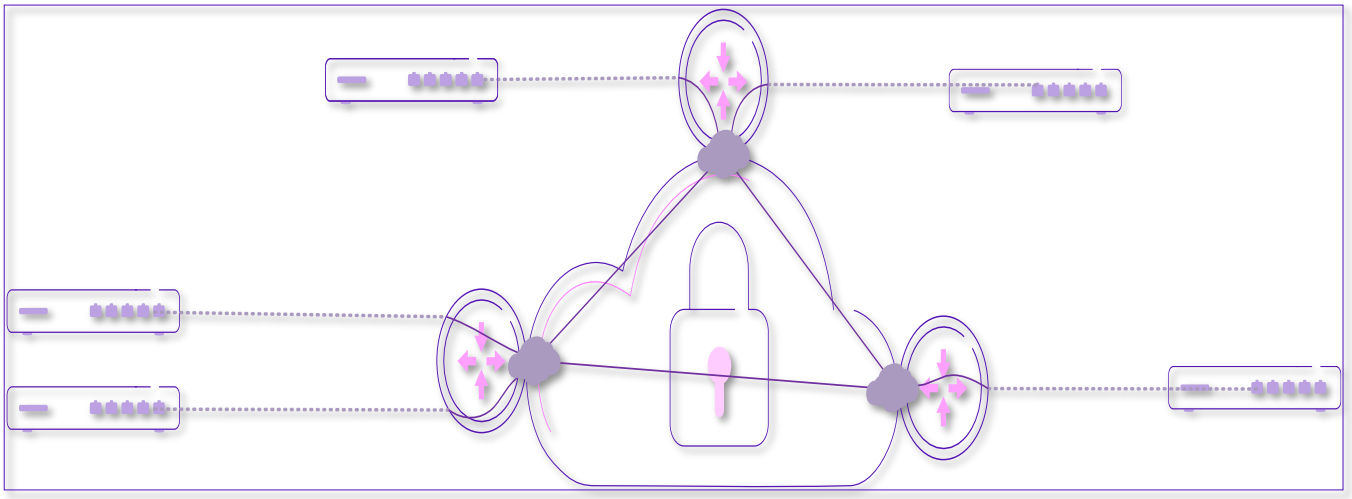
4.1.1 Point to Point Service



4.1.2 Hub and Spoke Service



4.1.3 Any to Any Service



NOTE:BT Ireland do not participate in STP with an Any to Any service.

5 Service Features

Ethernet Connect Ireland characteristics:

I. Symmetrical download and upload speeds on circuits
II. Dedicated bandwidth on circuits
III. Secure transmission of data across BT's core and access networks
IV. End-to-end service availability up to 99.95%
V. Circuit and Traffic based class of service options
VI. Etherway Access Resilience options
VII. Tested to industry standards, Y.1564, RFC2544 & ECPA (traffic) test
VIII. One way latency target of <10ms
IX. Target jitter of <5ms
X. Global connectivity via the BT Global Services points-of-presence in Dublin
XI. MEF 2.0 and MEF 3.0 Certified

6 Access: BT Etherway

The foundation of the Ethernet Connect Ireland service is BT Etherway Fibre Access. This provides the physical connectivity to BT's next-generation Ethernet network. It can be delivered using BT or Third-Party fibre. There are three access classification types available which the Customer must choose on the Ethernet Connect Ireland Order Form. These are: (i) Etherway Standard, (ii) Etherway Diverse, (iii) Etherway Diverse +.

6.1 Etherway Standard

The Standard configuration gives a single physical path from the customer site to the BT Network

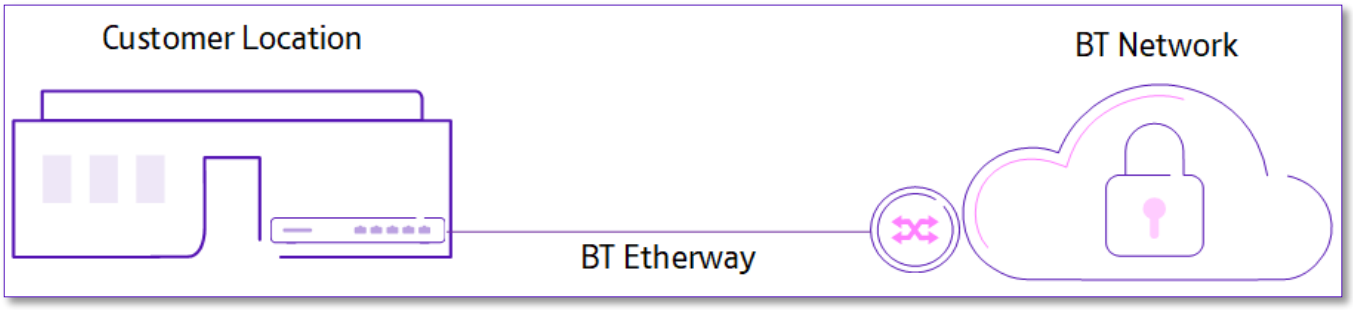


Figure 1: BT Etherway Standard

6.2 Etherway Diverse

Etherway Diverse provides two separate circuits connected to a single BT Point of Presence (PoP). The circuits are provided to the Customer on separate NTE's. Each circuit can be a different bandwidth and both circuits can be used simultaneously. Diversity between the two circuits is provided between the Customer and the BT PoP. The customer is responsible for ordering the EVCs on each of the two accesses and for switching traffic in the event of service failure or load balancing if both circuits are to be used simultaneously.

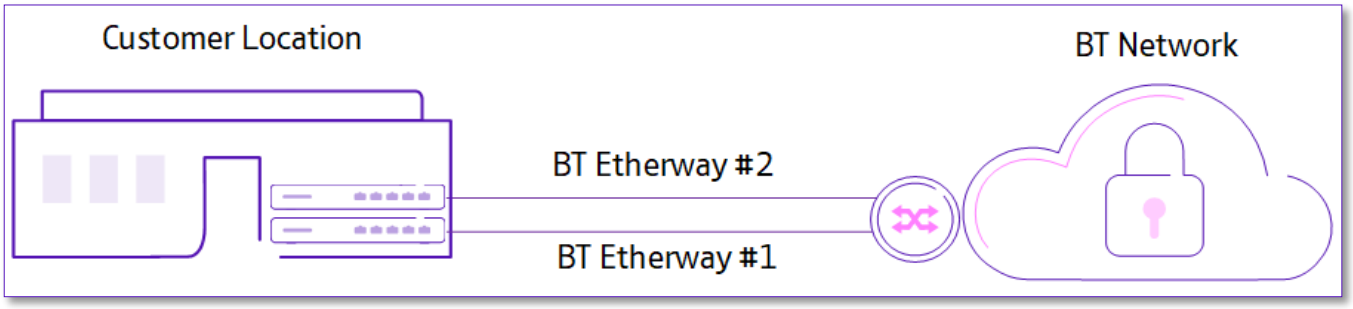


Figure 2: BT Etherway Diverse

6.3 Etherway Diverse Plus

Etherway Diverse Plus provides two separate circuits connected to two separate BT PoPs. The circuits are provided to the Customer on separate BT NTEs. Each circuit can be a different bandwidth and both circuits can be used simultaneously. Diversity between the 2 circuits is provided between the Customer and the two BT PoPs. The customer / customer's end-user is responsible for ordering the EVCs on each of the two accesses and for switching traffic in the event of service failure and load balancing if both circuits are to be used simultaneously.

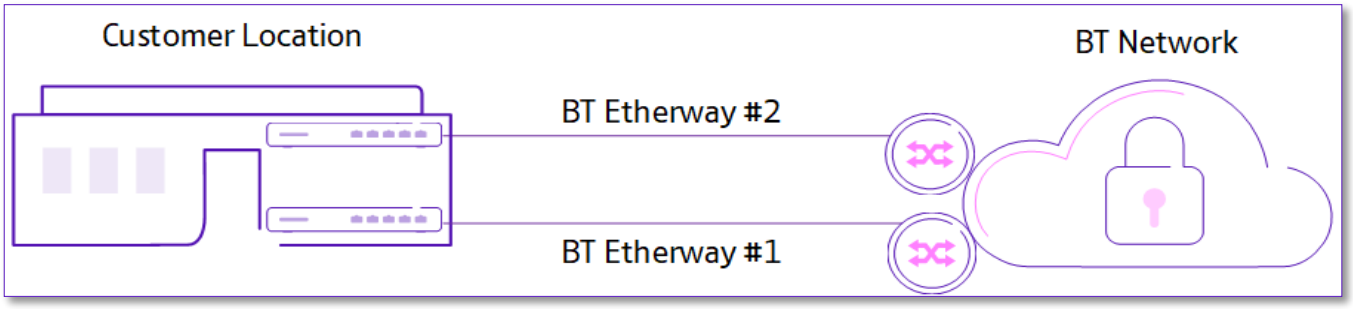


Figure 3: BT Etherway Diverse Plus

"Diversity" means that the fibre paths for each circuit reside in separate cables but the cables may not reside in separate ducts. There is no assurance against duct failure at any point on the two circuits. In the event that both circuits fail, the provisions of the Service Levels Annex shall apply.

