

BTnet Main Service Description

This document is the main Service Description for the BTnet service. It is supplemented by the following additional Service Description documents, which are available on request:

- **BTnet Customer Premises Equipment (CPE) Service Description**
- **BTnet Resilience Service Description**

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1 Introduction

BTnet is the UK's market leading leased line internet access service, providing dedicated, uncontended bandwidth via the leading edge 21CN network across the UK. It is available with circuits ("bearers") and bandwidths ("port speeds") ranging from 2Mbps to 10Gbps available.

If you rely on your Internet connection for your business, provide or host on-line content & applications, or have a requirement to obtain higher levels of throughput, service availability and support, you will benefit from the business grade service offered by BTnet.

The Internet is an ever growing network with an explosion in the content and services available as well as the end users ability to connect into the Internet from a multitude of devices and differing speeds. As a business, the ability to connect to customers over the Internet or look to the Internet for cost effective applications hosted within it, is becoming more important leading to continued growth in Dedicated Internet Access (DIA) services. BTnet is ideally placed to serve the growing demands of businesses for Internet connectivity in a service that is built specifically for business use.

BTnet is delivered using a high speed, highly resilient, 21CN IP access platform, which is used to support a range of data services, and is accessible through over 1900 access nodes across the UK and using a range of access and cabling technologies to your requirements and site delivery considerations.

Within the core network, BTnet uses BT's Internet Peering Platform, which is connected to multiple UK ISP peers and, via BT's European Internet backbone, to ISPs & customers around the world. These highly resilient connections are carrying tens of Gigabits of traffic every second.

The BTnet network will continue to be developed to offer the best of breed national and international connectivity that will support your business now and in the future. This includes options for entry-level dedicated internet access for customers looking to move "beyond Broadband", via our BTnet Express portfolio. It also includes access options for very high bandwidth requirements up to 10Gbps.

2 Service Features

BTnet is available with flexible speed options from 2Mbps to 10Gbps. For lower speed requirements "BTnet Express" is available, offering services of up to 100Mbps speed. BTnet Express is delivered using GEA (Generic Ethernet Access FTTC and FTTP) cabling access technologies. For larger requirements, Ethernet Fibre is used to deliver circuits ("bearers") in sizes of 100Mbps, 1Gbps and 10Gbps. A range of port speeds are available across these different sized circuits.

For Ethernet Fibre based services, once your service is up and running, you will be able to quickly increase or decrease your port speed within the bounds of your access bearer capacity, termed "flexing". BTnet offers guaranteed and dedicated internet access, with symmetrical (matching) upload and download speeds. The BTnet service is fully uncontended and is provided with a comprehensive, market leading Service Level Agreement (SLA).

Key BTnet service features are:

- A range of bearer speeds are available to deliver the required port speed in the following options:
 - BTnet Express from 2Mbps to 20Mbps using GEA FTTC access

- BTnet Express from 30, 50 or 100Mbps using GEA FTTP access
- 100Mbps Fibre
- 1Gbps Fibre
- 10Gbps Fibre
- 2Mbps to 10Gbps of uncontended and symmetrical port speeds available in flexible increments. Port speed increments will vary depending on the size of the access circuit used. Please note that all port speeds are based on Ethernet bandwidth, [Annex 1](#) provides the detail
- Port speed 'flex' capability giving customers the flexibility to vary their port speed (bandwidth) within their circuit capacity without the need for additional circuit installation work or long lead times. Not applicable for BTnet Express where a fixed bandwidth is provided dependent on the maximum supported for your location.
- Guaranteed, dedicated and uncontended speeds
- Symmetrical, matching upload and download speeds
- Unlimited usage with no caps, fair usage policies, traffic shaping or limits
- Total Care maintenance (including target 5 hour fix time)
- 24/7/365 support
- Option for Managed Customer Premises Equipment (CPE) services or wires only option if you would rather provide and manage yourself. Please see [Section 6](#) for more information.
- 1, 3 & 5 year term fixed price contract options with the standard connection fee waived for 3 & 5 year terms. All installations are subject to survey.
- Market leading Service Level Agreement (SLA), with stated targets for delivery, availability and network latency. Includes 100% target service availability. The latest BTnet Service Schedule including Terms and Conditions and the SLA is available online at www.bt.com/terms
- Static/Dynamic routed IP addresses supporting both IPv4 and IPv6 in a dual stack mode. IP addressing support and availability may vary by CPE option.
- Public IP address support with the following options:
 - Provider Aggregatable (PA) public IP addresses can be assigned from BT's pool of IP addresses.
 - Provider Independent (PI) IP address support for customers who wish to route their own public IP addresses acquired from official Internet Registry bodies.
- Resilience options available for added service protection - Failover, Loadbalancing, BGP and Back-up service variants available. Service variants available may depend on Managed CPE option. Please see the additional '*BTnet Resilience Service Description*' document for more information on these options.
- Bandwidth utilisation monitoring and reports available on request (free of charge) or provided as standard with some Managed CPE options.
- DNS (Primary and Secondary name servers)
- SNMP read-only access to the BT managed CPE to view utilisation and alarm statistics

3 Service Variants

BTnet can be provided as a standalone single circuit service, or with various resilience options if additional diversity and protection is needed at your site. The service variants available on BTnet are as follows:

- Standard single circuit delivery
- Back-up
- Failover

- Loadbalancing
- BGP

Please see the additional 'BTnet Resilience Service Variants' document for further information on the various resilience options. Available on request. BTnet Express is only available as a standalone single circuit delivery.

4 Access Network

BTnet Access is constructed of 2 physical parts:

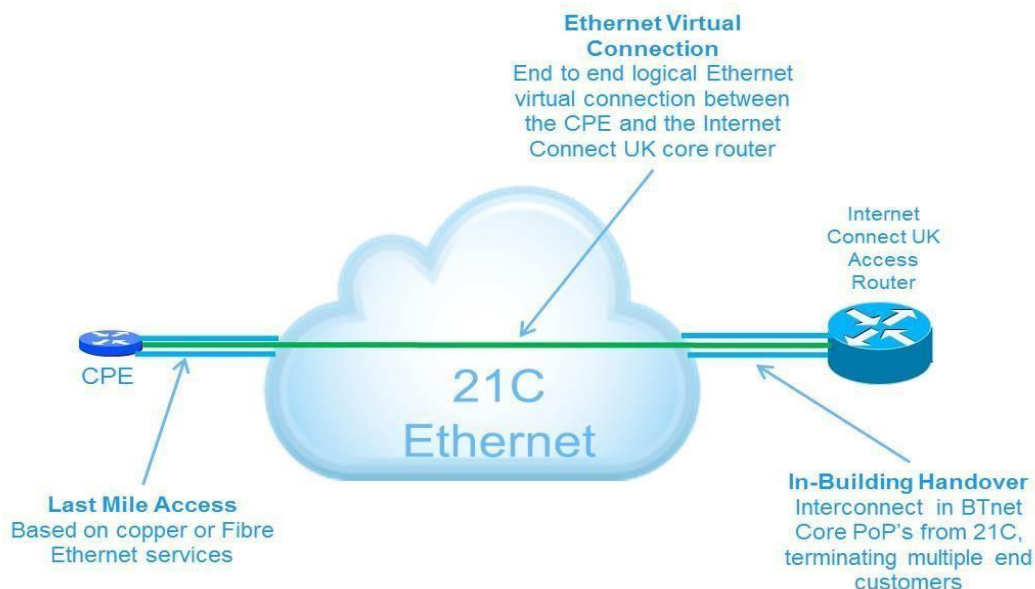
- Last mile Access
- Access Backhaul (including Interconnect between 21C and BTnet)

Running across these 2 physical access components is an end-to-end logical Ethernet Virtual Circuit (EVC)

All of the above components are combined into a single access solution provided to BTnet by the 21C platform and operational teams for the following access bearer types:

- GEA over FTTC 2Mbps – 20Mbps
- GEA over FTTP 30Mbps, 50Mbps or 100Mbps
- EFM 2Mbps – 35Mbps (*no longer available for new provides*)
- 100Mbps Ethernet Fibre
- 500Mbps Ethernet Fibre (*no longer available for new provides*)
- 1Gbps Ethernet Fibre
- 10Gbps Ethernet Fibre

The following diagram illustrates these 2 access components and how they relate to the end-to-end BTnet service.



4.1 Generic Ethernet Access (GEA)

4.1.1 GEA Overview

GEA access employs Fibre to the Cabinet (FTTC) and Fibre to the Premises (FTTP) last-mile infrastructure to provide a cost effective, business grade service for BTnet via our BTnet Express portfolio in covered locations. Leveraging the investment which BT is making in rolling out our Fibre (FTTC/FTTP) networks will provide greater coverage for an entry level service alongside alternative EFM access technology. These cabling access technologies make up the BTnet Express portfolio for entry-level dedicated internet access from BT.

Despite the use of FTTC/FTTP access cabling, GEA access for BTnet is not delivered via the BT Wholesale Broadband Connect network which, since it includes traffic from consumer ADSL and Superfast customers as well as business, will naturally include contention. Instead, by connecting directly to Generic Ethernet Access at the exchange (thus avoiding the Wholesale backhaul) we can leverage a much greater level of control and provide dedicated, uncontended bandwidth to the customer in line with our existing access variants.

