



SIN 329

Issue 9.6

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Suppliers' Information Note

For The BT Network

BT Broadband IP Products Service Description

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1. Introduction

Definitions:

Customer: The Service Provider (SP) or Business Customer (BC) who purchases the BT IPstream service from BT and sells or provides it to End-Users.

End User: The person using their PC to connect to a SP/BC's IP network via the BT IPstream service.

This Suppliers' Information Note (SIN) provides service description information about BT Central, BT Central Plus, BT IPstream S500/S1000/S2000 and BT IPstream 500, which form part of BT's Internet Protocol (IP) Transport Services portfolio (SIN 302^[1]). This SIN should be read in conjunction with SIN 302, BT's Internet Protocol (IP) Transport Services, SIN 336^[2] detailing BT's USB interface, SIN 386^[3] detailing BT IPstream Office, Home, Max and Max Premium products, SIN 374^[4] detailing BT IPstream L2TP interface and SIN 405^[5] detailing BT IPstream Symmetric.

All BT IPstream products are provided on shared infrastructure. The BT IPstream S and BT IPstream Office /BT IPstream Max Premium products have priority, through the shared part of the BT IPstream network, over the BT IPstream 500 and the BT IPstream Home /BT IPstream Max products. During a busy period a BT IPstream office, BT IPstream Max Premium or BT IPstream S product will receive a higher downstream throughput than the equivalent BT IPstream Home, BT IPstream Max or BT IPstream 500 product.

End user equipment used for the BT IPstream S and BT IPstream 500 products are described in detail in SIN 346.

BT IPstream Home Office Max and Max Premium products present an auto-sensing PPP layer – this will automatically configure itself to the PPP protocol and encapsulation presented by the End User's equipment. The supported combinations are: PPPoA VC-mux, PPPoA LLC/SNAP, PPPoE LLC/SNAP. See SIN 386 for more detail.

The BT IPstream Symmetric service offers a symmetric IP connectivity between Customers and their End Users providing a wires only SHDSL interface. End Users are connected to the Service Provider's BT Central link (not available on BT Central Plus) over BT's High Speed Data Network. See SIN 405 for more detail.

The BT Central product provides a connection from the BT Network to the Customer and is a necessary component for the end to end connection of BT IPstream S Series, BT IPstream Office, BT IPstream 500 or BT IPstream Home, BT IPstream Max or BT IPstream Max products to the Customer. The BT Central products are available for use by Customers (including OLOs, and Business Customers) to connect a number of End Users to their network.

The BT Central Plus product provides a simple and complete solution to Service Providers who wish to offer a Broadband Internet consumer service. Unlike the BT Central product that connects BT IPstream Ends Users to a Service Provider's network, the BT Central Plus service connects End Users directly to the Internet. Please note that where the Customer has opted for BT Central Plus with the Standard Charging option only the BT IPstream 500 and BT IPstream Home End User products are allowable for use with BT Central Plus.

BT Central Plus is aimed at Service Providers who do not want to manage their own Internet connections or IP networks.

BT IPstream enables a Customer to access multiple End Users via an IP network. The Customer owns the sales, marketing and recruitment of End Users and the contractual/service relationship. BT supplies the delivery transport and basic service.

For further information on the commercial aspects of this service, please refer to:

Your BT National Account Manager

BT Broadband Helpdesk via e-mail to: broadband.enquiries@bt.com

BT Broadband Helpdesk on 0800 0283663

ADSL website <http://www.btwholesale.com> > Broadband community

BT Wholesale website <http://www.btwholesale.com>

BT Terms website <http://www.bt.com/terms>

If you have inquiries relating to this document, then please contact: help@sinet.bt.com

2. Availability

The BT IPstream products will only be available over BT provided PSTN Lines (including Wholesale Access). There are also technical reach limitations, which will prevent ADSL-carried services being available to End Users beyond approximately 3.5 km from the local exchange for the BT IPstream Home 2000, BT IPstream S2000, and BT IPstream Office 2000 products, and beyond approximately 6 km for the, BT IPstream Home 1000, BT IPstream S1000 BT IPstream Office 1000. However, users on BT IPstream 500, BT IPstream S500, BT IPstream Home 250, BT IPstream Home 500 and BT IPstream Office 500, BT IPstream Max and BT IPstream Max Premium products may be able to obtain service at greater distances from their local exchange.

Note: The new reach limits on the 'fixed' and 'rate adaptive' products comes into force on the 6th of September 2004. Prior to this date the limit was 6 km for the 'rate adaptive', and 3.5km for the 'fixed' products.

During the initial order handling process, BT will check the suitability of the line for ADSL services and advise accordingly.

The products are only available in areas where BT has rolled out ADSL exchange equipment. There is a programme for rolling out capability across the UK. (See BT's ADSL website <http://www.btwholesale.com/broadband>

Some existing telephony based services may be affected by the techniques used to deliver the BT IPstream services over the same metallic line. This includes:

- 30k loop
- Private Circuits
- ISDN - all types
- Home Highway or Business Highway
- ISDN - Digital Calls & Access

- ISDN Connect
- RedCareⁱ
- FeatureNet 5000 services
- FeatureLine Hunt Groups
- Meter Pulse Facility
- PBX and AUX lines

We can only provide a single BT IPstream service over a single PSTN exchange line.

End Users can only receive a single Broadband Service over a PSTN line.

Please note that this list is not exhaustive. We will endeavour to update this list as new information becomes available.

3. Service Outline

BT IPstream consists of seven access products, BT Central, BT Central Plus, BT IPstream S Series, BT IPstream 500, BT IPstream Office, BT IPstream Home (see SIN386 for BT IPstream Home and Office) and BT IPstream Symmetric (see SIN405 for BT IPstream Symmetric). For end-to-end service the Customer will need at least one BT Central or BT Central Plus and multiple BT IPstream products.

3.1 Overview of BT IPstream Products

The basic architecture of the BT IPstream products is as follows:

3.1.1 Service with BT Central

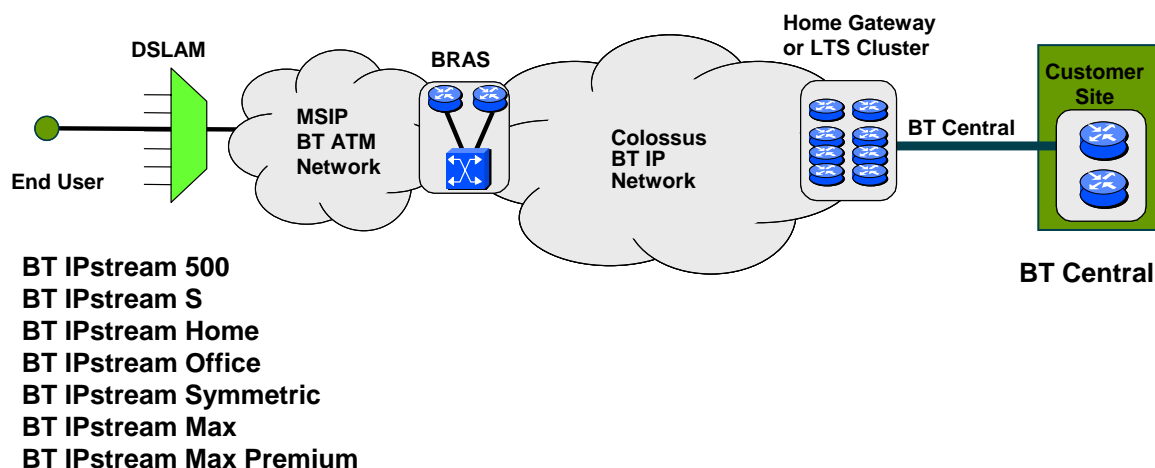


Figure 1. Basic architecture of the BT IPstream service with BT Central

ⁱ Redcare is being made compatible with ADSL. Call the Redcare General Information Helpdesk on 0800 800 828 for the latest information.

3.1.2 Service with BT Central Plus

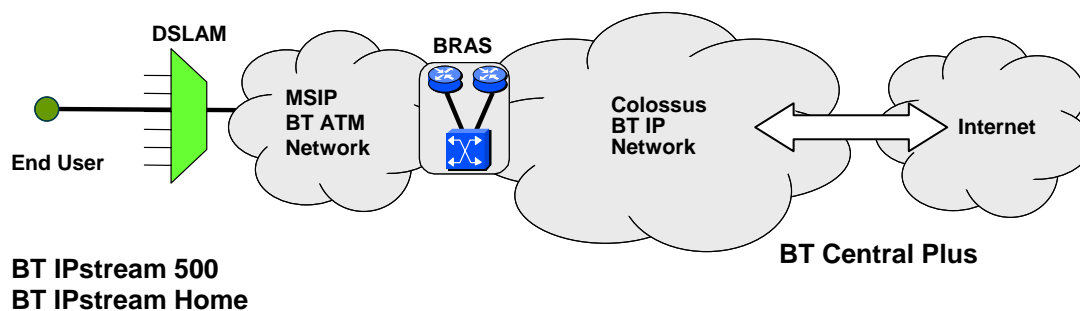


Figure 2. Architecture of the BT IPstream service with BT Central Plus

The BT IPstream 500, BT IPstream Office and BT IPstream Home, BT IPstream Max and BT IPstream Max Premium products enable connectivity between End Users and BT's High Speed Data Network. Customers will be provided with IP connections to End Users premises using Asymmetric Digital Subscriber Line (ADSL) technology.

The End Users connections are provided using the same copper access network as existing PSTN services. The ADSL technology over the copper pairs feeding each End User ensures that BT IPstream products and the PSTN service can co-exist. This service will only be available on a BT provided PSTN (or BT provided Wholesale Access) line.

The BT IPstream product's Network Termination Point is defined as the End Users-side of the Network Termination Equipment (NTE) installed by BT on the End User premises.

4. **BT IPstream S Series**

4.1 General

This provides session controlled ADSL based IP connectivity between an End User and a BT IPstream S Broadband Access Server (BAS) in the network, from which the End User connects to the Customer.

Please note that the BT IPstream S Series products will be withdrawn from new supply on 30th June 2006. By 31st December 2006 all support for existing services will be withdrawn. Customers who have existing BT IPstream S Products will be required to re-grade to an alternative BT IPstream product. For further information please refer to www.btwholesale.com.

4.2 BT IPstream S Products

The BT IPstream S products are suitable for Customers addressing the SoHo, remote office and tele-working access markets.

The BT IPstream S products have the following IP data rate options available for End Users:

- BT IPstream S 500 - Up to 512 kbit/s downstream; adaptive between 57 kbit/s and 256 kbit/s upstream (rate depends on line length and other related transmission conditions).
- BT IPstream S 1000 - Up to 1.024 Mbit/s downstream, up to 256 kbit/s upstream.
- BT IPstream S 2000 - Up to 2.048 Mbit/s downstream, up to 256 kbit/s upstream.