BT's Etherway access enables connectivity into a range of other BT services such as:

I. Private Line (E-Line) services
II. Dedicated Internet Access
III. International reach via the Ethernet Connect Global service
IV. SIP Trunking (voice over data service)
V. IP Connect Global services (layer 3)
VI. SD WAN

Products & Services (btireland.com)

This means the delivery time of additional services is reduced as the access is already in place. Thus, reducing the time to deliver new services, as well as the total cost of ownership.
BT uses a range of different access suppliers to provide the widest possible access footprint.

Ethernet Connect Ireland will be offered as "subject to survey". Excess construction charges will apply where appropriate.

7 Etherway Overbooking

This feature allows you to maximise the number of services you can deploy over your Etherway. Customers can order an Etherway which facilitates maximisation of the interconnect. This option allows customers to "overbook" capacity on the interconnect, BT recommend that customers would NOT exceed a ratio of 5:1.

It is the customers responsibility to manage capacity on the interconnect.

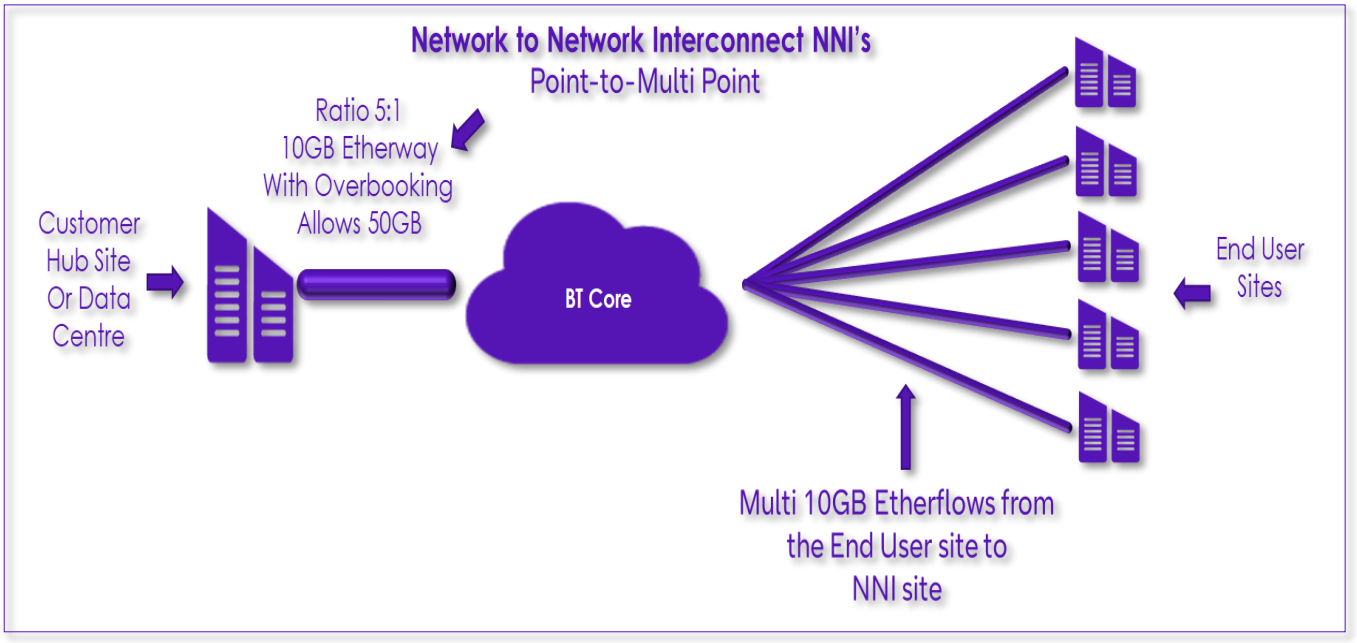


Figure 4: Etherway Max-Pro

Where multiple service types exist on an etherway and congestion occurs, BE Only service frames will be discarded in favour of traffic based EF, AF or BE frames.

8 Ethernet Virtual Circuit: EVC

This Ethernet Virtual Circuit (EVC) allows the creation of point-to-point and point-to-multipoint Layer 2 Ethernet services between sites. Speed options from 0.5mb to 10Gbit/s enable the matching of the service to your or your customer's requirements, without paying for excess bandwidth. EVC speeds of greater than 1Gbit/s are available via the 10Gb Fibre Etherway which is described in further detail below. Such EVCs are subject to a capacity check and carry the following bandwidth limits:

- Maximum 3Gbit/s of EF traffic on a 10Gb Fibre Etherway
- Maximum 6Gbit/s of EF + AF traffic on a 10Gb Fibre Etherway

Traffic is policed at the egress port on the BT Network Terminating Equipment (NTE) at the customer site. If a customer selects EVC sizes less than the Etherway bandwidth it is advisable to shape their traffic to the EVC speed.

Table 1: Bandwidth Options

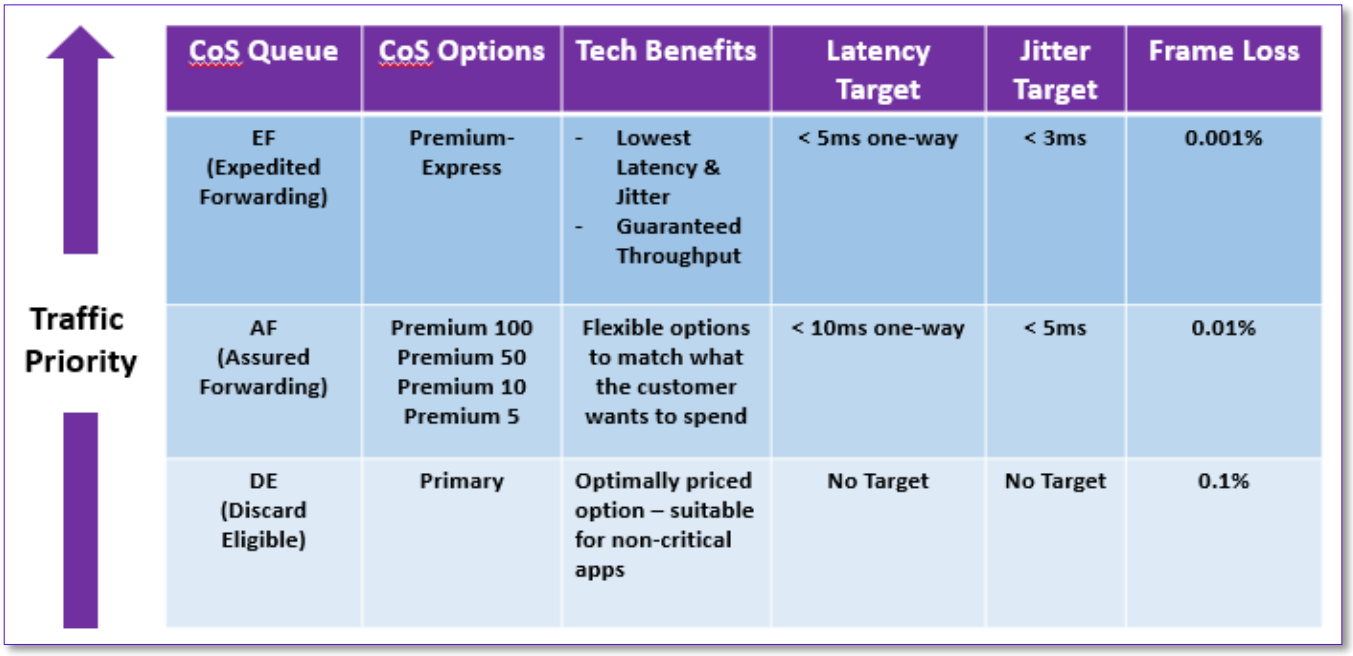
					10Gb	100Gb
					9Gb	90Gb
				900mb	8Gb	80Gb
				800mb	7Gb	70Gb
				700mb	6Gb	60Gb
			90mb	600mb	5Gb	50Gb
		20mb	80mb	500mb	4Gb	40Gb
		18mb	70mb	400mb	3Gb	30Gb
	8mb	16mb	60mb	300mb	2.5Gb	25Gb
	6mb	14mb	50mb	200mb	2Gb	20Gb
1mb	4mb	12mb	40mb	150mb	1.5Gb	15Gb
0.5mb	2mb	10mb	30mb	100mb	1Gb	10Gb