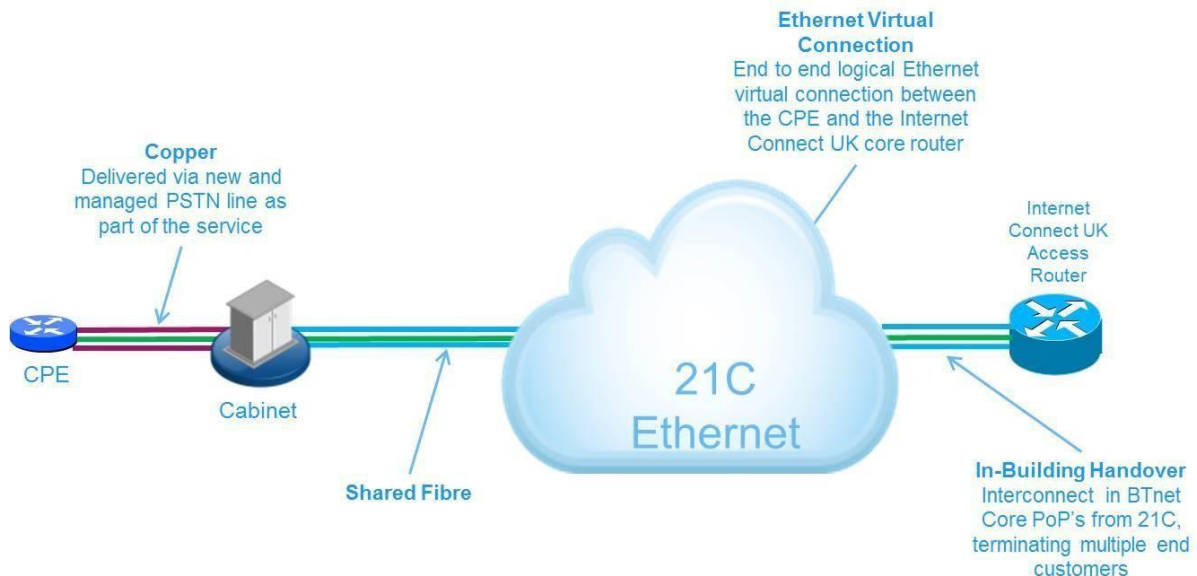
Please note however that BTnet Express delivered using GEA Access is not available with any resilience variants.

Generic Ethernet Access (GEA) is delivered to your site via one of the following technology variants:

- GEA over Fibre to the Cabinet (FTTC) - fibre is deployed from the exchange to the street cabinet
- GEA over Fibre to the Premise (FTTP) - an all-fibre solution where fibre-optic cables are deployed the whole way from the exchange to the premises

Further information on these variants is detailed in the following sections.

4.1.2 GEA over FTTC



GEA over FTTC is available in symmetrical port speeds from 2 - 20Mbps in 1Mbps increments. The actual speed achievable is dependent upon the line rate established to each specific customer site. This rate depends on: copper length, copper quality, and the volume of other GEA services connected to the same cabinet.

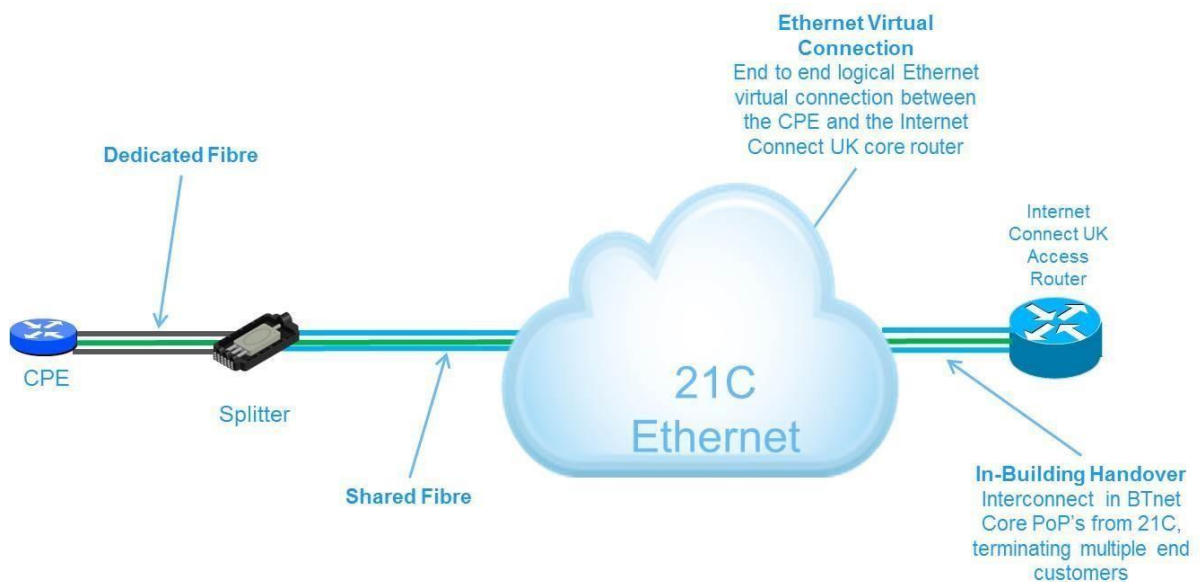
GEA over FTTC services can involve an occasional “retraining” of the line to optimise the line rate. This is achieved via Dynamic Line Management (DLM) which typically involves an outage of less than 2 minutes. GEA circuits are delivered by Openreach on the most stable setting such that

82% of GEA services can expect zero retrains in a month. This compares favourably to circuits provided to residential broadband customers who can expect multiple retrains in that same period.

Delivery of GEA over FTTC requires the customer to have a new PSTN line installed to the site in order to provide the copper path for the service. For BTnet the provision of this PSTN line will be included by default as part of the overall order for FTTC – it is not possible for the customer to either re-use an existing line, or to use a line procured in a different manner. Accordingly it should be noted that this PSTN line is owned and managed by BT and is therefore not available for the customer to use as a phone line (outgoing calls are blocked). This PSTN line will involve an additional engineer visit for installation prior to the main GEA service delivery.

At least two power sockets are needed within 1 metre of the main PSTN faceplate (NTE5) for GEA over FTTC, or within 30m of that point if making use of the 30m extension cable which the engineer can provide on request

4.1.3 GEA over FTTP



GEA over FTTP is available in symmetrical port speeds of 30, 50 and 100Mbps. The maximum speed possible for a given site is dependent upon an availability check performed as part of the quoting and ordering process. Unlike FTTC access options, Fibre to the Premises is not rate adaptive as it is fibre all the way to the customer's site.

Delivery of FTTP requires the customer to be within the coverage of the fibre network. The fibre is delivered from a splitter box that is located in the road nearby and may involve overhead or duct cables to the premises. Delivery is in two phases. The first part involves installation of the fibre to the outside of the premises and installation of a customer splice point that is currently located externally. The second phase is internal and the customer needs to be present during the installation of the Optical Network Terminating device (ONT) which involves cabling from the external Customer Splice Point, through a hole in the external wall, and to an Optical Network Terminating device (ONT). If there is existing an Optical Network Terminating (ONT) device and there are spare ports, then service may be installed on existing device rather than installing a new one.

FTTP delivered services may involve external construction work for which additional time will be required and additional costs may be charged.

At least two power sockets are needed within 1 metre of the Customer Splice Point (CSP) for FTTP, or within 30m of that point if making use of the 30m extension cable which the engineer can provide on request.

4.2 Ethernet in the First Mile access (EFM)

EFM (Ethernet in the First Mile) access is also used to deliver our BTnet Express service in some locations and is available from over 1700 access nodes (exchanges) across the UK. It is provided using bonded copper pairs, offering BTnet services in speeds from 2Mbps up to 35Mbps maximum. The available speed will depend on several factors including quality of existing copper pairs, the distance of your site from the access node and how many copper pairs are needed. A maximum of 8 copper pairs can be used to deliver EFM services. Because delivery is using copper pairs and is less complex than Ethernet delivery (see section 4.3) the lead time for BTnet services over EFM is 35 working days.

EFM access delivered services are no longer available for new provides. Only minor modifications are supported for existing services (e.g. bandwidth change, name change). No contract resigns or major modifications that involve a contract resign (e.g. external shift, change CPE) will be supported.

4.3 Ethernet Fibre access

Ethernet Fibre circuits are used to deliver BTnet services in sizes of 100Mbps, 500Mbps (*no longer available for new provides*), 1Gbps and 10Gbps. Ethernet Fibre uses fibre cabling and so may be subject to longer lead times and more complex delivery, especially where existing fibre and routing in to your site does not currently exist. As such, all orders are subject to survey although it is possible to get an early prediction of lead time from your BT Account Manager or Specialist at the point of order based on some availability checks and estimations of delivery requirements.

4.4 10Gbps Access

4.4.1 EAD10G & Optical Spectrum Access (OSA) Overview

EAD10G or Ethernet Access Direct from Openreach uses a dedicated fibre optic cable to provide an Ethernet service between the serving PoP and the customer's premises. This is used where the main link between the serving PoP and the customer's premises is no more than 25km.

Where one or more links are in excess of 25km we use OSA 10G or Optical Spectrum Access. This is a modular Openreach service which uses a dedicated fibre optic cable to provide high speed services between 2 sites where the main link between the 2 serving exchanges is no more than 50km.

Although in this scenario we are using it to deliver a single 10G Ethernet connection from the nearest 21CN Core or metro node to the customer's premises it is more commonly used to connect 2 customer sites together using a dedicated fibre optic cable and a pair of ADVA multiplexers that can support multiple 10G wavelengths which can be presented to the customer via various different interfaces, such as 10G Ethernet, 2.5G ATM, Multiple 1G Ethernet, Fibre Channel etc. depending upon the actual customer requirement. It is available in 2 options, Amplified and unamplified. Unamplified services are available on circuits with a main link distance of less than 25km while adding amplification can increase the reach up to approx. 50km.