The IP data rate is defined as the rate available for the transport of IP packets in the payload of ATM cells, note however that each IP packet will incur ATM adaptation layer, PPPoA/oE and encapsulation layer overheads. The maximum IP throughput rate that can actually be achieved will hence vary considerably depending upon the IP packet size. No allowance is required for the overhead introduced by the ATM layer, as this has already been taken into account in the above figures.

The BT IPstream S products (Type 1, 2 & 5 installations) present a 10baseT Ethernet (IEEE 802.3^[6]) connection (s) to the End User as per SIN 302, the Type 6 installation available from July 05 offers a 10/100baseT Ethernet (IEEE 802.3^[6]) connection (s) to the End User as per SIN 302.

The product supports:

- Dynamic IP addressing with many to one Network Address Translation (NAT) with the option of disabling DHCP.
- A Statically routed IP address (No-NAT) solution where the order requires the specified IP Address range to be used, the IP Address of the 10baseT Ethernet interface and whether or not DHCP is required.
- A port based routed solution (Port Address Translation, PAT), incorporating the use of NAT with the ability to map protocols to IP addresses. PPPoA using VC based multiplexing (for BT IPstream Home and Office only support is also provided for PPPoE using LLC/SNAP (this is planned to be introduced in 2003) as defined in RFC2364^[8] and RFC 2516^[9] – see SIN386 detailing BT IPstream Office and Home products)

On services where dynamic addressing is utilised the option is available to specify more than one destination BT Central/BT Central Plus domain name. Limited Service Selection (LSS) enables End Users to switch between different BT Central links. It does not support the End User connecting simultaneous sessions. This is of particular benefit to Customers, for example, wishing to allow End User access to a company network and an Internet Service Provider. Service selection also has the benefit of allowing End Users a backup access should their primary BT Central fail. Configuring service selection will be under the control of the Customer so they can control the services available to their End Users and will be limited to a maximum of 4 alternative destinations. It is not permissible for End Users on Capacity Charging to be connected to another Customer's BT Central/BT Central Plus utilising the Limited Service Selection (LSS) capability of BT IPstream where the BT Central/BT Central Plus is charged at Standard Charging.

Typically the End Users require occasional, fast, but 'bursty' access to private network facilities and / or the Internet (via the Customer). The products are not suitable for End Users who require continuous bit-rate, full-bandwidth services.

4.3 BT IPstream S Series, End User Installation

4.3.1 BT IPstream S Series, End User Implementation

From July 2005 BT IPstream S introduced a new combined Modem/Router for all new provisions and repair and this is known as the Type 6 installation, prior to this the installations were known as Type 5 and before this were known as type 1 and type 2 installations. Information on these is retained to support existing installations.

The End User will require a computer running an Internet Browser of at least Netscape 4 or Internet Explorer 4 (JavaScript support is needed) and with a 10baseT Ethernet card and TCP/IP protocol stack installed.

Type 1 and Type 2 Installations:

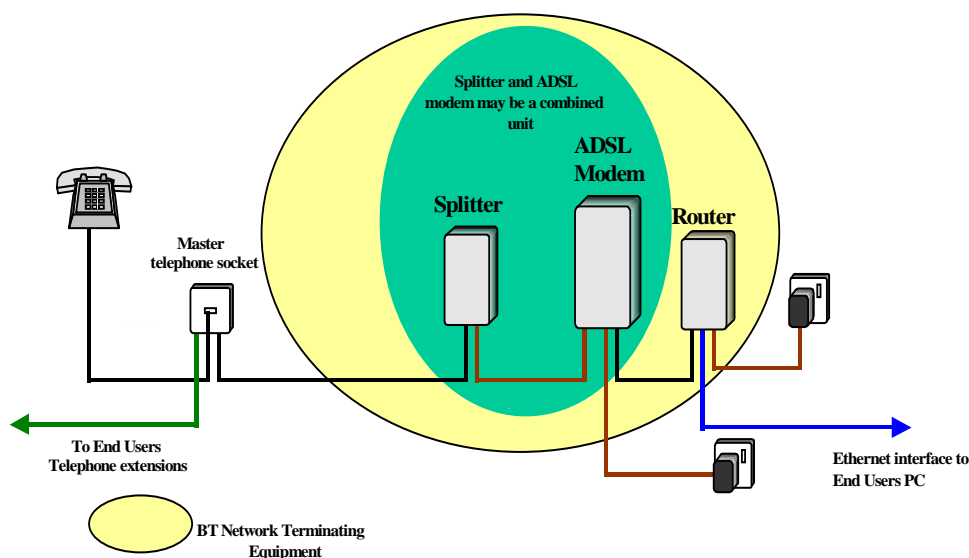


Figure 3. BT IPstream S Series, End User Installation (Type 1 and Type 2)

Prior to July 2000 the End-User “NTE” consisted of an ADSL modem, a PSTN splitter and a small router (Note: the splitter and modem may have been, a combined box or two separate boxes). The router will present a 10baseT (RJ45) Ethernet connection(s) to the End User. With Type 1 and Type 2 installations, the End User will require a direct point-to-point Ethernet connection between the PC and the NTE, a cross-over cable (see Table 1) is required. Alternatively, if one or more End Users are connected to an Ethernet hub – which is then connected to the NTE – straight-through cables are then required from both the NTE to hub, and the hub to PC.

Details of the cross-over cable (this must be wired using Category 5 UTP cable with RJ45 connectors) between the End User PC and the NTE Router are shown in Table 1.

Router		PC
Pin number	Colour	Pin number
1 (TX+)	white/orange	3 (RX+)
2 (TX-)	orange	6 (RX-)
3 (RX+)	white/green	1 (TX+)
6 (RX-)	green	2 (TX-)
5	white/blue	5
4	Blue	4
7	white/brown	7
8	brown	8

Table 1. RJ45 cross-over cable pin allocations

Type 5 Installation

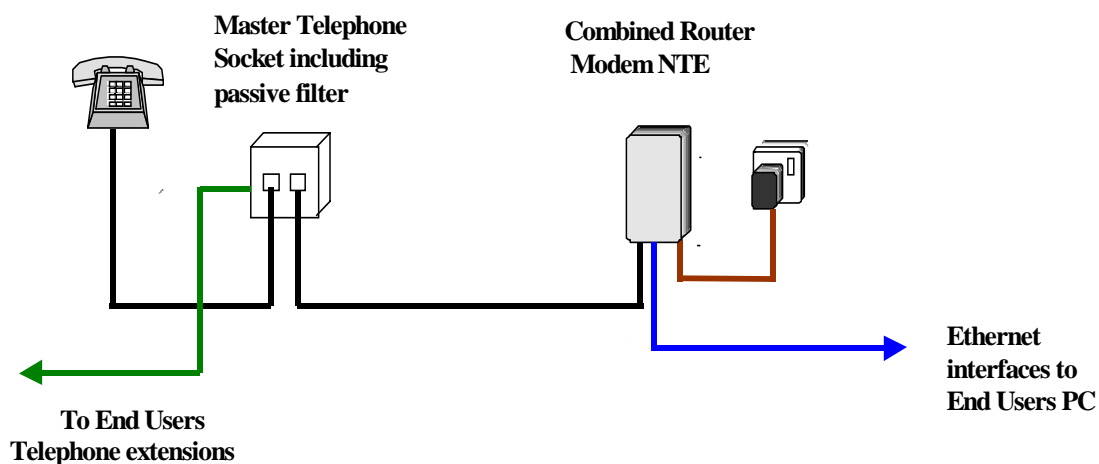


Figure 4. BT IPstream S Series, End User Installation (Type 5 & 6)

There are three types of NTE (Network Terminating Equipment) deployed for BT IPstream S. Type 1 can be identified by single status LED on the ADSL modem and no separate splitter unit. Type 2 can be identified by five status LEDs on the ADSL modem and a separate splitter unit. **Since launch, Type 1, 2 and 5 installations are no longer deployed. The Type 6 installation is now standard for End User installation.** This has the advantage of providing 4 x RJ 45 10/100 Ethernet ports, allowing simple connection of 4 devices. The functionality of the router is the same as the Type 1 and 2 installations. An additional advantage is that either standard straight Ethernet or “crossover” cables can be used. A single straight Ethernet cable (supplied without maintenance cover) will be provided as part of the Type 6 installation.

Please note that the 4 x Ethernet ports are shared not “switched” ports and are autosensing for both speed and cable configuration.

If you wish to “cascade” another hub device from the new combined Modem/Router, you will need an Ethernet cable to connect them.

For all types of BT IPstream S installations the maximum cable distance between the Master Telephone Socket and the ADSL modem/router is 30 metres.

For the Many to One NAT option the End User is required to set their TCP/IP configuration to “Obtain an IP address automatically”. On starting their PC, the NTE will allocate a private address via DHCP to the End User(s). By default the subnet used is 192.168.254.1-253, with DHCP serving in the range of 1 to 199, which are automatically served to the End Users PC, and addresses 200 to 253 are available as static address on the End User sub net. Alternative subnets and DHCP ranges are supported.

IP addresses will be assigned dynamically to the End User NTE. The Customer will supply the End User IP address. Many to One NAT is used to translate the End User IP address to the dynamically allocated address of the NTE.

Please note that if a DHCP service is specified, the LAN port IP Address of the End User NTE cannot be allocated from this range, but must be allocated a “static” IP address”

The product will cater for pre-defined, potentially overlapping, private IP addressing employed by the End User, using many to one NAT to translate to the dynamically assigned addresses associated with the active Customer session. The End User NTE performs the Network Address Translation.

As an option BT offer a “no NAT” statically routed IP address option. This works as follows:-

- The WAN port of the Router is still served an IP address from the Customer’s RADIUS server in the same manner as the Many to One NAT version.
- The IP subnet on the LAN port of the router will need to be globally registered if unrestricted access to the Internet is required. These addresses can be DHCP served, static or a combination of both. This would be suitable for End User applications such as web or other servers.
- Private Customer supplied IP addresses or the default BT supplied addresses can be used if restricted access is required. For example, access to a corporate Intranet or to an ISP using NAT or some form of address translation for Internet access. These addresses can be DHCP served, static or a combination of both.
- The Customers RADIUS will need to download a route to the NTE Router pointing to the static LAN side subnet at session set up. Please refer to further detail in section 6.1.2.
- In all cases, this is a fully routable solution.

4.3.2 BT IPstream S Series, Interface

The End User Interface consists of a RJ-45 type socket as specified in the IEEE802.3 specifications. Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed International standard.

BT IPstream S Series is only available on an analogue BT provided PSTN line (or BT provided Wholesale Access). BT IPstream S Series is not available over BT ISDN services. This service cannot co-exist with other ADSL based services on the same PSTN line.

5. **BT IPstream 500 Product**

5.1 **General**

This provides session controlled ADSL based IP connectivity between an End User and a Broadband Access Server (BAS) in the network, from which the End User connects to the Customer.