Bandwidth options available for 1G, 10G and 100G devices
100G devices soon to be launched
** 1G limits on 1G NTE and 10G limits on 10G NTE and 100G limites on 100G NTE*

Ethernet is a symmetrical product so the upload and down speed will be the same.
E.G If you ordered a 500MB Etherflow, upload will be 500Mbps max and download will be 500Mbps max

9 Class of Service (CoS)

BT's Ethernet Connect Ireland product offers more choice. In addition to Etherway Diverse and multi-service access capabilities, BT offers Class of Service (CoS), delivering business benefits. BT Ireland's EVPL offering can divide the source traffic from a customer into several separate service classes, each attracting its own quality of service targets. There are three queues (related to customer traffic priority), that are engineered in the BT core network, to separate customer traffic. These are:



CoS Queue	CoS Options	Tech Benefits	Latency Target	Jitter Target	Frame Loss
EF (Expedited Forwarding)	Premium-Express	- Lowest Latency & Jitter - Guaranteed Throughput	< 5ms one-way	< 3ms	0.001%
AF (Assured Forwarding)	Premium 100 Premium 50 Premium 10 Premium 5	Flexible options to match what the customer wants to spend	< 10ms one-way	< 5ms	0.01%
DE (Discard Eligible)	Primary	Optimally priced option – suitable for non-critical apps	No Target	No Target	0.1%

Table 2: BT IRL Class of Service

Frame loss targets for EF and AF queues are to be measured over any 15-minute period interval. Failure will be defined as when this is not achieved twice over any 24-hour period.

The benefits of BT's CoS options:

I. The Premium Express option is designed for packet voice, video, and other customer applications requiring lowest levels of latency and jitter.
II. The Premium 5 to Premium 100 options are designed for the most common of customer data applications. These offer excellent latency and jitter performance. The throughput guarantees are flexible to suit customer needs.
III. The Primary option is designed for customer data applications that require standard levels of performance and will typically suit non-business critical applications.

9.1 Eir NGN Class of Service (CoS)

	Traffic Type		
Parameter	Real-Time (EF)	Business (AF)	Standard
Delay (One-way)	10ms (Note 1)	25ms (Notes 1, 2)	35ms
Delay Variation (One-way)	2.5ms (Note 1)	3.5ms(Note 2)	3.5ms
Frame Loss	0.001% (Note 1)	0.01% (Notes 1,2)	0.1%

Figure 5: Eir NGN Class of Service

10 Ordering and Service Delivery

Orders will be submitted through your BT Account Manager using the BT Ethernet Connect Order Form to wholesalepricing@bt.com or using **On-line portal NOG (New Order Gateway)**. (See minimum order criteria below for guidance).

For BT to accept and progress orders, customers must provide all relevant information; customer details, site location(s), CoS option(s) and bandwidth requirements including any existing circuit IDs.

Below is an illustration of minimum order criteria for a point-to-point Ethernet Private Line service:

Customer Name	Service Type	EVC B/W & CoS Option	Access	Site A& B address(es)	Site A & B Contact Info.
e.g. "Customer A"	e.g. WEC	e.g. 100Mb Premium 100	1G/10G		

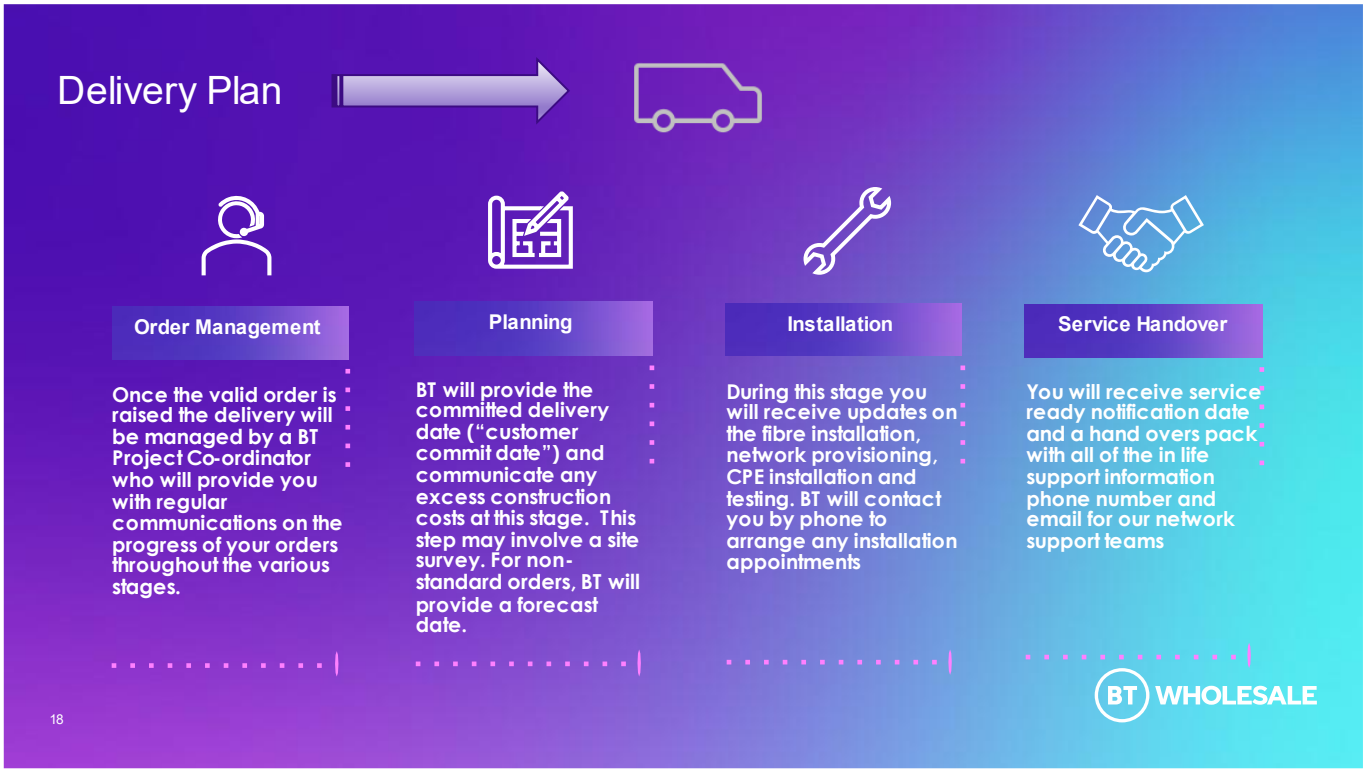
Site A & B Access Resilience	Site A & B Power Options	Site A & B Physical Presentation	VLAN ID
e.g. Diverse	e.g. AC or DC	See NTE Features table	1 – 3,998

Table 3: Minimum Order Info

11 Service Delivery Plan

Delivery of your BT Ethernet Connect service will be managed in stages, these are illustrated below.
Delivery will be managed by a BT Project Co-ordinator who will provide you with regular communications on the progress of your orders throughout the various stages.

** Please note that the order validation (including the verification of the order details, site details, local site contact details will be completed as part of the Pre-Sales process before the order enters service delivery stages.*



12 Delivery Lead Times

The estimated standard lead time for an end-to-end fibre access service (Etherway and EVC), for sites that are On-Net, with capacity, is 3-5 weeks. If non-standard (i.e. construction required or access to be delivered via a 3rd party access provider) then the indicative lead-time could vary from 12-14 weeks.

All Upgrade*/modify/new Etherflow orders (e.g., Change of bandwidth, CoS change, creation of a new EVC/ Etherflow over existing Etherway) are categorised as "Quick Connect" orders. The estimated lead time Quick Connect orders is 3 to 15 working days. This varies depending on a number of factors like the type of change required, whether the site is On-net or delivered via a 3rd party access provider, if a customer appointment is required to deliver the requested change etc. Quick Connect orders for BT On-net shall be delivered within 10 working days & may go up to 15 if an OLO is involved.