4.4.2 Tunnelling Traffic over 10Gbps 21CN

To ensure our network operates at optimum efficiency, we implement a feature called Flow Aware Transport (FAT) which may route different flows of traffic across different network paths. A flow is defined by matching IP or MAC source and destination addresses, so to allow us to do this, we need to be able to see the packet headers. If headers are hidden or encapsulated, then an alternative solution i.e. 10G OSA Direct, will need to be looked at.

Examples:

No Tunnelling	Tunnels without Encapsulation	Encapsulation Tunnels
Permitted	Permitted	Not Permitted
IPv4 packets	SSL VPNs	IPSec in Tunnel Mode
IPv6 packets	IPSec in transport mode	PWE3
Ethernet frames	VXLAN	GRE
Ethernet VLANs		L2TP
		IPv6 over IPv4
		PPP

4.4.3 10Gbps EVC's

EVC's (Ethernet Virtual Circuits) from 1.5Gbps to 10Gbps are designed to support an aggregate traffic capacity of 10Gbps via a combination of multiple IP flows.

In order for BT to be able to offer 10Gbps EVC services, whilst keeping the cost affordable, the traffic on a single 10Gbps EVC service may be load balanced across a number of backhaul links in our core network, consequently a single IP flow may not be able to consume the full capacity of the EVC.

In order to preserve packet ordering, any load balancing is based on a combination of the source / destination MAC and IP Address - this ensures that a 'flow' will always travel across the same path through our network. As these links are shared, it's possible that a single flow will be allocated to a backhaul link that has other, high priority traffic transiting across it and as a result, that single flow may not be able to use the entirety of the backhaul link.

The methodology of load balancing used for EVC's in MPLS enabled networks is 'Flow-Aware Transport' and is documented under IETF RFC6391.

In order to best utilise your 10Gbps EVC, the following guidance on key points has been put together.

Please note, if you are not using any form of tunnelling, and have a large number of discreet IP flows (Often in direct correlation to the number of network users), then the guidance in this document does not need to be followed.

Should your utilisation of the service change in the future the considerations in this document may still be applicable.

4.4.4 Network Interface Controllers (NIC)

The 10G BT service will be presented on a 10000base LR interface with SC connectors.

When extending the service across your LAN using copper interfaces, please ensure that the interface speed is set to, or negotiated to 10Gb Full Duplex. Ensure that the cable length matches the grade of cable; for example, Cat5e / Cat6 allows 10Gbps up to 55 meters and Cat6a allows for 10Gbps up to 100 Meters.

Where cable runs of longer than 100 meters are required, fibre optic transport is recommended; the distance that can be obtained from optical transport varies on the optic and the fibre used and should be verified with the manufacturer.

Ensure that all transport links, be they copper or fibre, are free from errors; this can be caused by damaged cables, connectors or optics, by cables that have been bent and by environmental factors in the case of copper such as cross talk and interference.

Connectivity in to end devices should also be considered. Limitations may be caused by the processing capabilities of the NIC, the bandwidth of the associated bus (e.g. PCIe) connecting it to the CPU, the processing capabilities of the CPU and other internal components in the end hosts.

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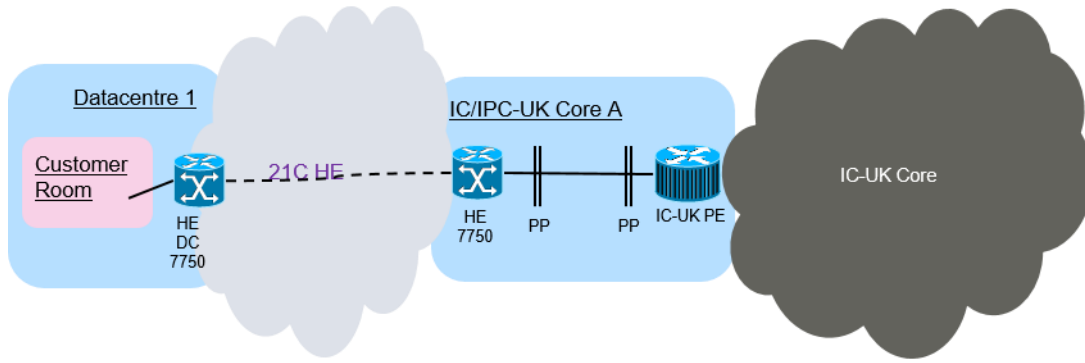
Connectivity in to end devices should also be considered. Limitations may be caused by the processing capabilities of the NIC, the bandwidth of the associated bus (e.g. PCIe) connecting it to the CPU, the processing capabilities of the CPU and other internal components in the end hosts.

4.5 Data Centre Access

A data centre is a secure building where customers can purchase rack space and power to put in their own servers and equipment. Customers can also purchase pre-equipped racks with servers built in. Data centres can be used as backup storage or processing facilities for many types of data. If customers have a high demand for services a customer may have his own designated secure cage within a data centre. Data centres typically have complex security requirements for access to sites and to carry out work.

Under the BTnet Bespoke Access Data Centre service, the BTnet 21C Network has been extended into a number of selected third-party Data Centres across the UK. This enables the provision of a 'Port Only' (Wires Only) service in these Data Centres, replacing the need for individual BTnet circuits to be ordered for customers with services based within the Data Centre.

The benefits to the customer are reduced costs and quicker lead times for installation.

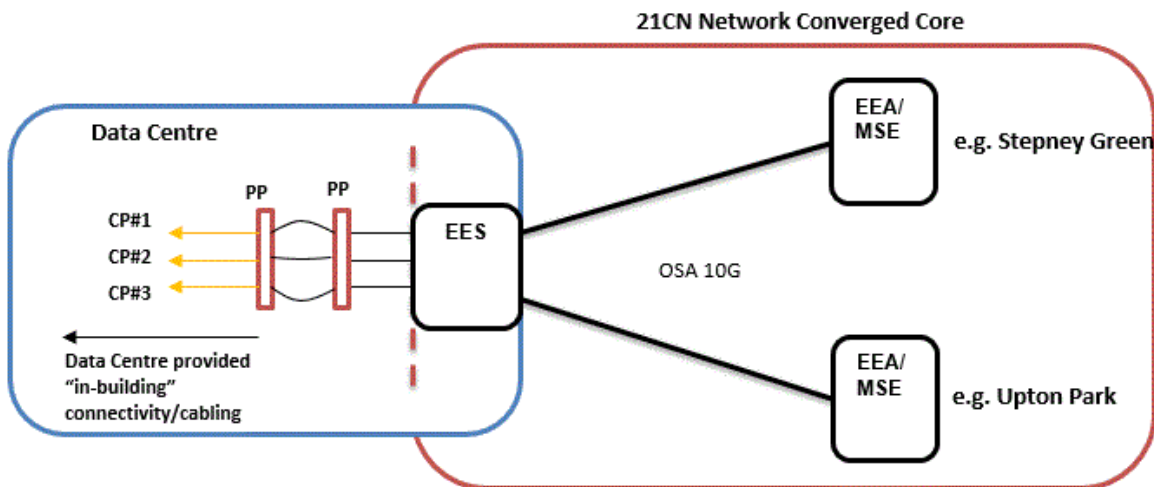


This access provides a BTnet into Data Centres using the 21C Bespoke Access Service option and can be offered to customers who have services co-located in a datacentre where BT 21CN also has a point of presence (“node”). Service shall be offered over 1G and 10G bearers with a range of port speeds for those bearers available up to 10Gbps maximum. The maximum port speed in some locations may be limited to 2.5Gbps but will be confirmed at the time of quoting.

- As this is a Port-Only and Wires Only service, there is no option for providing a BTnet Managed CPE of any type
- The customer will be responsible for providing their own equipment for the service
- The customer is also responsible for ordering the “Cross-Connect” within the Data Centre. This will need to be in place for the service to be delivered to the customer room from the Data Centre MeetMe room.

4.5.1 Data Centre Node Design

The Network is extended by deploying a 21CN 7750 router (known as Bespoke EES or Bespoke Node) within specific multi-tenanted Data Centres. The Bespoke Node will have the same build as standard 21CN node deployed into BT Exchanges around the country. The Bespoke node is diversely connected to two Metro nodes via two 10Gb OSA RO2 services provided integrated resilience. If one of the backhaul links fails, traffic will automatically be routed over the other backhaul circuit. This provides Diverse Plus resilience built into the Data Centre service. Other suppliers may be using single fibre links rather than the more complex, but more resilient Openreach RA02 design.



4.5.2 Port Termination and Interfaces

Data Centre Access is a port only service, and the customer buys access via 1Gb or 10Gb sized access bearers, which is then presented on a patch panel in a co-locate space in the Data Centre. The following interface options are available on the terminating patch panel and should be requested at the time of order depending on the customer requirements. The data centre will connect from our BT patch panel to the MeetMe room, and the customer will need to order a Cross Connect via the Data Centre provider to connect from the MeetMe room to their customer location. The termination optics will remain the same from end to end, so it is important to request the relevant option (where selectable) at the time of order for the BT patch panel termination.

1G Bearer options	<ul style="list-style-type: none"> • 1000BASE-SX (SFP) Optics Module 850nm MM (SC) Connector (Multi-Mode) • 1000BASE-LX (SFP) Optics Module 1310nm SM (SC) Connector (Single-Mode)
10G Bearer	<ul style="list-style-type: none"> • 10GBase-LR LAN Phy (single mode), Dual LC connector

No other termination options are available from this product

The service is ordered as Port only, (supporting a single EVC). Customers connect their equipment to the Port via an Internal Fibre Link (Cross Connect) which they will need to purchase from the Data Centre directly. Once delivery of the Data Centre service is complete, the BTnet service will be configured onto the port to connect the customer.