Please note that the BT IPstream 500 product will be withdrawn from new supply on 30th June 2006. By 31st December 2006 all support for existing services will be withdrawn. Customers who have existing BT IPstream 500 Products will be required to re-grade to an alternative BT IPstream product. For further information please refer to www.btwholesale.com.

5.2 **BT IPstream 500 Product**

The BT IPstream 500 product is suitable for Customers addressing the fast home Internet access market.

The BT IPstream 500 product will be available for End Users with up to 512 kbit/s downstream and adaptive between 57 kbit/s and 256 kbit/s upstream (rate depends on line length and other related transmission conditions) IP data rates. The BT IPstream 500 product presents a Universal Serial Bus (USB – Series A type connector as described in SIN 336) interface to the End User.

The product supports dynamic IP addressing with no Network Address Translation.

5.3 **BT IPstream 500 End User Installation**

The maximum cable distance between the Master Telephone Socket and the USB modem is 30 metres. The USB modem is BUS powered and does not require mains power. The appropriate software drivers will be supplied with the USB Modem on a CD-ROM. The responsibility for loading the drivers is with the Customer or End User.

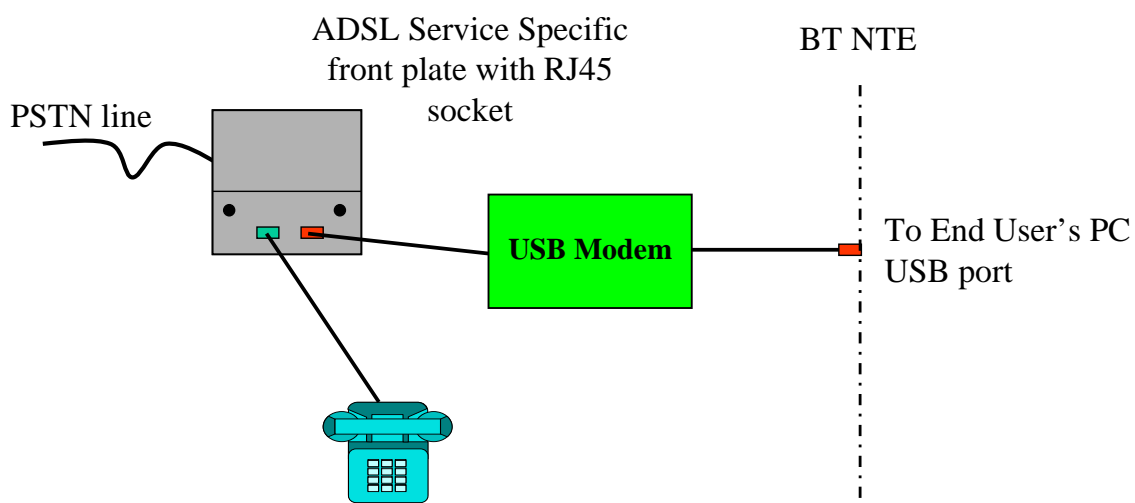


Figure 5. BT IPstream 500 End User Installation

The physical USB Series A type connector interface is described in SIN 336.

The interface delivers and expects a stream of ATM Cells, which are encapsulated in USB packets according to CDC 1.1.

USB bulk data transfer will be used as defined in CDC 1.1.

BT IPstream 500 supports dynamically or consistently (customer RADIUS) served IP addresses.

It is recommended that the minimum specification for the End User's personal computer supports:

- Windows 98SE, Windows 2000, Millennium Edition, XP and Apple MAC.
- An available USB port
- CD ROM drive
- Pentium 133 MHz or higher processor
- 32 Mbytes of RAM or higher

The end (PC) device must be able to:

- load modem specific drivers from a supplied CD
- establish a PPP session
- obtain an IP address from the network by means of a PPP session
- support CHAP authentication
- PPPoA using VC based multiplexing (for BT IPstream Home and Office only support is also provided for PPPoE using LLC/SNAP as defined in RFC2364 and RFC 2516 – see SIN 386)
- carry out upstream traffic shaping to the ATM rate corresponding to the IP data rate

It may be necessary to completely fill USB packets in order to get a good USB bus performance. This will result in cells crossing packet boundaries. In this case, a suitable cell delineation mechanism needs to be implemented in the host. This will form part of the modem driver software.

HEC checking is carried out in the interface. Cells with header errors are discarded prior to the interface. Header and payload protection is provided across the interface by means of the USB packet checksum.

The interface will pass all AAL types.

The interface will pass all VPI/VCI values. The service VPI/VCI will be determined by BT, and will be automatically configured as part of the modem driver installation.

6. BT Central

BT Central is available within the UK, with the exception of The Channel Islands, Isle of Man and Hull.

The customer has a choice of Central products that can be used, which differ in terms of interface/resilience options and bandwidths. Section 6.1 gives a summary of the products that are currently available. The 622 Mbps BT L2TP Central product is described in SIN 412^[10].

Customers should note that BT withdrew the 622 LNS product from new supply on 1st September 2005.

6.1 BT Central Product

The BT Central product enables connectivity between the BT High Speed Data Network and the Customers premises. This link is from the Broadband Access Server (BAS) in the network to the Customers premises and terminates on a NTE, which provides onward IP connectivity to the Customers network. Traffic is carried between BT and the customer premises in two ATM Virtual Paths for all but the 622Mb BT Central – see “Additional Notes” in this section for the effects of this on the service.

Physical connection to the NTE will be via:

- RJ-45 for 10baseT and 100baseT presented services
- Optical fibre – SC connectors for Gigabit Ethernet presented services.

The presentation for the 155Mb L2TP passthrough service is described in SIN 374.

BT Central NTE Power, Weight and rack space requirements of are provided in Table 4.

The BT Central product will be available to Customers in the following bandwidths:

Bandwidth	Interface Presentation	Number of Home Gateways	Maximum Simultaneous Sessions Supported (see note 1)	Typical Maximum IP Throughput Downstream (see note 2)	Total Maximum IP Throughput (Upstream + Downstream) (see note 3)
*512 kbit/s	10baseT Ethernet	1	250	0.37 Mbit/s	0.56 Mbit/s
*1 Mbit/s	10baseT Ethernet	1	250	0.73 Mbit/s	1.1 Mbit/s
2 Mbit/s	10baseT Ethernet	1	250	1.4 Mbit/s	2.1 Mbit/s
*4 Mbit/s	100baseT Ethernet	1	1600	3.1 Mbit/s	4.7 Mbit/s
10 Mbit/s	100baseT Ethernet	1	1600	7.6 Mbit/s	11.4 Mbit/s
34 Mbit/s	100baseT Ethernet	1	1600	25 Mbit/s	38 Mbit/s
*100 Mbit/s	100baseT/Gigabit Ethernet	3	4800	85 Mbit/s	128 Mbit/s
155 Mbit/s	Gigabit Ethernet (optic)	4 or 3	6400	126 Mbit/s	189 Mbit/s

Table 2. BT Central product, available bandwidths

* - BT Central bandwidths 512 kbit/s, 1 Mbit/s, 4 Mbit/s and 100 Mbit/s were withdrawn from new supply from 01.04.2002.

BT L2TP passthrough Central Products are available to customers in the following bearer bandwidths:

Bandwidth	Interface Presentation	Number of Tunnel Switches	Maximum Simultaneous Sessions Supported (see note 1)	Typical Maximum IP Throughput Downstream (see note 2)	Total Maximum IP Throughput (Upstream + Downstream) (see note 3)
155 Mbit/s	See SIN 374	2	8000	113 Mbit/s	170 Mbit/s
622 Mbit/s**	2 x Gigabit Ethernet (optic)	12	32000	557 Mbit/s	836 Mbit/s

Table 3. BT Central L2TP passthrough product, available bandwidths

** - The 622 Mbps BT Central product is rate policed to this value. This product is described in SIN 412.

Note 1: Customers may wish to connect less than the maximum simultaneous sessions supported by the BT Central to achieve their desired contention ratio or bandwidth per active session requirements.

Note 2: The typical maximum IP throughput downstream figures show the indicative IP throughput after protocol overheads have been removed. The actual values will vary depending on the size of the IP packets and mixture of the different sizes of the IP packets transmitted. The IP throughput downstream and upstream will be reduced if the total upstream and downstream traffic exceeds the total IP throughput performance of the BT Central (see Note 3).

Note 3: The total maximum IP throughput figures show the indicative limit of the sum of Upstream and Downstream traffic supported by the BT Central. The actual values will vary depending on the size of the IP packets and mixture of the different sizes of the IP packets transmitted.

The total maximum IP throughput (Upstream + Downstream) has been derived from 1.5 times the downstream IP throughput rate to reflect the asymmetry of the BT IPstream 500, S, Home and Office services. For example, if the downstream traffic is at full line rate and the upstream traffic exceeds half the maximum rate then both upstream and downstream traffic will be constrained to the total maximum IP throughput (Upstream + Downstream). Therefore, downstream throughput may be reduced as a result of the upstream traffic and vice versa.

In particular with the introduction of BT IPstream Symmetric Customers should consider the total maximum IP throughput (Upstream + Downstream) of the BT Central when planning to use the service with BT IPstream Symmetric.

For example, a BT Central 155 Mbit/s Gigabit Ethernet with a total maximum IP throughput of 189 Mbit/s provides up to 94 Mbit/s downstream and 94 Mbit/s upstream if the traffic is symmetrical. If the traffic were asymmetrical then the downstream and upstream throughput would vary between a max of 63 Mbit/s and 126 Mbit/s depending on the asymmetry of the traffic such that the total throughput upstream and downstream does not exceed 189 Mbit/s.

BT is considering introducing in the future other BT Central products with higher total maximum IP throughput (Upstream + Downstream) performance.

Additional Notes:

- BT recommends that BT Central products are not overbooked in terms of number of sessions.
- Only one NTE will be sited on the Customer's premises per Central.
- It is the Customer's responsibility to provide the connection between the BT NTE and their network.
- The number of Home Gateways per BT Central bandwidth may change.
- The BT Central bandwidths in Table 2 and Table 3 are shown rounded off as is normal in the industry. However, "1 Mbit/s" more precisely means 1.024 Mbit/s Line Rate. Likewise, the others in Table 2 and Table 3 mean 2.048 Mbit/s Line Rate, 4.096 Mbit/s Line Rate, 10.240 Mbit/s Line Rate, 33.920 Mbit/s Line Rate, 110.416 Mbit/s Line Rate and 149.76 Mbit/s Line Rate respectively.
- The Standard BT Central 155 Mbits service (not L2TP) is presented to the Customer as a GigaBit Ethernet fibre SX Multi-mode 62.5/125 micron interface using SC connectors. Please refer to SIN 360^[11] for further information.