**Upgrades assume available capacity headroom on related Etherways*

Delivery Category	Indicative Lead-time	Customer Commit Date Availability
BT Delivery -On Net	3 to 5 weeks	First weekly KCI
Quick Connects	3 to 15 working days	First weekly KCI
BT Delivery – Preducted/new fiber install	Subject to Survey + permissions timelines (Approx. delivery time 12 weeks)	On Average Day 20 subject to survey and permissions
BT Delivery using Third Party Provider	Subject to validation with supplier (Approx. delivery time 14 weeks)	On Average Day 20 subject to survey and permissions

13 Upgrades

The EVC is defined on the BT network by its bandwidth, CoS option and a VLAN identifier (VLAN ID). This empowers customers with greater flexibility in configuring the service as and when needed. An upgrade request is a quick and simple process to enable you to modify the EVC bandwidth or CoS option according to changing requirements. This will be subject to a change in the rental charge. A modification of service is also subject to a capacity review on existing access path, certain upgrades may require outage due to network configurations changes.

Note: Going from 1G to 10G you will need new NTU if you only currently have 1G NTU

14 Third Party Access Bearers

In BT Ethernet Connect terminology, the Etherway is the access service. Or in simple terms, the connection from your customer's site or your head-end site to the BT network. The access is always via a BT Network Point of Presence (PoP). This defines the point of entry to the BT network.

In order to reach our network, BT deliver our standards-based Etherway access services using the BT Fibre or suitable bearers provided by local last-mile providers in order to offer the broadest possible availability. As well as the use of our own extensive Fibre network, we have a number of agreements with third party suppliers for both Dark Fibre and managed bandwidth access solutions.

The service definition and service level agreement apply in full to all BT Etherways, regardless of the last mile option used.

BT Etherways are offered fibre based 1 Gb or 10 Gb connections.

Where 3rd party managed bandwidth is used as the Etherway bearer, the physical access will include the 3rd party Access Termination Device. It is your end-customer's responsibility to ensure that adequate facilities (space, power, and correct environmental conditions) are in place at the end-customer site to enable the additional equipment to be successfully installed.

15 Network Termination Equipment (NTE) & Physical Interfaces

BT Ethernet Connect is a high-capacity Ethernet service terminated with a BT NTE acting as a service demarcation device.

At supported locations, a BT Etherway can be ordered as a fibre presentation within a Data Centre "Meet-Me Room". For such orders, the presentation is via a single 1Gb or 10Gb customer LAN port, served from the in-building BT City Fibre Node. Data centre cross-connects to the meet me room must be provided by the customer.

Wires-only is available in these Data Centre locations Interxion, Dub1, Dub2, Dub3 and Equinix DB2.

16 BT Network Terminating Equipment (NTE)

16.1 Fibre Etherways (1Gb)

The **ADVA FSP 150-GE114Pro** (HE) will be the new default BT approved NTE (Network Terminating Equipment) device for use in terminating 1Gb BT Fibre Etherways. It is used to present EVC circuits at either end of any link and provides an Ethernet port (either LC optical or RJ45 electrical) for connection to customer equipment. Note that a second ADVA NTE will be necessary in instances where a customer contracts for the global equivalent of BT Ethernet Connect.

Ethernet Connect services can be presented on one of the four dedicated Gigabit ports of the ADVA device which can be configured for electrical or optical operation as per customer requirements. There are two Fiber Wavelength options for handing off at the customer access port Multimode (MM) and Singlemode (SM). There is also an additional 1GE network port that can be configured as an additional access port. In the case where only a single EVC circuit is delivered on this BT NTE we can provide a "transparent" service to a port, mapping all frames from it into a single Ethernet Connect Ireland service. Alternatively, or if there are multiple Ethernet Connect Ireland services delivered on a single physical (Etherway) access, BT will use VLAN tagging (802.1q) to differentiate between frames from each Ethernet Connect Ireland circuit / B-end.

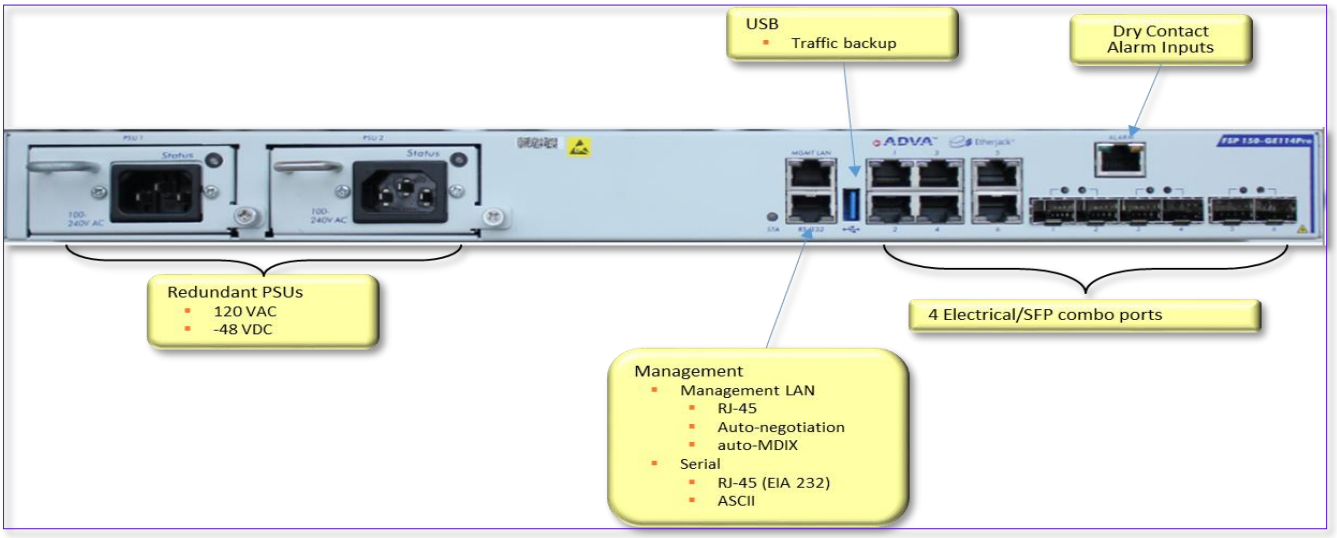


Figure 6: BT 1G NTE

The ADVA FSP 150 GE114Pro(HE) interface capabilities are summarised above. The customer's equipment connects to the BT NTE LAN interface and the ATD connects to the BT NTE WAN interface. The BT NTE is connected via a 3rd party or BT Fibre network connection to a Layer 2 Switch at a BT PoP. Shown below is the BT NTE interface detail.

BT NTE	I/F Speeds	LAN interfaces	WAN interfaces
FSP150-GE114Pro(HE)	10/100/1000Mbps	4x 10/100/1000BaseT or 4x 100/1000BaseX SFP 1 Network port can be re-defined as an additional access port	2x 10/100/1000BaseT Or 2 x 100/1000BaseX (SFP)

Table 1: Fibre NTE features (FSP150CC-GE114Pro)

** BT shall continue to support & manage the ADVA FSP 150CC-GE201 & ADVA FSP150CC-825 for existing (in-life) customer implementations.*

16.2 Fibre Etherways (10Gb)

In order to provide 10 Gb Etherway access to BT Ireland's Ethernet Connect network, the ADVA FSP150CC-XG210 is deployed. This is the BT approved NTE (Network Terminating Equipment) device for use in terminating 10Gb BT Fibre Etherways. The Ethernet Connect service is presented on a 10GbE LAN interface. VLAN tagging rules as per the ADVA FSP150CC-GE114Pro are also applicable here.

The ADVA FSP150CC-XG210 NTE is a 1U high, full-width chassis, with redundant modular Power Supply Unit (PSU) slots (AC/DC). The illustrations below show the key interface capabilities of the NTE.