The exact Rack and Port information of the BTnet service will be supplied to the customer by the Bespoke Access Team via a KCI (Keep Customer Informed) e-mail. It will be given in the format

Floor=001/Room=C/Suite=113/Rack=180/Shelf=34/Port=02

BT advise Port information to our customers very early in the delivery (around day 2) specifically so they have time to get a quote and place an order with the Data Centre. This should allow the connectivity to arrive in the same timescales as we complete the order for the port.

4.5.3 Customer Resilience Options

The following service variant options are available in cases where there are two diversely separated BT 21CN access nodes within the Data Centre

- Loadbalancing
- Failover

Notes about customer resilience options for BTnet Data Centre Access:

- It is only available where 2 nodes exist in a datacentre and will be confirmed on request
- it is not possible to deliver if only one node is available in a single data centre
- It is also It is not possible to offer resilience using one node from a datacentre, and another node from elsewhere in our 21CN network.
- Note that the BGP service variant, which is technically two separate single accesses, *will* be permitted even where only one node exists in the datacentre if desired.
- Split/dual site resilience to two different data centre locations is supported with each circuit being delivered to a different data centre location. However, this will require both circuits to be linked on same customer LAN by a point to point circuit as per the standard design for failover and loadbalancing when used between split sites. Provision and availability of a point to point connection between two data centres may not be possible depending on location, although it may be more likely where the two Data centres are on the same campus.

Where a resilient service is not available using the BTnet data centre access service, the customer needs to revert to selecting a standard Fibre access as the mechanism to deliver service to their site.

4.5.4 Data Centre Access Modification Options

Not all of the listed modifications in the later part of this document are supported or available for Data Centre access. Of note are the following modifications which are **NOT** available for this service:

- Add Managed CPE
- External shift
- Add backup
- Internal shift
- Add Voice

Available modification options for a BTnet Data Centre service will be confirmed on request.

5 Port Speed

The port speed is the ordered (and guaranteed) bandwidth available to you across the access bearer (between your site and the BTnet Access router).

For BTnet Express services the port speed is fixed and cannot be flexed. For Ethernet delivered services the port speed is flexible. You will contract to the access bearer and not to the port speed. Flexible port speeds are the underlying ability for you to control your costs by only ordering the port speed required independent of the access bearer ordered e.g. if you have a 100Mbps access bearer you may choose to only order a 50Mbps port to reduce cost and reflect the need for your current bandwidth requirements.

To allow customers control of their service and bills, the ability to 'flex' the port speed is offered. This allows you to quickly and easily change the port speed anywhere within the capacity of your access circuit (Bearer). Currently, a port speed Flex modification can only be performed during standard working UK hours: Monday to Friday (excluding bank holidays) between 08:00 and 16:00. Where the provided Managed CPE can support the new port speed requested, the flexing modification has a lead-time of 3 working days. If an upgrade is needed to your Managed CPE then the lead time for a flex will be 10 working days, to accommodate this additional change.

Ports on BTnet support symmetrical bandwidth - the same speed is supported on both upstream (from your site to the Internet) and downstream (from the Internet to your site).

The port speed achievable is limited to the maximum speed of the Access bearer and they range from 2 Mbps to 10 Gbps in flexible increments. Port speeds are policed, if more traffic is attempted to be sent across the BTnet access than is supportable by the port speed then packet drops will occur.

The following table provides the port speeds available per access bearer:

Access Bearer	Port Speeds Available
BTnet Express via EFM 2Mbps - 35Mbps	2Mbps to 10Mbps in 1Mbps increments 10Mbps to 35Mbps in 5Mbps increments

<i>(existing customers only, not available for new provides)</i>	
BTnet Express via GEA access over FTTC	2Mbps to 20Mbps in 1Mbps increments
BTnet Express via GEA access over FTTP	30Mbps, 50Mbps and 100Mbps fixed speeds
100Mbps	Only the following port speeds are available: 30, 50 and 100Mbps
500Mbps <i>(existing customers only, not available for new provides)</i>	50Mbps to 100Mbps in 1Mbps increments 100Mbps – 500Mbps in 10Mbps increments
1Gbps	Only the following port speeds are available: 30, 50, 100, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000Mbps
10Gbps	1000 to 5000Mbps in 500Mbps increments 5000Mbps to 10,000Mbps in 1000Mbps increments

6 Customer Premises Equipment (CPE)

A Managed CPE is provided as default, as part of the BTnet service except for Data Centre service options. The supported LAN interface(s) on the BTnet CPE provides the demarcation between the network and any of the customer's own equipment and defines the BTnet service boundary. Details of the available Managed CPE options will be provided by your account manager or specialist at the time of quote.

The design and specification of the BTnet managed CPE is set with no options to alter the type or model deployed by BT, the type of cards deployed within the equipment or much of the configuration of the equipment. Only those configuration options detailed in the relevant '*Customer Premises Equipment (CPE) Service Description*' document will be supported from the Managed CPE, with other options being unavailable. BT is solely responsible for the configuration and maintenance of the CPE provided with BTnet.

Therefore, if you require further flexibility of the type and function of the CPE then the BTnet service should be ordered as a wires-only service (i.e. without the BT managed CPE) and you can then design, implement and manage the CPE of your choice. A configuration guide for setting up non managed CPE is available on request.

The CPE device used is dependent on the Access bearer ordered. Some options may not be available for certain service variants such as failover, backup and loadbalancing and will be confirmed on request.

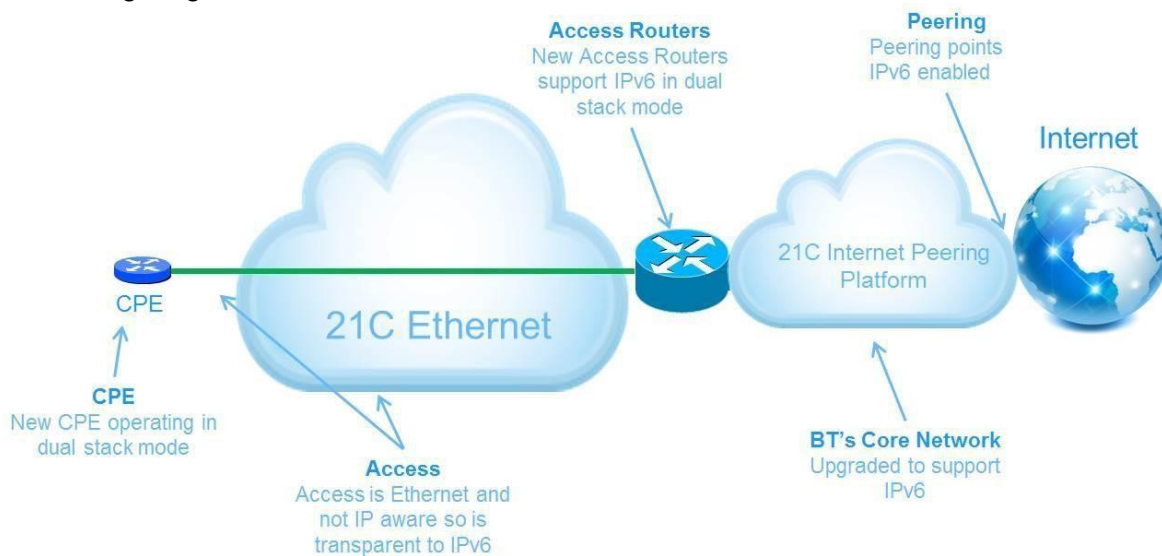
The detailed specifications of the Managed CPE options are provided in the additional '*Customer Premises Equipment (CPE) Service Description*' document.

7 IP Routing and Addressing

IP routing is the basic principle of enabling traffic to flow to and from the Internet to the customer's Internet facing devices. The IP addressing is an essential building block as public IP addresses (IPv4 and IPv6) are required to ensure unique addresses are identified for each customer so as to ensure traffic is sent and received correctly.

Public IP addresses are controlled under Internet Registry (IR) rules. BT has a relationship with the RIPE Regional Internet Registry (RIR) and is recognised by RIPE as a Local Internet Registry (LIR). This means that BT is able to allocate public IP addresses on behalf of RIPE for use by BT's end customers

BTnet supports both IPv4 and IPv6 standards in a dual stack capability and both will be allocated to the service. The support for IPv6 addressing may vary depending on the Managed CPE provided. The following diagram illustrates this:



All new services ordered will automatically be provided with a dual stack service. This future proofs the customer's investment by providing this capability as standard enabling the customer to implement their own IPv6 plans in their own timeframes without any change to their Internet Access service.

For existing IPv4 only customers a technology refresh is required in order to deliver the dual stack capability. This will require a 'Bearer Change' modification to support the delivery of a new IPv6 enabled dual stack service alongside their existing service before their service is switched over to the new dual stack configuration. Existing IPv4 addresses will be maintained on switchover with new IPv6 IP addresses deployed.

Please note that services provided with a Managed CPE (See [section 6](#)) where IPv6 is not supported will be allocated IPv6 as normal, and configured within our network so that the service is IPv6-ready. However you will be advised by your account manager or specialist that at this time the CPE will not support IPv6 routing. Allocating them within our network gives us the flexibility to make them available to you at a future date should the capability be added in a future service update.

7.1 IP Addressing

7.1.1 WAN IP Addressing

Only applicable for customers ordering the wires only option from BTnet i.e. there is no managed CPE device as part of the ordered service.

The WAN IP addresses are allocated on the BTnet Access Routers and the CPE to provide routing connectivity over the access between customer site and BTnet PoP. These IP addresses are not advertised out over the Internet like the LAN IP addresses and are allocated from BT's pool of IP addresses.

Both IPv4 and IPv6 WAN addresses are allocated for customers deployed with an IPv6 enabled dual stack service. IPv4 only customers will have IPv4 WAN addresses only.