- Services up to and including 34 Mbps have the Home Gateway (LNS) function within the NTE router on the customer's premises. Bandwidth is delivered to the customer site as two half sized ATM VPs¹ (i.e. the 10 Mbps service will utilise two 5 Mbps VPs). It is a feature of the service that in normal operation traffic between a particular BAS and Home Gateway will always traverse a particular VP (but under failure the traffic will traverse the other VP). Which VP is traversed will vary from BAS to BAS – so both VPs will normally be loaded. There are two side effects of this feature:
 1. It is impossible for any particular user to achieve more than the central VP rate – thus a 2 Mbit/s end user would not be able to achieve more than 1 Mbit/s on the 2 Mbit/s central service.
 2. For low numbers of end users (or where end users share the same geography) there will be a higher statistical probability of traffic imbalance between the two VPs – thus certain groupings of end users may be disadvantaged in comparison with others sharing the same central. In practice, this effect is only significantly noticeable for central services below 10 Mbps.

¹ Delivery of the service on two VP is done for resilience reasons.

Central Type	Physical layer NTE	IP layer NTE
2 Mbps – Type 1	Black Box DSU Height: 43 mm Width: 218 mm Depth: 305 mm Weight: 2.5 kg Heat dissipation: 20 BTU	Cisco 3640 Height: 87 mm Width: 445 mm Depth: 368 mm Weight: 25 kg Heat dissipation: 478 BTU
2 Mbps – Type 2	Cisco 3725 Height: 88.9 mm Depth: 373.4 mm Heat dissipation: 460 BTU	Width: 434.3 mm Weight: 5.2 kg
10 Mbps	Cisco 7204VXR Height: 134 mm Depth: 368 mm Heat dissipation: 1366 BTU	Width: 427 mm Weight: 22.7 kg
34 Mbps – wire	Cisco 7204VXR Height: 134 mm Depth: 368 mm Heat dissipation: 1366 BTU	Width: 427 mm Weight: 22.7 kg
34 Mbps – optic	SMA 1 ADM Height: 534 mm Width: 450 mm Depth: 300 mm	Cisco 7204VXR Height: 134 mm Width: 427 mm Depth: 368 mm Weight: 22.7 kg Heat dissipation: 1366 BTU
155 Mbps – type 1	SMA 1 ADM Height: 534 mm Width: 450 mm Depth: 280 mm	Cisco 7507 Height: 489 mm Width: 444.5 mm Depth: 637.5 mm Weight: 34.5 kg Heat dissipation: 3266 BTU
155 Mbps – type 2	SMA 1 ADM Height: 534 mm Width: 450 mm Depth: 280 mm	Cisco 7204VXR Height: 134 mm Width: 427 mm Depth: 368 mm Weight: 22.7 kg Heat dissipation: 1366 BTU
155 Mbps – L2TP Passthrough	SMA 1 ADM Height: 534 mm Width: 450 mm Depth: 280 mm	None
622 Mbps	2 x LES 1000 - each: Height: 44 mm Width: 439 mm Depth: 220 mm Weight: 3.7 kg	2 x Cisco 3550-12G – each: Height: 67 mm Width: 404 mm Depth: 445 mm Weight: 4.27 kg Heat dissipation: 1790 BTU

Table 4. NTE physical requirements

6.2 BT Central Re-grades

The different types of possible re-grading are:

- Re-grading (up or down) within a band
 - Band A 512 kbit/s, 1 Mbit/s and 2 Mbit/s
 - Band B1 4 Mbit/s, 10 Mbit/s and 34 Mbit/s
 - Band B2 4 Mbit/s, 10 Mbit/s and 34 Mbit/s SDH Resilience
 - Band C 100 Mbit/s and 155 Mbit/s.
 - Band D 155 Mbit/s L2TP
 - Band E 622 Mbit/s L2TP (from 1st September when the 622 LNS product will be withdrawn)
- Re-grading (up or down) between bands A, B1, B2, C and D requires the provision of a new service at the bandwidth you require and the cessation of the original service. There will be a minimum downtime of 1 hour.
- BT Central bandwidths 512 kbit/s, 1 Mbit/s, 4 Mbit/s and 100 Mbit/s were withdrawn from new supply from 01.04.2002

6.3 BT Central L2TP Passthrough

BT Central L2TP Passthrough is an enhancement that presents L2TP (Layer 2 Tunnelling Protocol) tunnels on a 155 Mbit/s STM-1 optical interface (single mode). This option for the 155 Mbit/s BT Central service has the benefit of allowing the Customer to control End User PPP (Point to Point Protocol) sessions directly, by terminating them themselves, rather than having the sessions terminated on the BT Central Home Gateway Router. For further information, please refer to SIN 374.

6.4 BT Central SDH Resilience

BT Central SDH Resilience provides a dual fibre in the SDH Access network down one duct into the Customer's premises, with a single interface to the Customer NTE. This is an optional extra with bandwidths of 4 Mbit/s, 10 Mbit/s, and 34 Mbit/s, and supplied as standard with the BT Central 100 Mbit/s and 155 Mbit/s. There is an option to provide the dual fibre through a second duct into the Customer's premises.

BT Central bandwidths 4 Mbit/s and 100 Mbit/s were withdrawn from new supply from 01.04.2002

6.5 BT Central and PPPoE

PPPoE is now available on all BT Central L2TP products. It will be supported across the rest of the IPstream portfolio, subject to demand & testing with Service Providers.

If a Customer's End Users are using PPPoE (see SIN 386 section 4.4.2.11) then they should be aware of the following behaviour with BT Central.

PPPoE clients should behave as per RFC2516 and RFC1661^[12] – if so:

- PPPoE End User client should send an MRU of 1492 Bytes or less to the BT LAC (in the BAS).
- The BT LAC will send an MRU of 1492 Bytes to the PPPoE client.

- The PPPoE client and BT LAC will agree on the lower value MRU.
- The BT LAC will then proxy on this value to the BT LNS.
- The BT LNS will then advertise this as an IP MTU towards the Customer of 1492 Bytes (or lower if the client asked) for PPPoE End Users.
- The BT LNS will continue to advertise 1500 Byte IP MTU for PPPoA End Users.
- The DF bit on IP packets will be obeyed, not ignored or overwritten, so IP packets over 1492 Bytes to PPPoE End Users with the DF bit set will be dropped.
- A message will be sent back to the server using ICMP stating the maximum packet size of 1492 Bytes.

If the PPPoE client does not obey RFC2516 and RFC1661 (which occurs frequently), one of two circumstances will occur:

- If the PPPoE client does not send an MRU, but agrees the BT LAC MRU of 1492 Bytes then the BT LAC will proxy that value on to the BT LNS which will advertise this as the IP MTU for that End User to the Customer.
- If the PPPoE client and BT LAC do not agree a valid MRU then the BT LAC will default to proxying a value of 1500 Bytes to the BT LNS which will advertise this as the IP MTU for that End User to the Customer.

If the End Users PC is behind the device raising the PPPoE session (for example, on a routed LAN), then the IP MTU of the PC must be set to 1492 Bytes or lower.

7. BT IPstream Configuration for BT Central Services

7.1 Session Establishment²

PPP is used to obtain dynamic IP addresses from the Customers address pool on a per-session basis, by direct allocation off the Customers RADIUS server or from an address pool held on the BT Central. Please note that only one session per End User is allowed. Multiple sessions are not supported.

For BT IPstream S to establish a session to the Customer, the End User points their browser to a web page provided within the End User NTE. This web page provides a mechanism for the End User to enter their username, domain name and password. For formats supported please see section 7.5. The End User NTE will then establish the PPP session.

² This section does not apply to the 622Mb BT Central Product

For BT IPstream 500, to establish a session to the Customer, the End User uses the software provide with the End User NTE to enable the PC to establish the PPP session. The End User will enter their username, domain name and password, for formats supported please see section 7.5.

7.2 IP addressing³

IP addresses can be static, consistently served or be dynamically assigned to the End User NTE during the set-up phase of a PPP session. These addresses are supplied by the Customer from pools which can be kept on up to three of the Customers own local RADIUS (Remote Authentication Dial In User Service) servers. There is an option for IP Address pools to be hosted on the Home Gateway(s) by BT (the default option) – such addresses are dynamically allocated from the pool.

NOTE: It is the Customer’s responsibility to provide:

- IP Addresses (US registered addresses can be supported)
- To provide, install, configure and administer their RADIUS servers

The Customer is able to assign any IP addresses from any address range, excluding BT Management IP addresses to the End User NTE. The IP address must be assigned from the Customer RADIUS, if the Customer is hosting the IP Addresses. The Customer must route to the BT NTE Ethernet IP Address, not the LAN address. The End User session to the Customer can be terminated by the End User from the web page provided by the NTE or when the End User establishes a new session. The session is also terminated if the End User NTE is switched off. In exceptional circumstances, such as abusive usage by an End User, the Customer may request BT to remotely disconnect one of their End User’s sessions forcibly. See Table 2 for the maximum number of concurrent sessions supported by the BT Central NTE Router.

For the “no-NAT” form of BT IPstream S End User installations the Customer must set aside a valid IP subnet from their IP address allocation for assignment to the LAN side of the End User NTE router. Out of the IP addresses within this subnet, two will be unusable for hosts (one will be the subnet number and the other the subnet broadcast address) and a third will have to be assigned to the Ethernet port on the NTE router. (Obviously, the IP addresses encompassed by this subnet are then not available for assignment to other End Users’ NTE). It is essential that a route to this subnet is downloaded to the BT Central NTE router during PPP session establishment. This is done in a RADIUS Access-Accept packet that contains attribute number 26 (the “vendor-specific” attribute, see **Table 6**) as described in section 7.3.

³ This section does not apply to the 622Mb BT Central Product

Option 1: Customer hosts the IP Address pools

End User PPP session comes in and an Access Request packet is sent from BT's NTE to the Customer's RADIUS. The RADIUS replies with a number of attributes (see Table 6), including attribute 8 (Framed IP Address).

Option 2: Customer gives BT the Dynamic IP Address pools to host

End User PPP session comes in and an Access Request packet is sent from BT's NTE to the Customer's RADIUS. The RADIUS returns an Access Accept packet with a number of attributes, which does not include attribute 8, but attribute 26 which includes the IP Address pool name (By default the same as the Central). As the Access Accept packet is returned to BT's NTE, it sees attribute 26 and assigns an IP address out of the pool name (as seen in attribute 26). In the accounting 'Start' messages sent from BT's NTE to the Customer's RADIUS, attribute 8 is included with the allocated IP Address.

7.3 RADIUS Authentication⁴

End User authentication will be achieved via a RADIUS mechanism at session set-up. The BT RADIUS server will authenticate the domain part of the Username and determine the Customer's BT Central and associated Customer's NTE Router. The Customer's RADIUS will then authenticate the End User by their username and password. Only those End Users authorised by the Customer to access the Customer service will be able to establish a session to that Customer.