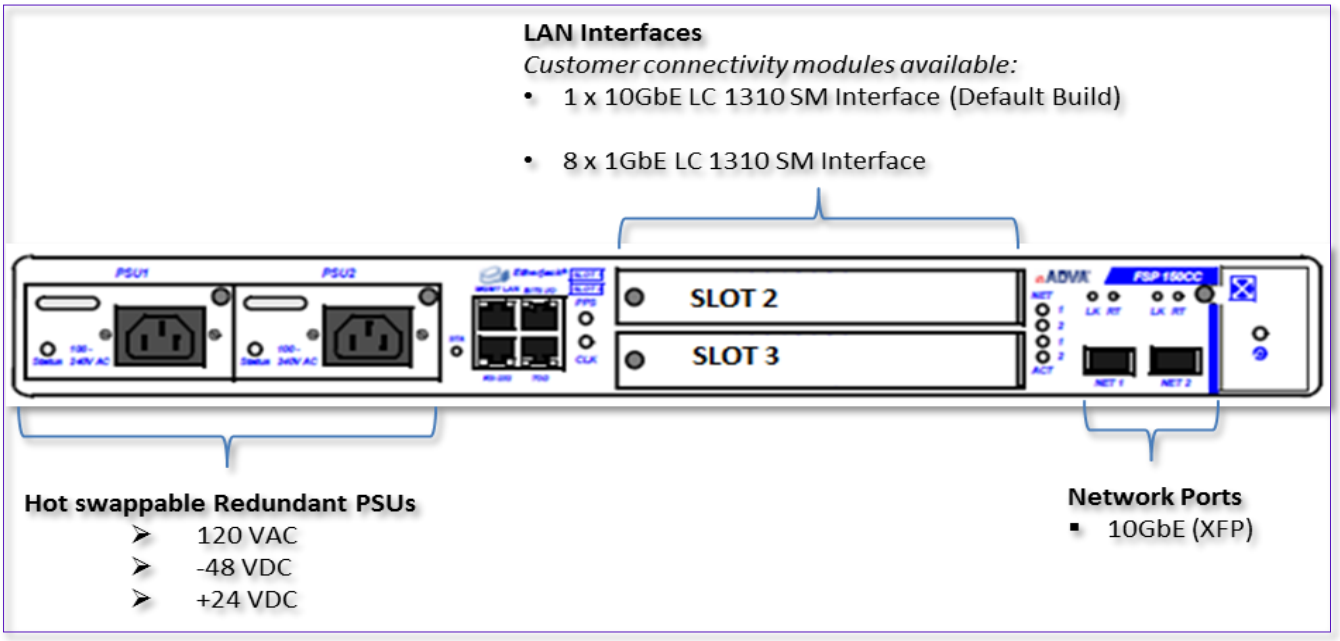


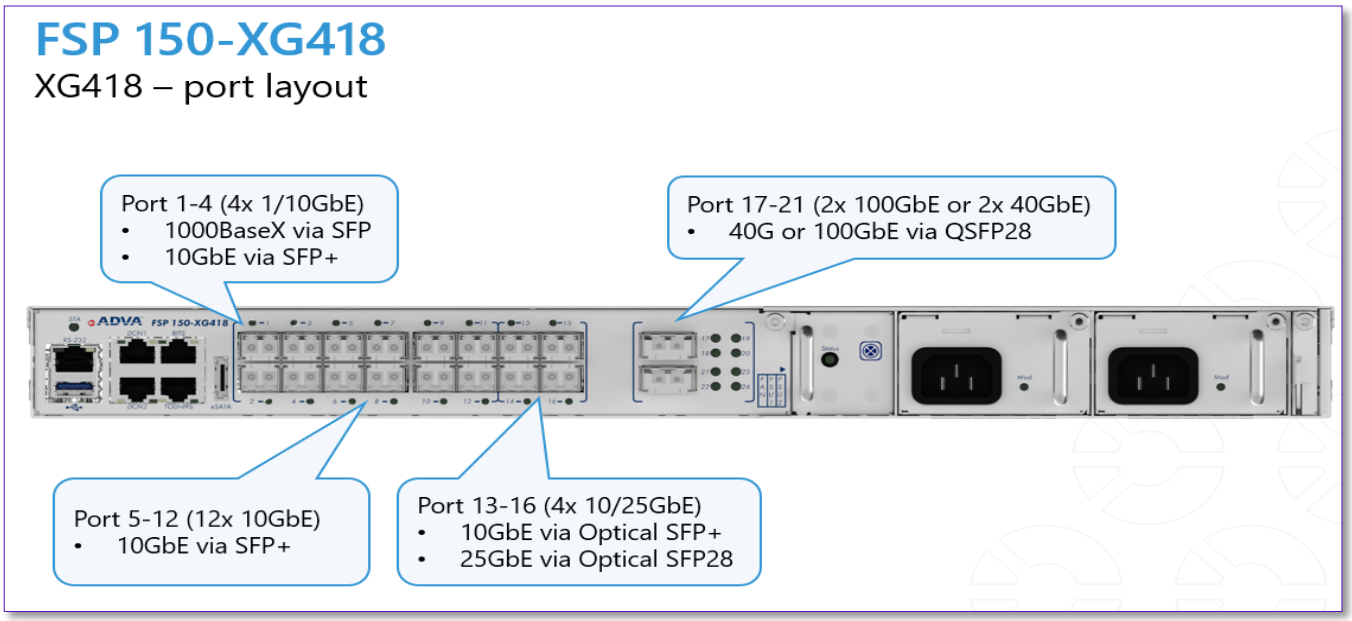
Figure 7: BT 10G NTE

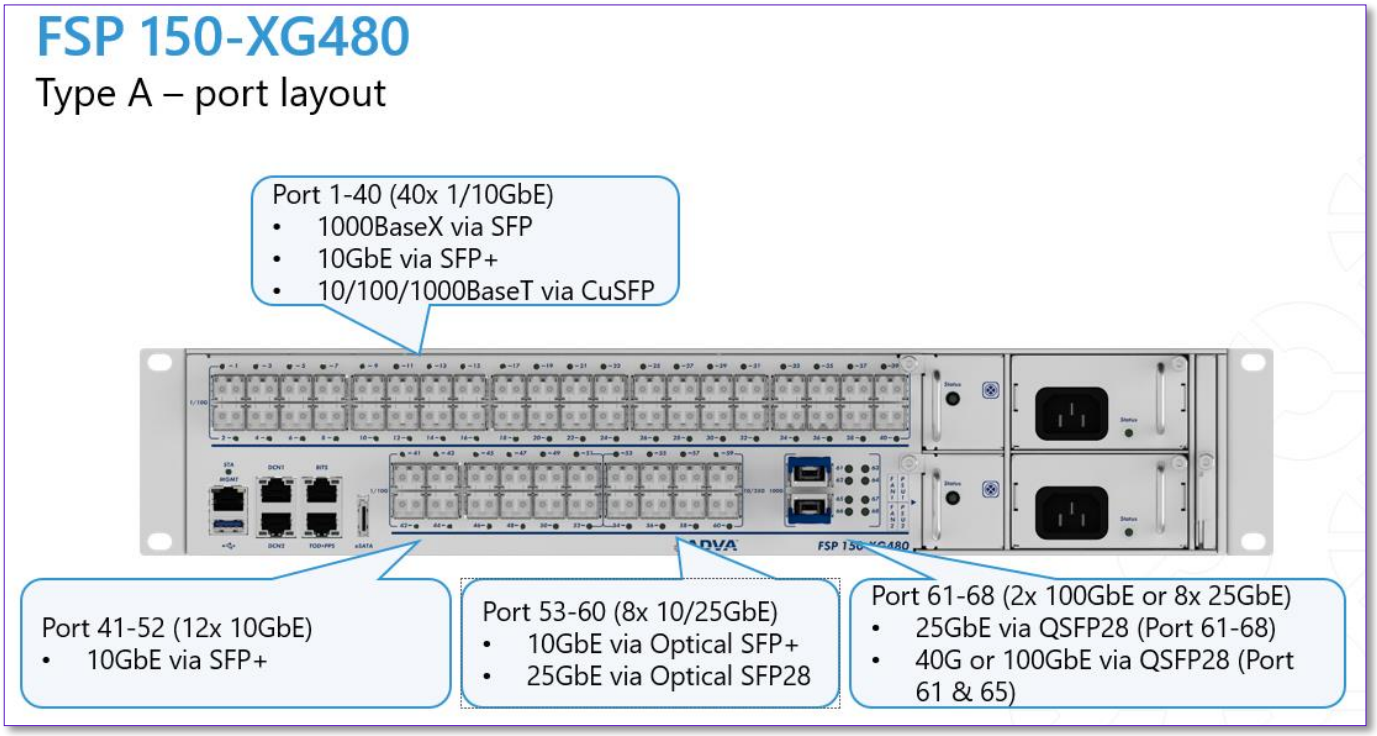
BT NTE	I/F Speeds	LAN interfaces	WAN interfaces
FSP150CC-XG210	1/10Gbps	1 x 10GbE LC Single-Mode module or 8 x 1GbE LC Single-Mode module*	2 x 10GbE (XFP)

Table 2: Fibre NTE features (FSP150CC-XG210)

16.3 Fibre Etherways (100Gb)

In order to provide 100 Gb Etherway access to BT Ireland's Ethernet Connect network, one of the ADVA FSP150-XG400 series is deployed. This is the BT approved NTE (Network Terminating Equipment) device for use in terminating 100Gb BT Fibre Etherways. The Ethernet Connect service is presented on a 100GbE LAN interface. VLAN tagging rules are also applicable here.