- For IPv4 the standard design is dependent on how recent the customer was deployed on BTnet: The current design is to deploy a /29 IPv4 address block (subnet mask of 255.255.255.248) providing 6 IPv4 addresses. One is used for the Access Router Interface and another for the WAN interface on the CPE router. This is applied to all new customers including those that undergo a bearer change modification
- For IPv6 the standard design is to allocate a /56 IPv6 address block

7.1.2 LAN IP Addressing

Customers will require public registered IP addresses for their BTnet service. Most customers IP addresses are issued by their ISP and are not transferable to another ISP, this is known as Provider Aggregatable addressing.

Customers who have their own public IP addresses (known as Provider Independent addresses) require a direct relationship with an official Internet Registry body and are wholly responsible for these IP addresses.

The following sections provide further detail on these two IP addressing options.

7.1.2.1 - Provider Aggregatable (PA) IP Addressing

Provider Aggregatable addressing is by far the most common method for customers to obtain unique Public IP addresses for their Internet Access service. As an ISP, BT has a relationship with the European Internet Registry body (RIPE). BT therefore has a block of public IP addresses (both IPv4 and IPv6) pre-assigned by RIPE to provide to customers. BT does not own these IP addresses and are duty bound to adhere to the IP addressing rules and regulations stipulated by RIPE.

PA addresses stay with the ISP who assigned them, so customers moving from another ISP will need to hand back their PA addresses and take new ones from BTnet.

7.1.2.1.1 - PA IP Address Ordering

BT use RIPE guidelines to ensure customers are allocated enough IP addresses for their needs (including the specification of exactly how many IP addresses are required and what equipment will be configured with these addresses). As part of these guidelines customers are required to justify the address space requested. It is important to ensure the customers IP requirements are an integral part of the sales journey.

Critical information that is mandatory on the BTnet order is as follows:

- Technical contact details for the customer. The customer technical contact should be IP literate as they will be registered on the RIPE Database and used during the delivery process to interact with the BTnet delivery teams.
- The nature of the customer's business e.g. ISP, Manufacturing, Retail, etc.
- The number of IP addresses required for the service. Do not ask for more IPv4 addresses than required and can justify for immediate use.
- An accurate description of what customer equipment the IP addresses will be configured on. Examples like Firewall, Mail Server, Web Server are acceptable with added detail around the equipment manufacturer and model number required in the RIPE form. Descriptions such as 'general use' are not acceptable and will lead to delays in the delivery of the order.

7.1.2.1.2 IPv4 Provider Aggregatable IP Addressing

The customer can request as many IPv4 addresses as they can justify for immediate use. BT will provide a 'standard allocation' of IP addresses for free as part of the service, which is a range suggested by RIPE to suit the needs of a wide range of customers.

The standard allocation of IPv4 addresses provided for free as part of the service is a /29 (Subnet Mask 255.255.255.248) which provides 5 usable IPv4 addresses for a service with a Cisco Managed CPE device.

If a customer needs more than the standard allocation of IPv4 addresses then additional rental charges may apply and will be provided at the time of quoting/ordering the service. For requirements beyond the standard allocation the customer will be expected to provide sufficient usage rationale also in line with RIPE requirements.

IP addressing information for your service will be communicated during the delivery journey via one of the KCI (Keep Customer Informed) order update emails.

7.1.2.1.3 IPv6 Provider Aggregatable IP Addressing

BT use RIPE guidelines for assigning customer IPv6 PA addresses from BT's allocation. The RIPE regulations provide a set design for IPv6 address allocation that allows BT to assign IPv6 addresses on a customer and site basis without the need to capture any additional information than the IPv4 justification provided at point of order.

The IPv6 PA addressing design is as follows:

	IPv6 Address Allocation	Details
Customer	/48	A /48 address block is assigned to each customer. This supports each customer by allowing 256 /56 address blocks to be assigned per site. The customer level /48 address allocation is different to how IPv4 address allocation currently works. A customer will not be provided the /48 address allocation as a fully routable IPv6 address block as the service is ordered at a per site level, however if the customer has more than 1 site (FTIP) then the individual /56 address allocations for each site will be assigned from the customers larger /48 allocation.

	IPv6 Address Allocation	Details
Site	/56	A /56 IP address block provides support for up to 256 subnets (/64) each with 18,446,744,073,709,551,616 IPv6 Addresses

As can be seen in the table above, IPv6 is very different to IPv4. A good source of reference for IPv6 is the RIPE site: <http://www.ripe.net/internet-coordination/ipv6>

7.1.2.2 Provider Independent (PI) IP Addressing

Customers can request their own IP address blocks from a Regional Internet Registry (RIR) either directly or through BT (as a recognised Local Internet Registry). In Europe the RIR is RIPE (<http://www.ripe.net/>). There are qualification criteria to be met before the RIR will allocate a customer PI addresses. To enable better control of PI Resources (PIR), RIPE has put in place mechanisms which requires BT to include the following conditions in its contracts with Customers who take PI Resources:-

- None of the PIR may be sub-assigned to a third party.
- The PIR will return by default to the RIPE Network Coordinating Centre if the customer cannot be contacted when required.
- The use of PIR is subject to RIPE policies as published on the RIPE web site and which may be amended from time to time.

If a customer's own PI addresses have been previously routed by another ISP, they will need to ensure that ISP's network stops advertising their addresses when they move to BTnet.

Similarly, if a customer wishes for BTnet to stop advertising their PI addresses, an order for a service modification (IP address reconfiguration) or a service Cease order must be submitted through your account team.

Please note that support for PI address ranges may be limited on some Managed CPE options. Please discuss this with your account manager or specialist if you would like to use a PI range.

7.1.2.2.1 PI IP Address Ordering

For efficient ordering of BTnet services with PI addressing the following mandatory information is required during the ordering process:

- Technical contact details for the customer. The customer technical contact should be IP literate as they will be registered on the RIPE Database and used during the delivery process to interact with the BTnet delivery teams.
- The nature of the customer's business e.g. ISP, Manufacturing, Retail, etc.
- Either the existing PI address range required to be routed or the indication that the customer wishes BT to apply for PA address space on their behalf
- The Internet Registry body who provided the PI addresses
- The ISP that provided the LIR sponsorship for the PI addresses
- Immediate and forecasted 3 month usage of the IP addresses (as per PA IP address ordering)

Additional RIPE forms will be sent to the account team/customer to fill out during the delivery process. The customer will also need to sign a contractual clause indicating their acceptance of responsibility for the PA address space. Failure to complete and return these will result in delays to the delivery of the BTnet service.

7.1.2.2.2 IPv4 Provider Independent IP Addressing

The minimum IPv4 PI address assignment is a /24 subnet (Subnet mask of 255.255.255.0 with 256 IP addresses). This is the minimum routable PI address block for IPv4 to meet Internet routing rules.

7.1.2.2.3 IPv6 Provider Independent IP Addressing

The minimum IPv6 PI address assignment is a /48 subnet. This is the minimum routable PI address block for IPv6 to meet Internet routing rules.

7.2 Static IP Routing

A static IP routing solution configures the public LAN IP addresses associated with a customer site into the BT routing tables that are advertised across the BTnet Internet Backbone and across into the Internet routing tables for global reachability. The IP addresses are static i.e. they are configured onto the BTnet Managed CPE and will not change unless a request is received by the customer for a modification.

Static routing is the default routing solution for BTnet.

7.3 Dynamic IP Routing

Dynamic IP routing is supported by the BGP service variant. Please refer to the additional '*BTnet Resilience Service Description*' document for more information.

7.3.1 Autonomous System (AS) Number Ordering

Customers with a BGP service variant may request an AS Number via BT. AS numbers are required for BGP configurations to work. AS numbers are controlled by the Regional Internet Registry bodies (e.g. RIPE) and as such are not owned or maintained by BT. The AS Number request can be requested from RIPE as part of the order delivery process for the BTnet service.

To order an AS Number:

- The customer will be asked to fill out the following form:
<http://www.ripe.net/ripe/docs/asnrequest.html>
- This form will be sent out after order is submitted by BT.
- The form is submitted to the routing registry (RIPE) by the IP Master team on behalf of the customer.
- RIPE will respond directly to the customer with the AS allocation.
- Please note that delays in returning the AS Request form will lead to delays in delivering the BTnet service.

7.4 VPN Support

The BTnet Managed CPE options do not offer any built-in Client VPN or site to site VPN support. Third-party VPN services and devices would be required if you wish to create any VPN's.

A Managed CPE option with traditional 'pass through' of IP addressing may be the preferred option for simplicity of setup.

8 BT's Internet Backbone

BTnet is delivered using a high speed, highly resilient, core IP platform called 21C Internet Peering Platform (21C IPP), which is used to support a range of services, including BTnet and BT's broadband services. BTnet has dedicated Access routers and DNS servers designed, implemented and managed to provide business grade Internet connectivity. So although the 21C IPP provides BTnet and Broadband transit in the UK, the access into the 21C IPP is dedicated to BTnet.

Within 21C IPP BTnet uses the core IP platform (AS2856), which is connected to multiple UK ISP peers and, via BT's European Internet backbone (AS5400), to tier 1 ISPs for onward global Internet connectivity. These highly resilient peering connections are carrying tens of Gigabits of traffic every second.

The peering points and performance statistics of BT's Internet Backbone can be checked via the website www.bt.net

The 21C IPP utilises OSPF and iBGP routing protocols internally to provide a highly stable, scalable and secure IP routing platform that supports BT's Internet Connectivity not only for BTnet customers but also for Broadband customers. This provides customers with direct connectivity to the largest Internet customer base in the UK (with BTnet and BT Broadband being the market leading Internet connectivity services in the UK). All traffic within the UK between the business and consumer users connected via BT will transit over the 21C IPP platform with no need to be sent via the peering links thereby providing a high performing service with minimal hops across Internet providers.