The Customer's RADIUS Server must conditionally or unconditionally, comply with RFC 2865 "Remote Authentication Dial In User Service (RADIUS)", 2866 "RADIUS Accounting", 2867 "RADIUS Accounting Modifications for Tunnel Protocol Support", 2868 "RADIUS Attributes for Tunnel Protocol Support" and 2869 "RADIUS Extensions" where applicable to the type of service required. It should be noted that the value of the Response Authenticator field in Access-Accept, Access-Reject and Access-Challenge packets will be constructed in the form "ResponseAuth = MD5 (Code+ID+Length+RequestAuth+Attributes+Secret_ where + denotes concatenation", as stated in RFC2865. RADIUS operation will consist of an Access-Request generated by the LAC or Home Gateway Router and forwarded to the Customer's RADIUS server. The Customer's RADIUS Server must conditionally or unconditionally comply with the relevant RFC.

⁴ This section does not apply to the 622Mb BT Central Product

The contents of this request is shown below:

Attribute Number	Attribute Name	Attribute Content
1	User-Name	User@domain or domain/user
3	CHAP-Password	Password
4	NAS-IP-Address	<NTE_Router_IP_Address>
5	NAS-Port	NTE Router Port
6	Service-Type	Framed
7	Framed-Protocol	PPP
61	NAS-Port-Type	Virtual

Table 5. RADIUS Access-Request Contents

Please note the following:-

- The “NAS-IP-Address” is the Home Gateway Router IP Address
- The “NAS Port” is the Home Gateway Router Port

If the authentication is successful, an Access-Accept will be sent from the Customer’s RADIUS server to the NTE Router. If it is not successful, an Access-Reject will be sent.

Below are the attributes BT will accept from the Customer in an Access-Accept request to establish a PPP session.

If any other attributes are sent, BT will remove them, but will still establish a PPP session.

The method used for the policing of the RADIUS Access-Accept attributes is to make use of an additional proxy RADIUS server that logically lies between the Customer’s RADIUS server and the BT Central NTE, for all BT Central Services, except the BT Central L2TP Passthrough service. All RADIUS packets that pass between the NTE router and the Customer’s RADIUS server pass via the proxy RADIUS server. In the RADIUS Access-Request packet that is sent to the Customer’s RADIUS server, the source IP address is that of the proxy RADIUS server. Therefore the Customer’s network must have a static (host-specific) route back to the proxy RADIUS server via the Ethernet port on the NTE router. In actual fact, there are two proxy RADIUS servers operating in a main and standby mode so two such host-specific static routes are required. These should take the following form:

<proxy_RADIUS_IP_address>via <NTE_router_Ethernet_IP_address>

<proxy_RADIUS_IP_address> via <NTE_router_Ethernet_IP_address>

BT use Network Address Translation (NAT) to connect the to the BT Proxy RADIUS Server. BT will use two Customer supplied IP addresses to NAT to the BT Proxy RADIUS server, as default. As an option the Customer can choose to use BT provided IP addresses for the Proxy RADIUS server. This has the benefit of offering a more straightforward routing solution for the Customer.

These are how appropriate routes would appear in the routing table of a router attached to the same LAN as the BT Central NTE, the “/32” means a host-specific route or one with a net mask of 255.255.255.255.

Attribute Number	Attribute Name	Attribute Content
6	Service –Type	<i>Framed</i>
7	Framed-Protocol	<i>PPP</i>
8	Framed-IP-Address	<i>Customer Administered IP Address</i>
25	Class	<i>Value used to mark accounting records.</i>
26	Vendor Specific	<i>Used for no-NAT routing updates and identifying from which IP address pool on the Home Gateway an address is to be allocated from</i>
27	Session Timeout	<i>Minimum Supported 7200 seconds</i>
28	Idle Timeout	<i>Minimum Supported 7200 seconds</i>

Table 6. Supported RADIUS Access-Accept contents

NOTE:

- Attributes 6, 7 and 8 are mandatory.

(Attribute 8 is mandatory in an Access-Accept packet, but this is not the case when using an IP address pool configured on the Home Gateway Router, where Attribute 26 (ip:addr-pool=<poolname>) would replace Attribute 8 in the reply string from the Customer RADIUS)

- If either the Idle or Session timeouts are less than 7200 seconds then BT will overwrite this value to be a default value of 7200 seconds. If either timeout value is not supplied (i.e. there is no timeout required for the session) then BT will leave this unchanged.
- The BT Proxy RADIUS will receive from and send to, both 1645/6 and 1812/3 port options but will default to 1645/6 unless requested to do otherwise. A Customer can still comply with the relevant RFC and use ports 1645/6, as their use is not mandatory. It should be noted that the BT Proxy RADIUS will not necessarily send from or receive to, ports 1645/6 or 1812/3.

Attribute 26 (the “vendor-specific attribute”) is used in a RADIUS Access-Accept packet for two functions, both of which need to be done during the establishment of a PPP session:

- For downloading one or more DNS server addresses to either an End-User’s NTE router (in the case of BT IPstream S) or directly to an End-User’s host (in the case of BT IPstream 500),
- For downloading to the NTE router a route pointing to a “no-NAT” BT IPstream S End-User’s LAN subnet.

The first of these is carried out using the following syntax:

```
ip:dns-servers=<Primary_DNS_IP_address> [Secondary_DNS_IP_address]
```

(The secondary DNS address is optional and if there are two then they must be separated by a space.)

If the RADIUS server doesn't support Cisco as a vendor then the correct entry is
Vendor-Specific="9:1:"ip:dns-servers=<primary_DNS_IP_address>
<Secondary_DNS_IP_address (if used)>

The second function is carried out using the following syntax:

```
ip:route=<NTE_router_LAN_subnet_number> <subnet_mask>
```

For example, if the IP subnet assigned to a given "no-NAT" BT IPstream S End-User's LAN were 192.168.10.24/29 (note the use of the "slash notation") then the appropriate command would be:

```
ip:route=192.168.10.24 255.255.255.248
```

The resulting route added to the NTE router's routing table will allow the End-User's LAN to become addressable. This route will automatically be removed when the End-User's PPP session terminates.

For all of the above commands, the appropriate formatting for vendor-specific attributes as described in the relevant RFC must be used (with the "Vendor-Id" set to 0x00000009 (for Cisco) and the "Vendor type" set to 0x01). There are a number of RADIUS parameters that can be "fine tuned" to optimise the interaction between the BT Broadband Network and the Customers RADIUS. The Customer should arrange for these changes to be implemented via their BT Account Management team. These are listed in the following sections.

7.3.1 Accounting

BT provides accounting messages as detailed in Table 7. RADIUS accounting messages are supported on all BT Centrals except for BT Central 155 Mbits/s L2TP and BT Central Plus.

Start and Stop accounting is provided as standard – the following are provided as an option:-

- Interim accounting.
- Traffic counting attributes (both octets and packets – attributes 42, 43, 47 and 48).
- Gigaword count attributes (wrap-rounds on octet counters – attributes 52 and 53).

The additional attributes (42, 43, 47, 48, 52 and 53) can be requested using the BT Central CRF as described in the Handbook for the BT IPstream service available from the ADSL website – <http://www.btwholesale.com/broadband> .

The interim accounting period is two hours.

The RADIUS accounting data transfer attributes (42, 43, 47 and 48) have a level of accuracy comparable with typical IP traffic measurement equipment however there are circumstances under which accounting packets and records may be lost. The traffic measurements are therefore an approximate indication of the individual End User traffic.

Start accounting will be delayed to allow the allocated IP address to be returned.

Attribute	Value	Type of Value	Start	Interim (Option)	Stop
User-Name	1	string	✓	✓	✓
NAS-IP-Address	4	integer	✓	✓	✓
NAS-Port	5	integer	✓	✓	✓
Service-Type	6	integer	✓	✓	✓
Framed-Protocol	7	integer	✓	✓	✓
Framed-IP-Address	8	integer	✓	✓	✓
Class	25	string	✓ *	✓ *	✓ *
Proxy-State	33	string	✓	✓	✓
Acct-Status-Type	40	integer	✓	✓	✓
Acct-Delay-Time	41	integer	✓	✓	✓
Acct-Input-Octets	42	integer	✓**	✓**	✓**
Acct-Output-Octets	43	integer	✓**	✓**	✓**
Acct-Session-Id	44	string	✓	✓	✓
Acct-Authentic	45	integer	✓	✓	✓
Acct-Session-Time	46	integer			✓
Acct-Input-Packets	47	integer	✓**	✓**	✓**
Acct-Output-Packets	48	integer	✓**	✓**	✓**
Acct-Terminate-Cause	49	integer			✓
Acct-Input-Gigawords	52	integer		✓**	✓**
Acct-Output-Gigawords	53	integer		✓**	✓**
NAS-Port-Type	61	integer	✓	✓	✓

Table 7. Start and Stop Accounting attributes

*: If Attribute 25 (Class) is returned in an Access-Accept packet then RADIUS Protocol says it should be included in accounting requests for that session.

** These attributes (42, 43, 47, 48, 52 and 53) are available as an option requested via the BT Central CRF.

7.3.2 RADIUS Default Timers

With extremely busy networks the following settings are recommended:

Home Gateway Router	timeout=10 seconds	no of retries=2
BT Proxy RADIUS	timeout=7 seconds	no of retries=0
Service Provider Proxy (if used)	timeout=3 seconds	

7.3.3 Test User Account

As part of the installation of BT Central, we will require a test user account to verify that the BT Network has aligned correctly with the Customers.

7.4 Routing Protocols

The use of BGP4^{[13][14]} routing protocol may be requested on BT Central service (Home Gateway). This option is only available on BT Centrals of 10 Mbits/s and above. Customers will want to use this feature if they wish to be informed of routing updates as result serving an IP address (using attribute 8 in the access- accept message) or downloading an ip:route (using attribute 26 in the access accept message).

Only the Interior form of BGP is used – the BT Central service peers with the Customers Gateway Router (which forms the next hop from the Central). The Home gateway router(s) will form an autonomous system with the Customers gateway router. This will be configured with a private AS number of 65400.

Customers will find this feature essential when using RADIUS IP address served or ip:route (no-NAT) features of the service in conjunction with the One to Many Domain Name Option. Outside of this static routing can be used in most situations.

7.5 Domain Names:

BT supports a number of domain name options on the BT IPstream service. These options are detailed below.

7.5.1 Access Domains (Access from the End User)

Described below are the mapping of domain names to BT Central Links and how the BT IPstream service works by connecting End Users to BT Central links through the BT Platform RADIUS. There are three options available.

- **One to One**

This is the default option, which maps one domain name to one BT Central link.

- **Many to One**

This option allows for more than one domain name to be used on one BT Central link. BT IPstream support up to a maximum of 50 domain names. This offers Customers more flexibility in constructing their service and tailoring it to their End Users.

- **One to Many**

This allows one domain name to be mapped to a group of BT Central links. PPP sessions are sequentially distributed over the Home Gateways/LTSs, and offers a form of resilience. This is not true load balancing. If a BT Central is lost, any PPP sessions lost will re-establish on another BT Central link (when a new PPP session is initiated). When the BT Central service is re-established the Customer must either force all the PPP sessions to re-establish manually, or allow re-balancing over time, with the natural churn of End Users.