16.4 Data Centre Presentations

In Carrier Neutral Data Centre Locations listed in Appendix G customers can choose a wires only option or an ADVA installation.

Domestic Data Centre Termination and Cross Connections Options	Supported
Option 1 : Wires only to MMR (Meet Me Room) in Data Centre. BT provide an LOA so the customer can order the cross connection from the Data Centre operator to their rack to our MMR positions.	Yes
Option 2: Delivery with a BT Adva in customer's rack, using customer-provided cabling. BT will share the MMR positions (LOA) so the customer can order the cross-connect from the Datacentre to their rack.	Yes
Cabling to the Customer Rack	**Not Support**
BT Ireland do not support Cabling to the Customer Rack as part of the Ethernet Connect Ireland. It's the customer responsible to order the cable through the data centre from the BT MMR to their own rack.	No

17 Customer Site Responsibilities

The customer is responsible for any costs associated with the required duct work within the boundaries of their end-user's delivery address. BT will deliver to the boundary of the public network (i.e. the street cabinet or distribution board).

- For fibre-based deliveries, BT will deliver service to the communications cabinet/housing at the delivery address, only where:

Fibre deliveries require a cable access duct (or similar), into the customer's building capable of carrying a 12-strand fibre cable within a 25mm sub-duct. In relation to duct access, the available duct space must be capable of housing a sub-duct with a 25mm minimum diameter and must be a telecommunications duct (used for services with extra low voltage). The entire route must be free of other services such as, but not limited to, water, sewerage and/or electrical-type services.

- BT may agree to use existing customer cabling found suitable. BT is not responsible for providing cabling within the customers property.
- Within the customer's building, a suitable route and containment is provided by the customer to facilitate running of the cable through to the communications room and into the communications cabinet/housing.
- For the termination of the cable delivery, a suitable communications cabinet/housing is provided into which a 19"" fibre tray will be installed.

Should a suitable route into the customer's building not exist, or internally through the customer's building to the communications room and onto the communications cabinet/housing, it is the responsibility of the customer to provide same. BT will place the order into "Customer Delay" until such time as a suitable route has been provided.

Where BT has no available duct at the customer's building to connect to the premises, the following points outline the responsibilities on BT, the customer, and the end user:

1 Where the end user premises is at the curtilage, the end-user must secure the appropriate approval from the landlord and create the entry point into the building to allow the passage of fibres into the building. The end-user will be responsible for providing the internal routing to allow fibre to be run within the building.

2 Where the curtilage of the end-user site and the wall of the premises are not one and the same, the end-user will:
(i). nominate appropriate serviceable existing duct between the curtilage and the wall of the building to facilitate passage of BT fibres into the building and the constructions costs incurred in doing same shall be borne by the end-user;
(ii). where appropriate existing duct is not serviceable, the end-user will review how and whether the existing duct can be made serviceable. Construction costs incurred in doing same shall be borne by the end-user. The end-user is responsible for organising and carrying out the construction work;
(iii). where no duct is available, or existing duct cannot be made serviceable (as determined in accordance with paragraph ii above), the end-user will be responsible for providing duct from the curtilage of the site to the building at its own cost. The end-user is responsible for organising and carrying out the construction work. BT can facilitate the undertaking of such construction work, which will be charged back to the customer.

3 It is the responsibility of BT to make the connection to the end-user serviceable duct, where this connection is made on public property.

4 It is the responsibility of BT to run the fibre all the way into the communications cabinet/housing within the end-user's premises.

18 Customer Space

The end-user provided space for the BT NTE should be within 1 metre of the ATD. BT recommends an allocation of 3U rack-space for BT on net and 6U for off et in one block within the same cabinet, to facilitate the BT NTE and any other equipment required to support the service. BT recommend that the rack is earthed. The demarcation point will be to a patch panel, specification as follows: 24 Port Panel – 2 * LC SM DX Keystone Couplers & 2 * RJ-45 Cat 6 Keystone Couplers, 20 * Ports Blanked Off. Note that, subject to availability, BT may offer the option of a "wires-only" presentation from an NTU located in a BT rack within certain datacentres. Where this option is offered and chosen, it should be noted that only a single port handoff equivalent to the Etherway capacity can be supported, and that service demarcation is to the end-user facing port on the NTU housed within the BT footprint.
The end-user shall be responsible for providing power to, and provisioning space for, all network equipment (to include the BT NTE and, where required, an ATD delivered by a third-party access provider). This is the case whether the service resides at the end-user Site or at Customer contracted third party sites (including Datacentres from BT and/or alternate providers or other third party contracted locations).

19 Power

Both the BT NTE and the ATD come fitted with Dual Power Supply Units delivered as standard. To take full advantage of both PSUs customers are recommended to present power-feed from two separate trip-switches. It should be noted that the BT NTE can be AC or DC (Fibre 1Gbps/10Gbps NTE only) powered as required, by the end-user. Environmental operating parameters for all NTE are available in the next section.
Stand-by Power (Battery Back-Up) is not available for all BT Ethernet Connect services- the end-user can use their own UPS if desired.

20 Delivery

For service provisions to a customer site or to a customer contracted third party site, BT will deliver to the agreed demarcation point. In the case of a Data Centre (from BT and/or alternate provider or other third party contracted location), this demarcation point will be the Meet-Me Room (MMR).

For Data-Centre deliveries, the customer is responsible for the provision of cabling from the MMR to the end-user cabinet. Cable routing within third-party locations beyond the MMR is not the responsibility of BT.

For non-Data Centre deliveries, the customer is responsible for the provision of cabling from the curtilage to the end-user cabinet. BT will quote an install and an annual recurring charge for the cabling as additions to the standard service price. Cable routing within third-party locations is not the responsibility of BT.

Where the end-user site is owned or managed by a 3rd party (owner/facilities management companies including private or shared datacentres), there may be additional charges related to service delivery. These are ultimately the customer's responsibility. In general (special cases below), BT will quote any NRC and ARC provided by the owner/facilities manager as an addition to the standard service price. The customer retains responsibility to meet the standard requirements for the BT NTU as set out above.

Special Cases:

For 3rd party services at Dublin Airport, the end-user should order the cable from DAA to the 3rd party demarcation to allow order completion (i.e. the installation of managed NTU at the end-user premises)
For BT on-net services at Dublin Airport for Ethernet Connect services, the end-user should order the cable from DAA to the 3rd party Demarc to allow order completion (i.e. the installation of managed NTU at the end-user premises)
For BT on-net services at Dublin Airport for Business Ethernet Connect services, BT can order DAA fibre for completion to the customer premises. DAA fibre costs (NRC and ARC) will be in addition to the standard service price.

Appendix A BT NTE Environmental Details

Appendix A.1 Fibre NTE (1 Gb Etherway): FSP-150 GE114Pro(HE)

- Supplier : Adva
- Dimensions : 1U compact chassis, 443mm x 44mm x 218mm / 17.4" x 1.7" x 8.6" (W x H x D), ETSI-compliant
- Operating temperature: -40 to +65°C (hardened environment)
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95%, B1 (non-condensing)
- Modular AC-PSU: 110 to 240VAC with over-voltage and over-current protection
- Modular DC-PSU: -48 to -72VDC or +24 to + 30VDC with over-voltage and over-current protection
- Power consumption: 24 Watts (Nominal), 29Watts (Max)
- Dual PSUs (either AC or DC) delivered as standard.