BTnet proactively monitors its core network infrastructure against DoS (Denial of Service) attacks. One of the main DoS mitigation tools used is Arbor Network's Peakflow SP which enables BTnet to monitor traffic flowing into and out of the core network. The tool allows BTnet to proactively detect most traffic anomalies and DoS attacks. The attacks can then be managed by cleaning the traffic and blocking the source of the attacks using filters.

9 DDoS Mitigation

A distributed denial-of-service (DDoS) attack is one in which a multitude of compromised systems attack a single target, thereby causing denial of service for users of the targeted system. This is achieved by a flood of incoming messages to the target system, usually from a network of compromised hosts (botnets), which essentially forces it to shut down, either by overloading the web server, firewall or saturating the communications link, thereby denying service to the system to legitimate users. A summary of the BT DDoS Mitigation service is as follows:

- BT Security DDoS Mitigation service mitigates attacks by monitoring the internet traffic, to detect DDoS floods, Protocol Misuse, Worm and Anomalous traffic. The BT Security DDoS Mitigation service profiles normal behaviour and identifies attacks based on anomalous behaviour patterns. It allows authorised traffic to continue unaffected by the attack but filters out the attack traffic.
- The solution protects BT provided services only. Where a customer has internet connectivity from other Internet Service Providers (ISP) as well as BT the connectivity provided by the other ISPs cannot be protected by BT.
- Depending on the level of service the customer has and how they want mitigation set up, the service will be able to mitigate attacks automatically or with manual intervention. BT's experience of automatic mode suggests that it will be able to stop ~ 80% of malicious attacks

with the rest being mitigated by manual intervention. The DDoS Mitigation Service can provide post-attack analysis report to customers.

- The customer is provided with a web portal providing visibility of attack alerts and the ability to drill down into the detail of the attack.
- There is no requirement to change or alter current IP addressing as part of this service.
- Customers will receive a weekly report of attacks that occurred during the week
- Available for both new customers (at time of new order) and for existing customers (via the Add DDoS modification). The standard lead-time for DDoS Mitigation to be added to a BTnet service is 10 Working Days

9.1 Bronze Lite Service

- Entry-level service providing automated traffic monitoring and a single manual mitigation
- Alerting service based on traffic volumes exceeding circuit capacity by a defined percentage.
- One on-demand, continuous mitigation provided to protect against the most common volumetric attacks.
- Mitigation response within an hour of customer request via email
- Upgrade paths available once the single mitigation has been used to Bronze, Silver, Gold packages detailed below

9.2 Bronze Service

- No limit to the number of auto mitigations performed in a year
- Alerting services
- Weekly reports

9.3 Silver Service

This contains all that is provided in the Bronze service as well as:

- Flexible, self-service monitoring and reporting options specific to the customer
- Up to 16 amendments to denial of service monitoring configurations and actions per annum at no extra charge
- A DDoS portal is included as part of the service, allowing the monitoring of thresholds and mitigation actions to be viewed alongside any events BT security experts available to assist at the customer's request.
- Option of layer 7 protection using CPE, combined with the cloud solution.

9.4 Gold Service

This contains all the capabilities that are provided in the Silver Service plus:

- The increased layer 7 capability giving combined cloud and CPE protection option.
- 24/7 proactive support from BT's highly trained security analysts
- Unlimited service requests
- Active reach out to the customer on a 24/7 basis if BT suspect the customer to be the subject of an attack or planned attack
- Scanning of Intelligence sources to identify active threats relevant to or defined by customer and notification within 24 hours

10 SNMP Read-only Access

SNMP or Simple Network Management Protocol is a standards based protocol defined by the IETF (Internet Engineering Task Force). It provides the ability to monitor IP networks and is available on most IP devices for remote monitoring purposes.

SNMP Read Only (RO) access allows limited SNMP read only access to the CPE to view utilization and alarm statistics, it includes the ability to Ping the CPE interface from the customer nominated management devices.

The following criteria apply to this service:

- The customer must have one or more circuits totalling 10Mbps of bandwidth or above.
- The customer must have suitable network management systems in place. The maximum number of network management prefixes (SNMP/Ping) is 5

To enable SNMP Read-Only Access and Ping on the CPE device a new access-list must be created listing the addresses from which SNMP read-only and Ping access is allowed. A separate line is required for each distinct SNMP/Ping polling device required by the customer with a unique public IPv4 address per polling device.

It is expected Ping's will originate from the customer nominated SNMP server, it is not an option to specify a management device for Ping or SNMP only. Managed IP addresses which are not registered for SNMP RO access will not be able to Ping the CPE device.

Customers should be advised that BTnet will not accept RFC1918 (private) IP addresses for use in conjunction with SNMP Read-Only Access. Customers must have public IP addresses that either BT has provided or BTnet are advertising on behalf of the customer.

For services provided with a Cisco Managed CPE device, BTnet SNMP RO access currently supports SNMPv2c RFC1901-1908, which is backward compatible with SNMPv1. SNMPv3 is not supported.

For security and to minimize potential impact of CPE performance it is recommended that customers minimize the size of the management prefixes allowed SNMP and Ping access to CPE, and minimize the number of SNMP servers polling a single CPE.

The configuration also requires the definition of a community string required to be used by the polling device to permit access to SNMP data on the BTnet managed CPE. Blank spaces and the "@" symbol must not be used when setting up the community string.

11 Domain Name Service

The Domain Name System (DNS) is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet. An often-used analogy to explain the Domain Name System is that it serves as the phone book for the Internet by translating human friendly computer hostnames into IP addresses. For example, the domain name www.example.com translates to the addresses 192.0.43.10 (IPv4) and 2620:0:2d0:200::10 (IPv6).

A Domain Name Service (as per the one offered with BTnet) uses BT's dedicated DNS servers to translate queries for domain names from customer's into IP addresses to connect to the relevant internet facing devices.

The BTnet DNS service offerings are summarised in the following table

DNS Service	Details
Caching DNS	Supported as default
Authoritative Primary DNS	Optional for customers who have their own registered Domain Name
Authoritative Secondary DNS	Optional for customers who have their own registered Domain Name
DNS Registration	Optional for customers looking to register their own Domain Name

More details on the above are contained in the following sections.

11.1 Caching DNS

This is provided as default to all BTnet customers. The service does not hold any authoritative data and is used solely for resolution of DNS queries. DNS queries are directed to the caching name server by a resolver (e.g. PC client, network application etc.). The caching name server will recursively query other name servers until it obtains an authoritative answer, which it returns to the resolver. The caching name server will cache the answer for a limited period of time (defined by the Time-to-live value associated with the answer).

The customer is provided the Primary and Secondary DNS server addresses during the order journey and is able to configure their equipment to use BT's DNS servers for DNS resolution.

11.2 Authoritative Primary DNS

Each customer connected to the BTnet network that has a registered domain name (or requires one) must have multiple name servers for the domain: a primary server and at least one secondary server for back up purposes.

The primary DNS has the authority for the whole domain. Each domain must have a primary and at least one secondary name server.

- Up to 10 primary DNS names are included and hosted free of charge. Additional names can be added as a chargeable option.
- BTnet can register DNS on the customer's behalf (This is a chargeable option).
- Primary DNS is available for any domain that the customer owns.
- If the customer is moving to BTnet from another supplier they must inform the local registration authority of the change to their existing Primary DNS or have their current supplier do that for them. The registration authority will only accept changes from either the customer or existing supplier.
- Domain names are subject to separate terms and conditions set by the appropriate registry.

11.3 Authoritative Secondary DNS

Each customer connected to the BTnet network that has a registered domain name (or requires one) must have multiple name servers for the domain: a primary server and at least one secondary server for back up purposes.

BTnet provides a secondary DNS for name and address resolution. This is reliant upon the customer having already obtained a primary DNS, which will transfer details to the BTnet secondary DNS. Guidelines for this service are as follows:

- Secondary DNS for up to 250 domains per customer are included as standard. More domains can be included as a chargeable option if required.
- Changes to the DNS Primary server that may affect zone transfers must be notified to BT through the BTnet DNS team (dns.registration@bt.com). Stating your Service Identifier (FTIP) reference

11.4 DNS Registration Charging

BTnet provides a registration service for the customer's domain names. We will register with the appropriate registration authority their requested domain name, subject to the availability of the requested name.

When the customer requests a domain name, they will incur specific charges associated with that domain name. Two charges may be involved; the first charge is that made by BTnet. The second is that of the governing bodies with whom the customer is to be registered. Both of these charges will be billed to the customer by BT.

There are five governing bodies for domain names registration used by BT. Any domain names not available through these bodies will not be accepted. The governing bodies are:

- Network Solutions PO
- Nominet UK
- UKERNA Atlas (JANET)
- Markmonitor
- CentralNic Ltd

BT will provide support for DNS changes in standard working hours. Changes made out of hours will be chargeable at the published rates. Requests for support must go through the appropriate BT channels. DNS work is not covered by any Service Level Agreements.

12 Mail

Email, along with most network applications, is based on client/server architecture. BTnet's email system is based on the Simple Mail Transfer Protocol (SMTP). SMTP allows the transmission of messages from one server to another. The objective of SMTP is to transfer mail reliably and efficiently.

BTnet has multiple mail servers and offers the customer (if they have their own mail server) an SMTP outgoing mail service and a 2nd preference incoming mail service. This is based on standard SMTP protocols.

The services supported by the Mail platform are:

Mail Service	Details
Outgoing Mail (SMTP Relay)	Provides the ability for customers to configure their email servers to send via the BTnet Mail Servers.