Customers should note that there is current limit of 480 Home Gateways / LTSs that can be supported in a One to Many group and this will limit the number of BT centrals that can be configured against a domain name. The number of Home Gateways / LTSs in a central is specified in Table 2 and Table 3 respectively. For example, this restriction will mean that there is an upper limit of 240 BT Central L2TP 155 Mbit/s in a One to Many group.

A combination of 'Many to One' in conjunction with 'One to Many' will provide a 'Many to Many' capability.

Please note:

- *One to Many groups of BT Centrals of differing bandwidths are not supported because sessions are sequentially shared between the BT Centrals and this would lead to higher contention on the lower speed BT Centrals in the group.*
- *One to Many groups must be all the same type i.e. all BT Central L2TP services or all standard BT Central services, a mixture is not supported.*
- *BT Strongly recommends that the Customer provides BT with two extra IP addresses, and BT will NAT the proxy RADIUS to those addresses, which is more efficient with the Customer's RADIUS Packet Routing.*
- *Where the Customer is using IP addresses served from their RADIUS then BGP4 Routing must be used.*
- *The BGP4 routing protocol is only available on BT Centrals of 10 Mbit/s and above. This means that solutions involving the use of One to Many and RADIUS served IP addresses or ip:routes (no-NAT) cannot be used on BT Centrals of below 10 Mbit/s*

7.5.2 Presentation Domain (How the domain is presented to the Service Provider)

This is how the username and domain name is presented to the Customer in the RADIUS Access requests. There are three formats available listed below.

- **Default Domain Name**

Two formats of presenting the domain name and user name are supported. These are:

End.user@link.business-name.com

Link.business-name.com/end.user

Please note:

- *The characters '!', '/', '\', '%', '@' and '#' are reserved characters and can not be used within a username or domain name.*
- *It is possible for Customers to receive "domain/user" even if they are expecting "user@domain". How this is processed is up to the Customer.*

Please note that the Virtual Domain Name and Domain Name-less options (presented below) are not compatible with the '/' delimiter Domain Name format.

- **Virtual Domain Names**

This option will allow a portion of the username to be included in the domain name of the BT Central link.

For example a Customer with a domain name of 'sp.com' (configured as a virtual domain), and a user with a username of Fred Smith who works for Acme will have *fred.smith@acme.sp.com* presented to their RADIUS. This could be used for example by groups of end users using multiple mailboxes from a single connection e.g. different first names for a family connection, employees of a company, or groups of end users who wish to retain their company identity when having service delivered by a 3rd party network provider.

With Virtual Domain Names everything to the left of the first '.' in the Domain Name is treated as a wildcard, everything to the right of the first '.' is treated as the selecting Domain Name (the Domain Name entered on the End User CRF). E.g. in:-

fred@bloggs.isp.com

"fred" is the username

"bloggs" is the wildcard

"isp.com" is the selecting domain name.

Where a customer's domain name is configured as a virtual domain name, BT's network has been configured to accept an End User login *with or without* the 'wildcard' element of the virtual domain name. From the first example, both *fred.smith@acme.sp.com* and *fred.smith@sp.com* would be valid. However, this functionality is dependent on an acceptable format for the selecting domain name.

Acceptable formats of the selecting domain name on the virtual domain order request are shown in the following examples.

Example 1. “*isp.com*”, “*isp.net*” etc, which allows end users to login **with or without a wildcard** preceding the selecting domain name (*isp.com*)

e.g. allowing logins of [fred@bloggs.isp.com](#) OR [fred@isp.com](#) (where *bloggs* is a wildcard)

Example 2. “*isp*” where the end user of that customer **will be using a wildcard** [separated from the selecting domain name by a “.” (dot)] to precede the selecting domain name as part of the end user login

e.g. allowing a login of [fred@bloggs.isp](#) (where *bloggs* is the wildcard)

Please note that the login [fred@isp](#) **will not work**, where the selecting domain name is in the format “*isp*” i.e. with no ‘.’ (dot) in the selecting domain name.

- **Domain Nameless⁵**

This option allows the username only to be presented to the Customer RADIUS, stripping away the domain name.

For example a Customer with a domain name of ‘sp.com’ and a user with a username of ‘fred.bloggs’, will have only ‘fred.bloggs’ presented to their RADIUS.

This option is used in the corporate sector for simplification of the RADIUS set up.

Please note:

- *When selecting this option, a domain name is still required to be assigned to the BT Central link in order for the BT IPstream service to work.*

7.5.3 Username and Domain Name length

The maximum length of the combined username and Domain Name string can be no longer than 253 characters (including the separator).

The maximum length of a Domain Name is 32 characters (applies to everything to the right of the first ‘.’ If the Virtual Domain Name option is selected).

⁵ This section does not apply to the 622Mb BT Central Product

7.5.4 Session Handling under failure⁶

If a BT Central loses all connectivity with the Customer's RADIUS server then PPP sessions destined for that BT Central will be terminated within the BT network. This feature protects the BT network from the effects of End User's equipment continuously trying to establish a PPP session and thus protects the rest of the service from a degraded performance. The feature terminates the PPP session within a special "captive" environment where DNS requests are re-directed to allow End Users using web-browsers to view a page that informs them the connection to their Customer is down. End Users may disconnect and try to establish another session at will.

The maximum PPP session duration associated with this feature is currently 10 minutes.

7.6 MTU Size

The maximum MTU size on the BT Broadband network is 1500 bytes – the IPstream infrastructure now ensures that End User data packets up to and including this size are carried without fragmentation. Customers should use an MTU size of 1500 bytes on the link toward the BT central.

This feature applies at the layer being carried by IPstream PPP. If tunnelling protocols (such as PPTP or IPSEC) are being used over this connection customers should advise end users to configure the MTU on these higher layers correspondingly smaller to ensure that the packets being carried by the IPstream PPP layer do not exceed 1500 bytes.

Customers using the L2TP passthrough central services should note the MTU size on the central link should be set to 1600bytes to ensure 1500 byte end user packets are carried without fragmentation (See SINS 374 and 412).

Customers using PPPoE should read section 6.5 to assess its impact on MTU size.

8. BT Central Plus

8.1 General

This service differs from BT Central as the Customer requires no accommodation to support the service because the BT Central Plus provides the direct Internet connection. Customers can specify their own domain names for their BT Central Plus service. Up to 50 domain names per Customer can be used to allow the Customer to customise the service offerings, allowing Virtual ISP configuration.

BT Central Plus is available in two charging variants:

- BT Central Plus – Standard Charging
- BT Central Plus – Capacity Charging

⁶ This section does not apply to the 622Mb BT Central Product

By default Standard Charging will apply. A Customer may opt for either Capacity Charging or Standard Charging in accordance with the ordering process described in the Handbook relating to the BT IPstream Service. When a Customer opts into either charging option it is not permissible to change to the other option within 3 months of the date the chosen charging option starts to apply.

If a Customer has opted for Capacity Charging then Capacity Charging prices will apply to all of the components of their BT IPstream Service. It is not permissible for a Customer to mix Capacity Charging and Standard Charging.

If a Customer has opted for Standard Charging then Standard Charging prices will apply to all of the components of their BT IPstream Service. It is not permissible for a Customer to mix Standard Charging and Capacity Charging.

It is not permissible for End Users on Capacity Charging to be connected to another Customer's BT Central/BT Central Plus utilising the Limited Service Selection (LSS) capability of BT IPstream where the BT Central/BT Central Plus is charged at Standard Charging.

A range of reports will show Customers the utilisation of their BT Central Plus service. Daily report files (csv format) are available to BT Central Plus Customers which detail per End User, Connection, Upstream and Downstream traffic information. A Weekly Milestone Report file is also available detailing End User info regarding connection & service type. To register for these reports please contact your BT Account Manager.

8.1.1 BT Central Plus – Standard Charging

BT Central Plus - Standard Charging can be used in conjunction with all BT IPstream Home products and BT IPstream 500; other BT IPstream products are not supported. At least one BT Central Plus service must be purchased to provide end to end service.

BT Central Plus Standard Charging is purchased in blocks of 5000 ports, each port supporting 1 End User session.

Each port is dimensioned to provide Internet connectivity to match the speed and performance of BT IPstream 500 and BT IPstream Home products.

The provisioned BT Central Plus service can be expanded or reduced by adding or removing blocks of 5000 ports. This is achieved by raising a provision or cease order on a BT Central Plus Customer Requirement Form.

The standard lead-time to provide the initial BT Central Plus service is 65 working days. Subsequent 5000 port blocks have a standard lead-time of 5 working days.

8.1.2 BT Central Plus – Capacity Charging

BT Central Plus – Capacity Charging is used in conjunction with any BT IPstream End User Access option and is sold in two components:

- BT Central Plus – Access, this provides a block of 100 Mbps of capacity connecting BT IPstream End User Accesses to the BT Central Plus network.
- BT Central Plus – Internet, this provides a block of 100 Mbps of capacity connecting BT IPstream End User Accesses via the BT Central Plus network to the Internet.

Customers must purchase both BT Central Plus-Access and BT Central Plus-Internet to provide an end to end service. Customers may purchase different quantities of BT Central Plus-Access and BT Central Plus-Internet if required.

In order to opt into BT Central Plus – Capacity Charging the Customer is required to purchase a minimum of 1Gbps of BT Central Plus – Access and 1Gbps of BT Central Plus – Internet, this is necessary to ensure efficient utilisation of IP addresses.

When a Customer takes BT Central Plus Capacity Charging, the BT Central Plus can be expanded or reduced (but not below the minimum capacity requirements) by adding or removing blocks of 100 Mbps. This is achieved by raising a provision or cease order on a BT Central Plus Customer Requirement Form.

Customers must purchase sufficient 100 Mbps blocks of BT Central Plus – Access capacity and BT Central Plus – Internet capacity to meet their traffic requirements (including any traffic peaks) at all times.

Please note the follow applies to both BT Central Plus – Standard Charging and BT Central Plus – Capacity Charging variants:

- Provision of RADIUS by the Service Provider is not required as the BT platform performs the authentication task
- BT is planning to support an option for a Customer RADIUS for Authorisation, Audit and Accounting information
- Only dynamic IP address allocation provided by BT is supported. There is no option for Service Provider supplied IP addresses. Static and consistently served IP addresses are not supported and therefore addressable hosts such as web servers or email servers are not supported.
- POP3 Email is not provided as part of this service.
- No idle session time-out is set for BT Central Plus service. *Idle session timeout options are being considered for future developments.*
- The product is not suitable for End Users who require continuous bit-rate, full-bandwidth services.
- The standard lead-time to provide the initial BT Central Plus is 65 working days. Subsequent BT Central Plus blocks have a standard lead-time of 5 working days
- Standard lead times for BT IPstream apply.
- BT reserves the right to “port scan” the BT Central Plus service. This is done in the interests of protecting End Users from the abusive or malicious intent of other Internet users.