Appendix A.2 Fibre NTE (10 Gb Etherway): FSP-150 XG210

- Supplier : Adva
- Dimensions: 1U compact chassis, 439mm x 43mm x 269mm / 17.3" x 1.75" x 10.6" (W x H x D), ETSI-compliant
- Operating temperature: 0 to +65°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95%, B1 (non-condensing) Modular AC-PSU: 90 to 264VAC (47-63Hz) with over-voltage and over-current protection
- Modular DC-PSU: -36 to -72VDC or +18 to +30VDC with over-voltage and over-current protection
- Maximum power consumption: 100Watts
- Maximum distance of 10km or 30km on Network-Side XFP (interface)
- Dual PSUs (either AC or DC) as standard

Appendix A.3 Fibre NTE (100 Gb Etherway): FSP-150 XG400 series

- Supplier : Adva
- Dimensions: XG418/404 1U compact chassis, 439mm x 43mm x 269mm / 17.3" x 1.75" x 10.6" (W x H x D), ETSI-compliant. XG400 2U compact chassis, 482.6mm x 216 mm x 88.1mm – weight 10KG
- Operating temperature: 0 to +65°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95%, B1 (non-condensing) Modular AC-PSU: 90 to 264VAC (47-63Hz) with over-voltage and over-current protection
- Modular DC-PSU: -36 to -72VDC or +18 to +30VDC with over-voltage and over-current protection
- Maximum power consumption: 100Watts
- Maximum distance of 10km or 30km on Network-Side XFP (interface)
- Dual PSUs (either AC or DC) as standard

Appendix A.4 Third-Party ATD:

- Supplier : RAD
- Dimensions : H437mm x W440mm x D300mm
- Operating temperature: 0 to -50°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Power: AC or DC
- Power consumption: 1G NTU 18.5 Watts (max) 10G NTU 95Watts (max)
- Dual PSUs (AC) delivered as standard.

BT recommends customer should present two power-feeds from two separate trip-switches where available.

Appendix B Protocols/Ports Types

Appendix B.1 Auto-Negotiate Settings

All Ethernet access types are Full Duplex, the customer's / customer's end-user equipment also needs to be set to Full Duplex non-auto negotiation. The speed will be as per the access and again must be set and not left as auto-negotiation.

Appendix B.2 Network Link Loss Forwarding (LLF)

Network LLF is not currently enabled on the Ethernet Connect service.

Appendix B.3 Frame Sizes Supported

With fibre access, the BT Ethernet Connect service supports a minimum frame size of 64 bytes and Maximum Transmission Unit (MTU) of 9000 bytes.

Appendix B.4 Port Types / Service Modes

For each Etherway on an Ethernet VPN customers can choose between two configuration options:
Port (Transparent) Mode – The Etherway will be transparent to all VLAN tags sent by the customer. Only a single EVC can be provided through this configuration.

VLAN Aware Mode – customers will need to tag each frame with a VLAN ID in order to identify which EVC the frame is for.

In VLAN Aware mode customers must differentiate the traffic using 802.1Q VLAN tagging (using TPID 0x8100) in order to identify the EVC that their data should route over. When the frame gets to the BT Ethernet switch the traffic will be routed to the correct point-to-point connection.

The tag ID is unique per port (there are 4,094 possible values) and so a VLAN tag ID must be specified for each end of an EVC, if both Etherways are running in VLAN Aware mode.

Customers can either allocate VLAN IDs themselves, or BT can allocate IDs for them. Customers may request allocation of any VLAN ID number from 1 to 3,998.

Note that VLAN IDs are unique to each Etherway only. If required the same VLAN ID can be utilised multiple times on the same VPN

Ethernet Throughput

Ethernet interfaces can operate at either 10Gbps, 1Gbps, 100Mbps or 10Mbps. This is the total amount of raw bits that get sent over the line in one second. For a standard BT Ethernet Connect delivery, however, the BT NTE is configured to add an additional 4 byte VLAN tag to each frame before transmission. This tag is used in the core to determine which customer service to map a frame into.

Adding 4 bytes to each frame is basically overhead that reduces the maximum throughput level achievable. As it is added on a per frame basis the bandwidth this overhead requires is proportionally greater when small frames are being sent. Therefore the full bandwidth of any given EVC circuit will not be available for traffic. Customers can expect a variable throughput percentage, depending on the size of the frames, with larger frame sizes resulting in a throughout in roughly the mid 90's.

If a customer has ordered a hub and spoke network, the hub site will always be VLAN-aware and the hub will use VLANs to differentiate the traffic from the different spokes on the network.

Appendix B.5 Protocol Transparency

BT Ethernet Connect is transparent to Layer 2 protocols, for full details refer to the tables below:

Protocol usage	Standard	Destination MAC address	Layer 2 Control Protocol (L2CP) handling
Customer Bridge Group Address (Spanning Tree)	802.1D, 802.1Q	01-80-C2-00-00-00	Tunnel (EPL) Discard (EVPL)
802.1p	802.1Q	n/a	Not transparent in C VLAN header
PAUSE		01-80-C2-00-00-01	Discard
Link Aggregation (LACP, LAMP)	802.3 slow protocols	01-80-C2-00-00-02	Tunnel
Link OAM 802.3ah	802.3 slow protocols	01-80-C2-00-00-02	Discard [Possible future option to Peer, release dependent]
Port Authentication (802.1X)	802.1X	01-80-C2-00-00-03	Non-transparent
Reserved		01-80-C2-00-00-04	Non-transparent
Reserved		01-80-C2-00-00-05	Non-transparent
Reserved		01-80-C2-00-00-06	Non-transparent
MEF E-LMI		01-80-C2-00-00-07	Non-transparent
Provider Bridge Group Address (S-VLAN Spanning Tree)		01-80-C2-00-00-08	Tunnel
Reserved		01-80-C2-00-00-09	Non-transparent
Reserved		01-80-C2-00-00-0A	Non-transparent
Reserved		01-80-C2-00-00-0B	Tunnel
Reserved		01-80-C2-00-00-0C	Tunnel
Reserved		01-80-C2-00-00-0D	Tunnel
LLDP	802.1AB	01-80-C2-00-00-0E	Non-transparent
Reserved		01-80-C2-00-00-0F	Tunnel
All LANs Bridge Management Group Address		01-80-C2-00-00-10	Tunnel
GARP Block	802.1Q	01-80-C2-00-00-20 through 01-80-C2-00-00-2F	Tunnel
Service OAM, MEF UNI ME, CC		01-80-C2-00-00-30	Reserved – non-transparent
Service OAM, Operator / Service Provider MD-levels, LT		01-80-C2-00-00-31 through 01-80-C2-00-00-34	Reserved – non-transparent
Service OAM, Subscriber MD-levels, LT		01-80-C2-00-00-35 through 01-80-C2-00-00-37	Transparent
Service OAM, MEF UNI ME, LT		01-80-C2-00-00-38	Reserved – non-transparent
Service OAM, Operator / Service Provider MD-levels, LT		01-80-C2-00-00-39 through 01-80-C2-00-00-3C	Reserved – non-transparent
Service OAM, Lowest Subscriber MD-level, LT		01-80-C2-00-00-3D	Transparent
Service OAM, Subscriber MD-levels		01-80-C2-00-00-3E through 01-80-C2-00-00-3F	Transparent

Table 4: L2 Control Protocol Handling (1 Gbps Access)

Protocol usage	Protocol Name	Layer 2 Control Protocol (L2CP) status
RFC 5798	Virtual Router Redundancy Protocol	OK
RFC 2281	Hot Standby Router Protocol	OK
RFC 826	Address Resolution Protocol	OK
802.1ad	802.1q in 802.1q	OK
802.1D-2004	Spanning Tree Protocol	OK
802.1w	Rapid STP	OK
802.1s	Multiple STP	OK
802.3ad	Link Aggregation Control Protocol	OK
PAGP	Port Aggregation Protocol	OK
802.1x	dot1x	OK
802.1ag	Connectivity Fault Management	Possible Future Option
RFC 2516	PPPoE	OK
CDP	Cisco Discovery Protocol	OK
VTP	VLAN Trunking Protocol	OK
LLDP	Link Layer Discovery Protocol	OK
ICMP	Internet Control Message Protocol	OK
DHCP	Dynamic Host Configuration Protocol	OK
DHCP Relay	Dynamic Host Configuration Protocol	OK
GRE	Generic Routing Encapsulation	OK
MPLS w/LDP	Multi-Protocol Label Switch with LDP Signaling	OK
BGP4	Border Gateway Protocol	OK
OSPFv2	Open Shortest Path First	OK
RIP	Routing Information Protocol	OK
EIGRP	Enhanced Interior Gateway Routing Protocol	OK
ISIS	Integrated System to Integrated System	OK
PIM	Protocol Independent Multicast	OK
IGMP	Internet Group Management Protocol	OK

Table 5: L2 Control Protocol Handling (10 Gbps Access)

Appendix C Global Connectivity

BT Ethernet Connect can operate nationally & internationally which considerably extends the reach to Irish Customers for next generation services and cross-border connectivity.