Incoming Mail (2nd preference MX)	Provides a back-up mail service to the customer's primary mail server. The customer would configure their DNS settings so that in the event their primary mail server is down their mail gets sent to the Internet Connect UK Incoming Mail servers. Our servers hold the mail for 3 days and will attempt to re-deliver this mail to the end customer's primary mail servers when they become available. This is a backup mail service.
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Access to the SMTP outgoing mail relay service is controlled by adding the Customer's domain name to an access list. The customer must have a matching forward (A record) and Reverse DNS¹ entry that should be provided at time of order. Include the following information at time of order:

- The IP address used to send email
- An A record that resolves the IP address

The Incoming and outgoing mail relays both use the Spamhaus blacklist and will not relay or accept mail for IPs on this list. Customers managing their own mail servers must ensure they are NOT configured to allow open mail relay. Failure to enforce this could lead to BTnet blocking all customers mail as open relays are used for SPAM.

Monitoring is in place to detect customers sending large numbers of undeliverable mail. Their IP addresses will be blocked from using the outgoing mail relay. At the moment the number of undeliverable mail items to trigger this action is 500 message failures received within last 20 minutes (average 25 failures per minute).

Currently BT do not perform any restrictions on message size, Max number of messages per hour or Max number of recipients per mail. However BT reserves the right to restrict these items to protect the Mail platform for all customers.

13 Cleanfeed

BTnet services have Cleanfeed as a standard feature that is enabled by default. Cleanfeed blocks access to internet sites included on the Internet Watch Foundation (IWF) list. The system uses a filter to capture any attempts to reach URLs / IP addresses on the IWF black-listed websites list only and then black holes the traffic.

The system is designed to cater only for port 80 HTTP traffic through a special 2 stage filter that compares requests against known black-listed websites. All other traffic bypasses the filtering system. Customers attempting to access a blacklisted site will receive an "HTTP Error 404 Website not Found" message

BT plays no part in the construction or identification of sites contained within the IWF list. Nor does it add any other categories or items for consumer blacklisting. BTnet does not hold any records of access to sites on the IWF list.

A customer, who wants the blocking removed, must request this at time of order (or via their BT Account Manager for existing services). A checkbox on the final stage of the BTnet order (on Quick Quote) can be de-selected if Cleanfeed is not to be applied.

¹ Reverse DNS is IP address to domain name mapping, the opposite of forward (normal) DNS which maps domain names to IP addresses.

Please note, any queries on the sites listed must be made directly with the IWF and not BT. Please see the IWF site for details (<http://www.iwf.org.uk/>) for the process to unblock incorrectly identified URLs sites.

14 Customer Utilisation Reports

A User Portal is available on request which will provide an on-line bandwidth utilisation report for no additional charge.

The information provided by these reports offer three levels of detail:

- **Service summary** - the Service Summary Dashboard gives you the 'big picture' of your service's effectiveness.
- **Feature summary** - traffic reports on Links allow you to maximise the effective use of these service features.
- **Feature detail graphs** - detail how specific values have changed over your selected time period (i.e. a trend graph) and allow you to analyse time-dependent situations.

For the feature summary and the feature detailed graphs customers can select to see a report for a day, week, month or year time period.

With easy access to the reports 24/7 along with the clarity, the coverage and depth of your reports provide a number of benefits including:

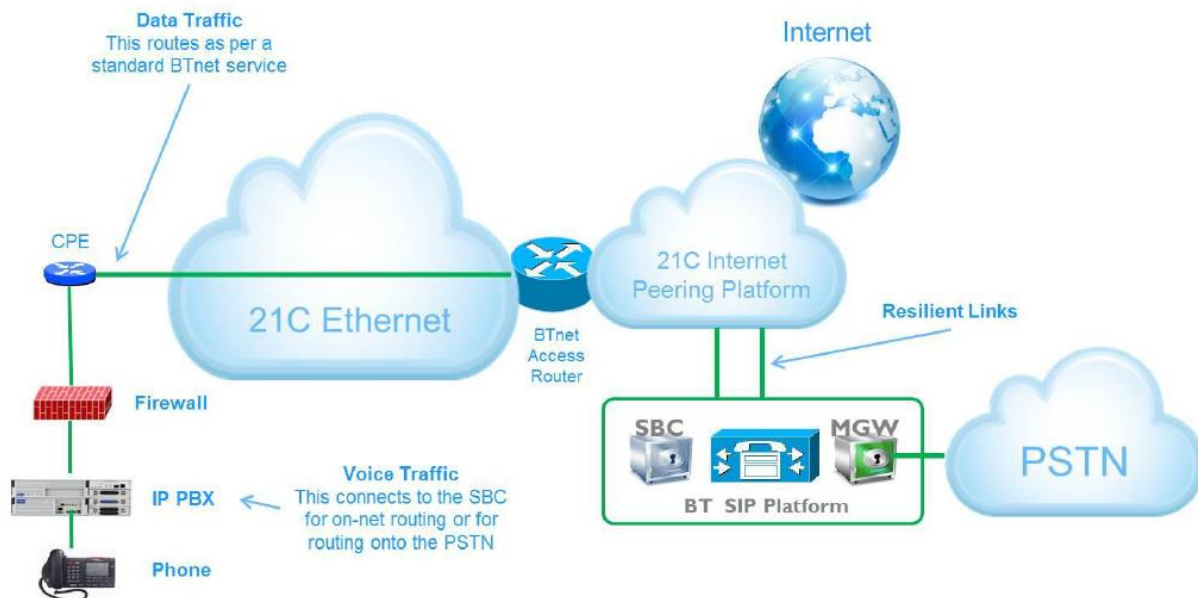
- Web Browser based access
- Effective control of service cost and utilisation
- Ability to plan for future enhancements to the service.
- More easily identify and resolve any end-to-end networking issues.

15 SIP and Voice Services

Voice over IP services utilise SIP (Session Initiation Protocol) as the signalling protocol that sets up real-time voice connections over IP networks. BT voice services are available based on SIP trunking that use BTnet as the access solution for the voice service. BTnet provides the connectivity between customer voice equipment and the network-based SIP server and PSTN exchange (which allows outgoing and incoming calls from the PSTN).

For services provided with a Managed CPE, BTnet has been developed to provide an element of Quality of Service (QoS) at the egress points across the BTnet connection, i.e. downstream from the BTnet access router to the Customer site and upstream from the BTnet managed CPE router to the BTnet core/PSTN. The QoS applied is prioritisation of the Voice traffic over the non-delay sensitive data traffic. This provides an enhanced connection to reflect the need for a real-time application to have low variance in delay (aka jitter)

This is illustrated in the following diagram:



Please note that BTnet product does not provide nor is responsible for any of the SIP service elements (PBX, Phones, etc.). BTnet is simply the transport mechanism used by the voice services to deliver this service.

16 Service Level Agreement (SLA)

BTnet is covered by a Service Level Agreement (SLA), which will provide guarantees and targets in three areas; Installation, Availability and Network Latency. This enables BTnet to give you a commitment to a high standard of network performance.

Please see the BTnet Service Schedule and Terms and Conditions available at www.bt.com/terms for further information. Details of the SLA are also available on request from your BT Account Manager or Specialist.

17 Maintenance and Firmware Updates

The quality and reliability of your BTnet internet access service is our number 1 priority and from time to time that means, as explained in our Terms and Conditions; that we might need to carry out network maintenance or provide firmware updates to your Managed on-site equipment.

These updates allow us to offer performance and service improvement as well as occasional bug fixes. We thoroughly test any firmware updates before rolling them out to our customers and have scheduled them out of Business Hours to take place at a time which we hope will minimise any impact to your service and business operation.

Firmware updates to the Managed CPE will be completed remotely with no action required by you. The device will reboot itself once the update is complete which will result in a very small amount of downtime, After this, your service should work as normal with no further action needed.

We will alert you to scheduled network or equipment maintenance in advance wherever possible.

18 Customer Service

BTnet provides a comprehensive SLA and aims to clear faults within 5 working hours of the fault being reported for all services. A single point of contact is available for fault reporting:

To report a fault:

- Tel: 0808 100 2440 (BT Retail customers)
- Tel: 0800 456 5909 (BT Global Services/Wholesale Customers)

BTnet provides comprehensive arrangements for:

- order entry & provision management
- fault management
- billing

19 Service Delivery

19.1 Service Delivery Overview

An appointed service desk will centrally manage the provision of a BTnet service ordered from BT. Delivery support will be available Monday to Friday between 8am and 5pm, excluding public holidays.

The service desk will co-ordinate and own the provision of your new order and progress it appropriately. A number of functions are carried out which includes project management (where appropriate), service design, commissioning and acceptance testing.

Once the order validation and any necessary survey activity are complete, you will receive confirmation of acceptance of the order, target delivery dates, order reference number (PIP reference), and notification of any additional costs. You will be requested to verify your acceptance of any additional costs as a prerequisite to delivery.

The service desk will continue to manage delivery of the order through to completion and will provide you with regular progress updates.

A service guide will also be provided explaining the service features, key information and key contacts.

Once the order is completed, the service desk will ensure that it has been delivered to your complete satisfaction. You may be requested to provide a satisfaction assessment of the overall support provided. Billing will only commence once the service has been delivered and accepted by the customer.

19.2 Additions, Modifications & Cessation

The initial request for additions, modifications and cessation may be made directly via your BT Account Manager or Specialist. All activities will be coordinated in a similar way as previously described for new service delivery.