8.1.3 Interface Option for BT Central Plus with Capacity Based Charging

- An option for BT Central Plus with Capacity Charging is to support the interfacing of customer equipment located on a Broadband PoP site for use with BT Central Plus. This equipment will be under the control of the Customer. This will allow the Customer to develop amongst other things, feature rich services for their End Users and control their bandwidth demands.
- This introduces flexibility to BT Central Plus Customers that already exists for Customers utilising BT Centrals.
- This option is not available for BT Central Plus Standard Charging Customers.
- The Customer will need to provide, using the BT Wholesale Locate Venture product, an enclosure at each Broadband PoP site for their equipment.
- Although Customers are not obliged to have a ubiquitous service, for the Customer to provide a nationwide feature set they will have to have an enclosure at every Broadband PoP site.
- The option is ordered via a CRF (which can be found on the BT Website) and the Customer will need to fill in all the required details. The Standard Lead time for the interface option is 65 working days upon acceptance of the CRF. This does not include the provision of the Customer enclosure at the Broadband PoP sites which is a pre-requisite. If the Customer wishes to cease this option at any PoP Site, they will need to fill in a cease request on the CRF and allow for a minimum of 10 working days from acceptance of the CRF before the change becomes effective.
- The ingress and egress Customer traffic will be via multiple Gigabit Ethernet interfaces presented on a patch panel for which rack space will need to be allocated within the Customers enclosure. Egress customer traffic will be handed back to BT.
- The standard patch panel presents SC type fibre connectors. The Patch Panel itself does not restrict usage to a particular fibre type (i.e. Multi Mode or Single Mode) however BT normally utilises Multi Mode. These presentations will be agreed at the time of order placement.
- The number of these interfaces will be agreed with the Customer based on current and future traffic flow predictions. These will be monitored as part of an ongoing capacity review.
- The Customers End Users will be presented on these interfaces as IP traffic. PPP sessions are not extended to the interfaces.
- The routing protocol used is IGP/EGP coupled with Policy Based Routing which is used to control & direct the flow of ingress & egress traffic. In addition an EGP is required at the Customer interface. The IGP is OSPF^[15] while the EGP is BGPv4
- BGP is utilised to advertise a default route to the Upstream Customer routers and BT Central Plus addresses to Downstream Customer routers. The Customer BGP AS will be a private AS and will not be advertised by BT.

8.2 BT Central Plus and PPPoE

If a Customer's End Users are using PPPoE (see SIN 386 section 4.4.2.11) then they should be aware of the following behaviour with BT Central Plus (this applies to both BT Central Plus – Standard Charging and BT Central Plus – Capacity Charging variants).

PPPoE clients should behave as per RFC2516 and RFC1661 – if so:

- PPPoE End User client should send an MRU of 1492 Bytes or less to the BT RAS.
- The BT RAS will send an MRU of 1492 Bytes to the PPPoE client.
- The PPPoE client and BT RAS will agree on the lower value MRU.
- The BT RAS will advertise this as an IP MTU towards the Internet of 1492 Bytes (or lower if the client asked) for PPPoE End Users.
- The BT RAS will continue to advertise 1500 Byte IP MTU for PPPoA End Users.
- The DF bit on IP packets will be obeyed, not ignored or overwritten, so IP packets over 1492 Bytes to PPPoE End Users with the DF bit set will be dropped.
- A message will be sent back to the server using ICMP stating the maximum packet size of 1492 Bytes.

If the PPPoE client does not obey RFC2516 and RFC1661 (which occurs regularly), one of two circumstances will occur:

- If the PPPoE client does not send an MRU, but agrees the BT RAS MRU of 1492 Bytes then the BT RAS will advertise this as the IP MTU for that End User to the Customer.
- If the PPPoE client and BT RAS do not agree a valid MRU then the BT RAS will default to advertising a value of 1500 Bytes as the IP MTU for that End User to the Customer.

If the End Users PC is behind the device raising the PPPoE session (for example on a routed LAN), then the IP MTU of the PC must be set to 1492 Bytes or lower.

9. BT Central Plus Static IP

9.1 Service Outline

BT Central Plus Static IP will enable customers to use a BT Central Plus to offer business applications as part of their product set, as currently BT Central Plus is restricted to consumer/residential use.

The introduction of BT Central Plus support for Static IP Addressing adds functionality to the existing BT Central Plus product.

This will allow customers to offer business type applications that require a static IP address using a BT Central Plus. Currently the product only supports dynamically served addresses which cannot support all types of business application.

This will enable customers to make efficiencies by merging their consumer and business end user traffic onto the same platform. For example, Consumer traffic is predominantly in the evenings and Business during the day. Currently a Service Provider with a BT Central Plus platform for Consumer End Users would have to support a separate platform (for example BT Central Classics) for Business End users.

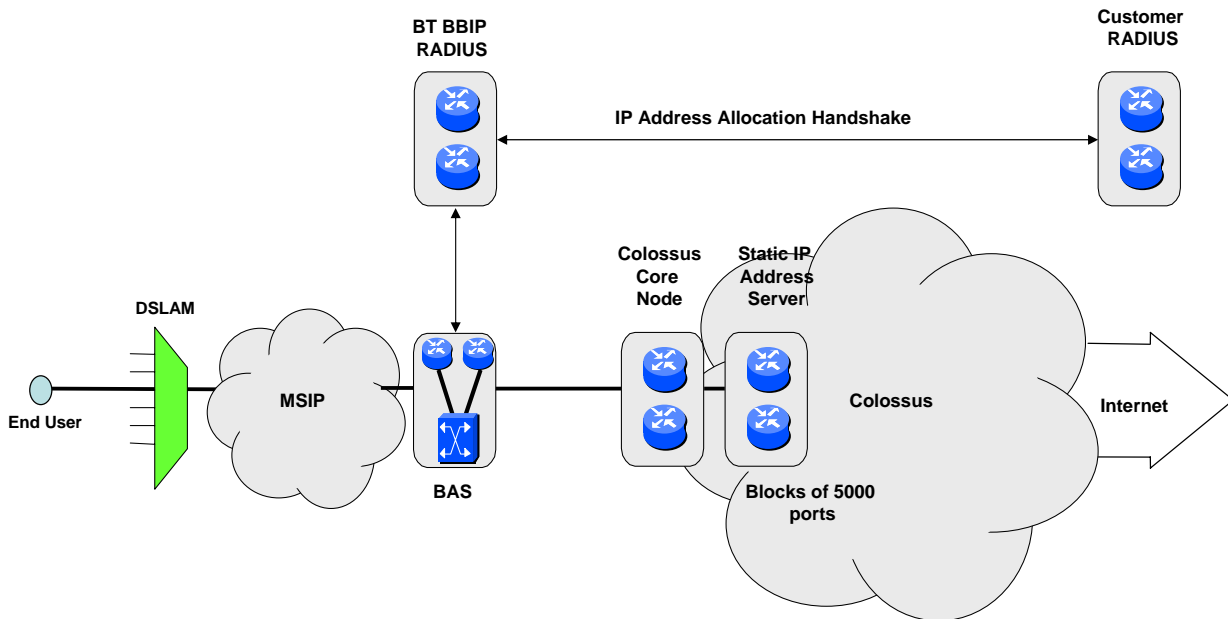


Figure 6. Static IP Address Support on BT Central Plus

9.2 Service Availability and Tariffs

Please refer to the Customer Handbook for a full explanation of how this service can be ordered. The tariffs will be published in the BT Price list.

Terms and Conditions and the Customer Handbook will be made available from the www.btwholesale.com/broadband site.

9.3 BT Central Plus Capacity Charging with Static IP Support

Blocks of 5000 Static IP enabled ports are purchased in addition to blocks of BT Central Plus Access and Internet bandwidth, each port supporting 1 End User session.

A constraint in the service means that 5000 ports are assumed to have a maximum throughput of 20 kbit/s per port, therefore the block of 5000 ports will have a throughput constraint of 100 Mbit/s. Either of these “running out” will mean a new order needing to be generated. There will be 2 measures, one based on ports and the other based on bandwidth utilisation. Both will be used to trigger the need to order additional capacity. This will be included as part of the normal capacity reviews with the customer.

There will be a connection charge and a yearly rental charge for each block of 5000 Static IP ports with an option to pay rental charges monthly or quarterly.

Please note that this service is not currently available on BT Central Plus Standard Charging.

9.4 IP Addressing

For the static/No NAT IP address it is up to the customer to obtain/host the static/No NAT IP addresses for their End Users. The customer will need to supply and advise BT of the range of network addresses assigned for their users and update BT with new assignments. This is necessary so that BT network equipment may be appropriately configured. The customer will need to ensure that the addresses provided are easy to summarise to allow BT to minimise routing table size in their network equipment.

End User PPP sessions will be terminated on HGR (LNS) equipment at Business C+ POP sites with addresses allocated via the SP Radius.

Notes:

- Only RIPE IP addresses supported by the product.
- Contiguous blocks of IP addresses are required to enable efficient routing. Domain names/IP addresses from blocks can not be shared between sites/logical POPs.

For no-NAT End User access the Customer will need to provide a valid IP subnet from their IP address allocation for assignment to the LAN side of the EU Router. A route to the subnet will be downloaded to the HGRs during PPP session establishment. This is done via a RADIUS Access-Accept packet that will contain attribute number 22 (the “Framed-route” attribute, see Table 11). The HGR will complete the routing statement by adding whatever WAN address has been allocated to the session for the NTE Router.

For Dynamic End Users the addresses are provided from the BT owned address Pools and therefore the customer does not need to host these addresses.

9.5 Radius Authentication

End User authentication is carried out via the RADIUS mechanism at session set-up. The BT Central Plus Static IP product supports/requires a customer Radius to be present.

The Customer’s RADIUS Server will need to support the Relevant Radius IETF RFCs as identified in this SIN.

Two options exist for the support of Static IP/No NAT on BT Central Plus Static IP. One Option relates to SPs who share dynamics/statics EUs on a common domain. This requires a method to separate out the dynamics.

The other option relates to SPs that do not share domain names between static/No NAT EUs and Dynamic EUs. Dynamic end users who are using separate domains are terminated on the BRAS in PTA mode. Static/no NAT EUs are supported in tunnelled (LAC) Mode. This is true for both options.

9.6 Option 1: For customers who mix Dynamics & Static/No NAT on same domain name

For customers whose EUs (Static/No NAT/Dynamics) share domain names, the BT Platform Radius will need to proxy RADIUS access request messages to the customer Radius from the BRAS in order to separate out the Dynamic EUs and terminate these End Users directly on the BRAS.

For this endeavour, in the unlikely situation that the BT Radius is unable to communicate with the Customer Radius, the BT Radius will reject end user service requests until such time that the SP Radius is able to handle the authentication requests.

The Customer Radius servers will need to be accessible through public Internet addresses. It is the Customer's responsibility to send back appropriate attribute contents as defined below so that Dynamic and static/No NAT users can be differentiated. The contents of the Access request is provided in Table 8.