The global service covers the main European centres, USA and Asia with a footprint currently in 55 countries and growing.

Note: a second ADVA BT NTE will be necessary in instances where the customer contracts for the global service offering.

Appendix D BT Ethernet Connect Billing

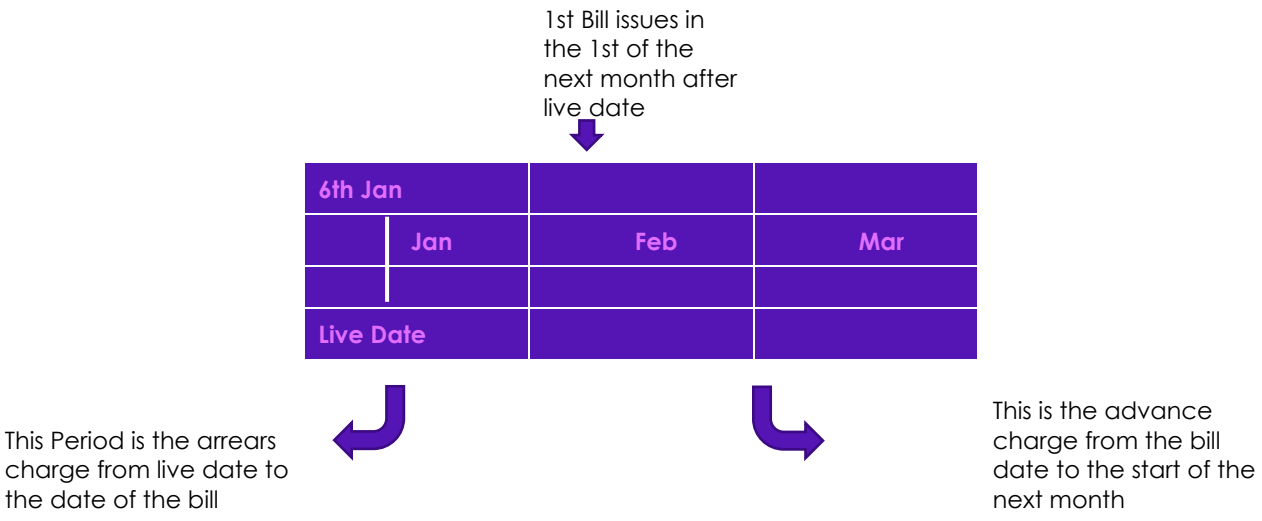
BT Ethernet Connect is billed at the start of every month.

The exception is your first BT Ethernet Connect Bill which contains:

- The once-off Install charges for the service
- Pro-rata (arrears) rental charges
  (From Service live-date to first Bill issue date)
- Pro-rata (advance) rental charges
  (From first Bill issue date to the end of that month)

This Bill is issued at the start of the first month after the service live date. This brings your billing in line with the standard monthly billing cycles.

All subsequent billing will contain the full monthly (advance) rental charges for the service.



Appendix E FAQs

Q. Are the lead times guaranteed?
A. Actual dates vary on a case-by-case basis &lead times are subject to survey. However, a customer commit date will be provided once the order has been validated by your project coordinator and is supported by an SLA.
Q. What options are you able to provide for traffic shaping?
A. Customers should shape their traffic to the EVC they order from BT. Not doing so risks data discards. The service is bandwidth assured and the performance parameters apply to all frames. To achieve this across a third-party access supplier (where necessary), we use assured bandwidth services from those suppliers.
Q. What repair time SLA is provided?
A. The target response (acknowledging a fault and logging on our system), repair times and customer updates for incidents for the BT Ethernet Connect product (fibre access) are as follows:

Targets	Fault Response Time	Restore Time	Customer Updates
P1	1 hour	4 hours	Every hour
P2	3 hours	8 hours	Every 2 hours
P3 (Non-Emergency)	3 hours	12hours	Agreed with customer

Table 7 – Priority Fault Targets, Response Times & Customer Updates for Fibre Access

** Please note that some OLO (Other Licensed Operators) have different SLA's with BT.*

Q. What is the process to request a quote?
A. Mailbox for quote requests: wholesalepricing@bt.com

Format of quote:

Customer Name	EVC Speed (Mbps)	EVC CoS Option	Site A address	Site B address	Term (yrs)

Table 9 – Sample quote request for Ethernet Connect

Quote turn-around: 2 business days (for standard quotes)

Non-standard and multi-site: 5 business days typical

Appendix F Strength and Innovation

BT is a global provider of communications solutions and IT services. We have significant local operations in Northern Ireland and the Republic of Ireland with close to 3,000 employees on the island of Ireland.
We employ many of the leading network and IT services experts on the island, with over 300 accredited and certified professionals, and can draw on the support of our global business where required. We partner with technology leaders like Cisco, Avaya, Microsoft, HP, Oracle, VMware and EMC2 to integrate their products into our customer solutions.
We are at the forefront of global VPN technology and have been pioneers of Ethernet services. We offer flexible, consistent service levels and an exceptional customer experience

Appendix G List of Data Centres

Data Centre	Eir Code	Ethernet Product Name	Wire Only	ADVA CPE
Equinix DB1	D24 AX06	Ethernet Connect Ireland	Yes	yes
Equinix DB2	D22 FV12	Ethernet Connect Ireland	Yes	yes
Equinix DB3	D15 XW94	Ethernet Connect Ireland	No	yes
Equinix DB4	D15 E205	Ethernet Connect Ireland	No	yes
Interxion DUB1	D12 WY98	Ethernet Connect Ireland	Yes	yes
Interxion DUB2	D12 YY88	Ethernet Connect Ireland	Yes	yes
Interxion DUB3	D22 NN24	Ethernet Connect Ireland	Yes	yes
Keppel DC Dublin 1 (KDC DUB 1)	D24 CR70	Ethernet Connect Ireland	No	yes
Keppel DC Dublin 2 (KDC DUB 2)	D15 YN9K	Ethernet Connect Ireland	No	yes
Servecentric	D15 CXE2	Ethernet Connect Ireland	Yes	yes
BT Citywest Data Centre Data	D24 E180	Ethernet Connect Ireland	Yes	yes
CIX	T23 R68N	Ethernet Connect Ireland	No	yes
"Digital Profile Park" (Digital Realty) Building DUB13	D22 TY06	Ethernet Connect Ireland	No	yes
Kyndryl Ireland Limited	D15 K82N	Ethernet Connect Ireland	No	yes

Appendix H Order Validation

ORDER VALIDATION CHECKLIST	
Customer Contact Information	Customer response
1. Pimary site contact - mobile, landline and email	
2. Site 1 -Can you confirm Full site address - provide Eir Code where possible	
3. Secondary site contact - mobile, landline and email	
Site Readiness / Access Checks	
1. Is the site owned directly by the customer or leased from a landlord , if Landlord please provide Landlord details who needs to approve works onsite?	
2. Is the building a multi-Tenant building, if yes please provide building manager contact details	
3. Do you require a method statement or Insurance cert?	
4. Do you require technicians to complete any site induction course? If yes please give us details of type of induction eg. On line, one day course etc.	
COMMS ROOM	
1. Are you aware of the internal route the circuit will take through the building to the comms room? Please provide Comms Room location and Floor details.	
2. Specifically is the comms room ready to accept delivery of the circuit?	
3. We will require between 1-3 U of “free” rack space available in the rack where the BT device is to be installed, is this available?	
4. A Patch panel and cable manager can also be included if customer wishes each requires an extra 1U of space please confirm if required?	
5. We will require 2 - 4 x free AC power sockets available in the rack where the BT device is to be installed – 2 POWER OUTLETS ARE REQUIRED “”IN”” THE RACK	
6. Please confirm power cable type available in the rack where the BT device is to be installed – ie, is it 3pin standard type socket or kettle lead type (C13PDU)	
Technical Information Access	
1. Confirm Access Bandwidth	
2. Confirm Port/Service Bandwidth	
3. Confirm Presentation Type, RJ45 or Optical single or Multimode	
4. VLAN	
Notes	

Find out more at bt.com

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