All modifications can be broken down into two basic categories:

- Minor Modification – an in-life modification that does not require a contract resign such as a port speed ‘flex’ or an IP address change. There is an option for a new contract to be resigned by the customer for some minor modifications if required.
- Major Modification – a modification that requires a contract resign such as an external shift of the service, bearer size upgrade or change in service variant.

Modifications supported are detailed in the following table:

Modification Name	Price Impacting	Modification Category	Lead-time	Description
Add /Remove BGP	No	Minor	10 Working Days	Add or remove BGP Dynamic Routing on the customers service
Add / Remove DDoS	Yes	Minor	10 Working Days	Add or Remove DDoS on the customers service
Add / Remove Failover	Yes	Major	As per standard lead-times for new provide orders (Access type dependent)	Add or Remove Failover for the customer’s service. For Add modification, this will involve a new access bearer provided diversely from the existing circuit. Additional Excess Construction Charges are likely to provide diversity on these services.
Add / Remove Loadbalancing	Yes	Major	As per standard lead-times for new provide orders (Access type dependent)	Add or Remove Loadbalancing for the customer’s service. For Add modification, this will involve a new access bearer provided diversely from the existing circuit. Additional Excess Construction Charges are likely to provide diversity on these services.
Add / Remove Back-up	Yes	Major	As per standard lead-times for new provide orders (Access type dependent)	Add or Remove Back-up for the customer’s service. For Add modification, this will involve installing a back-up access service without impacting the customer’s current primary circuit.
Change from Loadbalancing to Failover	Yes	Major	10 Working Days	Change the resilient configuration on a customer’s service from Loadbalancing to Failover.
Change from Failover to Loadbalancing	Yes	Major	10 Working Days	Change the resilient configuration on a customer’s service from Failover to Loadbalancing.
Bearer Speed Change and/or External Shift	Yes	Major	As per standard lead-times for new provide orders (Access type dependent)	<p>This modification provides a seamless migration of an existing customer’s service to a new access service. This is to meet either changing requirements for the service (e.g. more bandwidth) or to support an external shift of the service to a new customer location. The modification order delivers a new 21C service to the customer site and migrates their existing service features (and IP addresses) to the new service before recovering the old service. This also means the customer is only billed for the active service and does not bear the cost of dual running.</p> <p>There is also the option to add a resilient service (where none already exists) at the same time as performing this modification.</p>
Change Port Speed (Flex)	Yes	Minor	3 working days	Ability to change a port speed within the constraints of the existing access circuit
Change port speed (Flex)	Yes	Major	10 working days	Ability to change a port speed within the constraints of the existing access circuit where

where CPE change is required				a Managed CPE change is also required. A new contract term will apply.
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Company Name / Address Change	Yes	Minor	5 Working Days	Records-only update of Company contact details
Contract Resign	No	Major	N/A	Contract resign with no change to customer price or service features. Only available within last 3 months of existing term
Disaster Recovery Modification	Yes	Minor	10 Working Days	Ability to Modify or Cease an existing Disaster Recovery plan
Internal Shift	Yes	Minor	30 Working Days	Internal shift provides the ability for the access circuit to be moved to an alternative location within the existing customer site. Time related charges will apply. Not available for BTnet Express services
IP Address Change	Yes	Minor	10 Working Days	Modification for any change of IP address information on the customer's service
Modify Mail / DNS	Yes	Minor	10 Working Days	Ability to Add, Modify or Cease a customer's Mail or DNS service
Request Customer Reports	No	Minor	10 Working Days	Order to add Customer Reports to a service if not already provided by default
Remove Managed CPE	Yes	Major	10 working days	Ability to remove any Managed CPE option and revert to wires only service.
Add Managed CPE	Yes	Major	20 working days	Ability to add a Managed CPE option if existing wires only service is being used
Change Managed CPE	Yes	Major	10 working days	Ability to change between available Managed CPE options if required.
Change Managed CPE LAN Interface (available on certain router models only)	Yes	Minor	15 working days	Ability to change between 1000 Base T and 1000 Base SX LAN interfaces on the 1Gb Managed CPE models (see CPE Service description for more information)
Add / Remove <i>BTnet Security</i> package	Yes	Minor	3 working days	Ability to add or remove the <i>BTnet Security</i> package where supported from your Managed CPE option
SNMP Read Only Access Modification	Yes	Minor	10 Working Days	Ability to Add, Modify or Cease a customer's SNMP Read Only Access service.
Add Voice (Hosted VOIP/SIP Trunking)	No	Minor	2 Working Days	Ability for existing customers to add the SIP Voice enabled service capability to their BT managed service. Please note this is for BT Retail and BT Wholesale customers only. If existing service is not currently managed then BT CPE must first be ordered and installed.

Regrade to 21CN Fibre	Yes	Major	As per standard lead-times for new provide orders (Access type dependent)	<p>This modification provides a seamless migration of an existing customer's legacy 20CN service to a new 21CN fibre service. This modification order delivers a new 21C service to the customer site and migrates their existing service features (and IP addresses) to the new service before recovering the old service. This also means the customer is only billed for the active service and does not bear the cost of dual running.</p> <p>This option only allows the existing resilience options to be retained if they also exist on 21C fibre; otherwise a non-resilient option is supplied.</p>
Regrade to 21CN EFM	Yes	Major	As per standard lead-times for new provide orders (Access type dependent)	<p>This modification provides a seamless migration of an existing customer's legacy 20CN service to a new 21CN EFM service. The modification order delivers a new 21C service to the customer site and migrates their existing service features (and IP addresses) to the new service before recovering the old service. This also means the customer is only billed for the active service and does not bear the cost of dual running.</p> <p>This option only allows the existing resilience options to be retained if they also exist on 21C EFM; otherwise a non-resilient option is supplied.</p>

In the case of a cessation order, the service will be suspended and a final invoice issued prior to actual decommissioning of the physical BT elements of the service.

A cease order must be supported by an email or faxed letter on your headed note paper, to your BT Account Manager.

19.3 Lead Times

Service	Target Service lead-time
BTnet Express using GEA access FTTC	40 working days
BTnet Express using GEA access FTTP	45 working days
100Mbps, 500Mbps, 1Gbps Ethernet	Subject to survey, location and delivery category. Lead time estimation available on request at point of order
10Gbps Ethernet	Subject to survey, location and delivery category. Lead time estimation available on request at point of order. Certain delivery options may carry additional lead time
Data Centre Access (1Gb and 10Gb bearer options)	15 working days

Note: 'Working days' refers to standard working hours, Monday to Friday, excluding public holidays. All lead-times are subject to site survey and line plant availability at customer site and therefore are not a committed date for delivery of service.

20 Termination of Service

Termination of service details is covered by BTnet Service Schedule and Terms and Conditions available at www.bt.com/terms

21 Pricing

For a full explanation of BTnet prices, including provision, rental and added service charges, please contact your BT Account Manager or specialist.

22 Billing

You will be charged the relevant annual rental for the services you have taken. This will be billed quarterly in advance and your first bill will also include any applicable connection charges and Excess Construction Charges (ECC) where appropriate.

All bills will include a contact number for billing enquiries. Billing will commence from the time that the BTnet service is delivered and accepted by the customer.

For billing enquires Tel: 0800 679 320, option 2
Email: crbilling03@bt.com

23 Other Information

Further documentation is available from your BT Account Manager or specialist. This includes:

- BTnet Service Level Agreement (SLA) documentation
- Terms and Conditions. See www.bt.com/terms, in 'Broadband and Internet Services'
- BTnet Brochure
- BTnet DDoS Data Sheet
- BTnet Customer Premises Equipment (CPE) Service Description
- BTnet Resilience Service Description

24 Abbreviations

The following terms and abbreviations in this document are defined and used as follows:

21CN	21 st Century Network
BGP	Border Gateway Protocol
CPE	Customer Premise Equipment
CRF	Customer Requirement Form
DNS	Domain Name Service
DOS	Denial of Service

DDoS	Distributed Denial of Service
DR	Disaster Recovery
EAD	Ethernet Access Direct (access circuit type)
ECC	Excess Construction Charges
EFM	Ethernet in the First Mile Technology
EVC	Ethernet Virtual Connection
Gbps	Gigabits per second
GEA	Generic Ethernet Access
FTTC	Fibre to the Cabinet
FTTP	Fibre to the Premise
HSRP	Hot Standby Routing Protocol
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISP	Internet Service Provider
IWF	Internet Watch Foundation
KCI	Keeping Customers Informed
LE	Local Exchange
Mbps	Megabits per second
NTE	Network Terminating Equipment
PA	Provider Aggregatable
PI	Provider Independent
PoP	Point of Presence – the exchange location where your access circuit connects into the BTnet service.
OLO	Other Licensed Operators
SLA	Service Level Agreement
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
VLAN	Virtual Local Access network

Annexes

Annex 1: Bandwidth throughput

BTnet provides the latest high-quality Ethernet Access based services to connect the customer to the Internet. As such all port speeds are sold as Ethernet (Layer 2) speeds. As with any ISP using this technology, bandwidth throughput differs in relations to the protocol being used and where the throughput is being measured from. The IP layer throughput will be different to the Ethernet layer throughput due to the overheads associated with delivering the IP packet over the Ethernet access.

The IP throughput can vary based on the type of IP applications being run e.g. IP Telephony traffic has far greater overheads compared to FTP traffic due to the nature of the voice application driving the need to package the voice data into small IP packets to be sent over the IP network quickly and at regular intervals as opposed to the FTP traffic that is typically sending large (non real-time) data across the network in large IP packets.

So the customer's BTnet service can potentially achieve an IP throughput of up to 98% however this may decrease based on applications being used over the Internet Access connection.

This is not just applicable for BTnet services, any Ethernet (layer 2) Internet Access service purchased from any other ISP will be subject to the same bandwidth throughput considerations.