ATTRIBUTE_NUMBER	ATTRIBUTE_NAME	ATTRIBUTE_CONTENT
1	User-Name	User@domain
2	User-Password	<Password>
3	CHAP-Password	<Password>
4	NAS-IP-Address	<RAS IP Address>
5	NAS-Port	<End-user RAS Port>
6	Service-Type	Framed
7	Framed-Protocol	PPP
33	Proxy-State	<determined by RADIUS>
61	NAS-Port-Type	Virtual

Table 8. BRAS Access-Request Attributes

In return, the following Accept message attributes need to be supported by the Customers for Dynamic/Static/No NAT users.

ATTRIBUTE_NUMBER	ATTRIBUTE_NAME	ATTRIBUTE_CONTENT	MANDATORY
6	Service-Type	Framed	Yes
7	Framed-Protocol	PPP	Yes
8	Framed-IP_Address	Customer Administered IP Address	No
11	Filter-Id	Static or Dynamic Filters	No
22	Framed-Route	Used for No-NAT routing updates	No
25	Class	<string> to appear in all Accounting-Requests associated with the session	No
27	Session Timeout	Minimum Supported 7200 seconds	No
28	Idle Timeout	Minimum Supported 7200 seconds	No
33	Proxy-State	<determined by RADIUS>	No

Table 9. Access-Accept Attributes

For each type of EU the following Attribute contents will be required from the Customer in the Access-Accept messages.

Business Dynamic (Dynamic users have an IP address allocated to them from the IP pool on the BRAS)

RADIUS Access-Accept packet will contain the following attributes from the customer:

Attribute 6 Service-Type “Framed-User”
Attribute 7 Framed-Protocol “PPP”
Attribute 33 Proxy-State <determined by RADIUS>

Business Static (Static Users have a statically defined IP Address)

RADIUS Access-Accept packet will contain the following attributes:

Attribute 6 Service-Type “Framed-User”
Attribute 7 Framed-Protocol “PPP”
Attribute 8 Framed-IP-Address <determined by SP>
Attribute 33 Proxy-State <determined by RADIUS>

Business No-NAT (No-Nat users have a Framed-Route and do not use Network Address Translation)

RADIUS Access-Accept packet will contain the following attributes:

- Attribute 6 Service-Type “Framed-User”
- Attribute 7 Framed-Protocol “PPP”
- Attribute 33 Proxy-State <determined by RADIUS>
- Attribute 22 Framed-Route <determined by SP>

If the Customer does not send back either the Framed-IP-Address or Framed-Route in an access-accept from the SP RADIUS then the service is terminate at the RAS (PTA Mode).

If either Framed-IP-Address, Framed-Route or both attributes are returned in an access-accept message then the service should tunnel to a home gateway (LNS) similar to a BT Central service. The HGRs are load shared within a domain groups/sites.

The Customer will be responsible for ensuring that EUs are appropriately distributed amongst their different domain groups/sites.

9.7 Radius Authentication (For customers who do not mix Dynamics & Statics on same domain name)

For customers who do not share Dynamics & Statics/no NAT on the same domain name, the BT Platform Radius does not need to directly interface to the customer RADIUS. Instead for No NAT/Static IP End Users the BT Platform RADIUS server will authenticate the domain part of the Username and determine the customer’s BT Central.

As per standard BT Central, the Customer’s RADIUS is required to verify each End User via HGR access request/accept messages sent/received from it. A proxy radius, also as per BT Central, sits between the HGRs and the Customer RADIUS. As mentioned earlier, the customer will need to ensure that its RADIUS Servers are Internet addressable.

When an End User PPP session arrives at a HGR an Access Request packet [see Table 10] is passed to the Customer’s RADIUS via the BT Proxy RADIUS. The Customer RADIUS will reply with a number of attributes as shown in Table 11 depending on the type of user (Static/No NAT).

ATTRIBUTE_NUMBER	ATTRIBUTE_NAME	ATTRIBUTE_CONTENT
1	User-Name	User@domain
2	User-Password	<Password>
3	CHAP-Password	<Password>
4	NAS-IP-Address	<HG IP Address>
5	NAS-Port	<HG Port>
6	Service-Type	Framed
7	Framed-Protocol	PPP
33	Proxy-State	<determined by RADIUS>
61	NAS-Port-Type	Virtual

Table 10. HG Access-Request Attributes

ATTRIBUTE_NUMBER	ATTRIBUTE_NAME	ATTRIBUTE_CONTENT	MANDATORY
6	Service-Type	Framed	Yes
7	Framed-Protocol	PPP	Yes
8	Framed-IP_Address	Customer Administered IP Address	No*
11	Filter-Id	Static or Dynamic Filters	No
22	Framed-Route	Used for No-NAT routing updates	No*
25	Class	<string> to appear in all Accounting-Requests associated with the session	No
27	Session Timeout	Minimum Supported 7200 seconds	No
28	Idle Timeout	Minimum Supported 7200 seconds	No
33	Proxy-State	<determined by RADIUS>	No

Table 11. HG Access-Accept Attributes

*Either Framed Route or Framed IP address must be provided.

The Customer's RADIUS will need to authenticate the End User via the assigned username and password. Only those End Users authorised by the Customer to access the service will be able to establish a session.

In order to be able to pass the correct attribute contents (Framed Route/Framed IP address etc) the IP Address pools will need to be hosted by the customer on their Radius.

NOTE: It is the Customer's responsibility to provide:

- IP Addresses.
- To provide, install, configure and administer their RADIUS servers.

9.8 Radius Accounting

BT will pass RADIUS accounting traffic to an Internet Addressable customer RADIUS Server. All RADIUS accounting traffic (start, stop, and interim accounting messages) will be forwarded. The BT HGRs will be the source of the accounting for the Static IP/No NAT service as per the BT Central service. The accounting interface is a fire and forget interface i.e. Acknowledgements are not supported. RADIUS Start, Stop and interim accounting packets are supported on this product. All are enabled by default. The RADIUS accounting data transfer attributes have a level of accuracy comparable with typical IP traffic measurement equipment however there are circumstances under which accounting packets and records may be lost. The traffic measurements are therefore an approximate indication of the individual End User traffic. Start accounting will be delayed to allow the allocated IP address to be returned.

PACKET_TYPE	ATTRIBUTE_ID	Start	Interim	Stop
1	User-Name	✓	✓	✓
4	NAS-IP-Address	✓	✓	✓
5	NAS-Port	✓	✓	✓
6	Service-Type	✓	✓	✓
7	Framed-Protocol	✓	✓	✓
8	Framed-IP-Address	✓	✓	✓
25	Class	✓	✓	✓
33	Proxy-State	✓	✓	✓
40	Acct-Status-Type	✓	✓	✓
41	Acct-Delay-Time	✓	✓	✓
42	Acct-Input-Octets	✓*	✓*	✓*
43	Acct-Output-Octets	✓*	✓*	✓*
44	Acct-Session-Id	✓	✓	✓
45	Acct-Authentic	✓	✓	✓
46	Acct-Session-Time			✓
47	Acct-Input-Packets	✓*	✓*	✓*
48	Acct-Output-Packets	✓*	✓*	✓*
49	Acct-Terminate-Cause			✓
52	Acct-Input-Gigawords		✓*	✓*
53	Acct-Output-Gigawords		✓*	✓*
61	NAS_Port-Type	✓	✓	✓

* Optional Attributes selected via CRF

Table 12. Radius Accounting. Start/Stops/Interim attributes

9.9 DNS

The Customer can have the option to specify its own DNS through CRF and this can be configured on the on a per service basis. If the Customer does not specify its own DNS then the BTW DNS will be utilised.

DNS attributes sent in the Access-Accept messages, by the customer, will be ignored.

9.10 Session Control

There will be no session control implemented for BT Central Plus Static IP session and idle-timeout parameters will be set to infinity. Please note that Session/idle timeout attributes will be policed and set to 120 minutes duration minimum should the Service Provider return attributes with value of less than 120 mins, as with other central services.

10 Minute Session and Inactivity timeouts will be applied to default accepted customers in order to protect the BT network from any customer Radius outages.

9.11 Upstream Traffic Routing

This section is applicable to the BT Central Plus Capacity Based Charging with the BT Central Plus Interface option service only. For upstream Internet traffic which exits a Customer Network (via the Interface Option) the customer will need to ensure that traffic is routed back across the same logical PoP from which it came – otherwise the customers business Central plus and Consumer Central Plus traffic may become intermingled causing potential POP site capacity issues. For downstream traffic BGP and policy-based routing at the POP site will ensure that the correct logical POP is traversed.

10. Product Enhancements

Please see <http://www.btwholesale.com/broadband> for the latest information on product enhancements/developments.

11. References

[1]	SIN 302	BT Internet Protocol Transport Services, Service Description
[2]	SIN 336	Universal Serial Bus (USB) for the BT Network, Interface Characteristics
[3]	SIN 386	BT IPstream Office & BT IPstream Home Products, Service Description and Interface Specification
[4]	SIN 374	L2TP Interface For BT IPstream, Interface Characteristics
[5]	SIN 405	BT IPstream Symmetric, Service Description and Interface Specification
[6]	IEEE 802.3	Standards for Local Area Networks: CSMA/CD Access Method
[7]	CDC 1.1	Universal Serial Bus Class Definitions for Communication Devices
[8]	RFC2364	PPP Over AAL5
[9]	RFC2516	A Method for Transmitting PPP Over Ethernet (PPPoE)
[10]	SIN 412	622Mb Edgeless L2TP BT Central Product For BT IPstream, Interface Characteristics
[11]	SIN 360	Ethernet Customer Interfaces, Interface Characteristics
[12]	RFC1661	The Point-to-Point Protocol (PPP)
[13]	RFC1771	A Border Gateway Protocol 4 (BGP-4)

[14]	RFC 1772	Application of the Border Gateway Protocol in the Internet
[15]	RFC 2328	OSPF Version 2

SINs are available from <http://www.sinet.bt.com>

For copies of referenced documents please see the contacts on the Document Sources page at <http://www.sinet.bt.com/docsources.htm>.

12. Abbreviations

AAL	ATM Adaptation Layer
ABC	Alarms By Carrier
AC	Alternating Current
ADSL	Asymmetric Digital Subscriber Line
AS	Autonomous System
ATM	Asynchronous Transfer Mode
BAS	Broadband Access Server
BC	Business Customer
BGP	Border Gateway Protocol
BRAS	Broadband Remote Access Server
BTW	BT Wholesale
C+	BT Central Plus
CD	Compact Disc
CDC	Communication Device Class
CHAP	Challenge Handshake Authentication Protocol
CRF	Customer Requirements Form
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System/Server
EGP	Exterior Gateway Protocol
EU	End User
HEC	Header Error Check
HG	Home Gateway
HGR	Home Gateway Router
IEEE	Institute of Electronic and Electrical Engineers
IETF	Internet Engineering Task Force
IGP	Interior Gateway Protocol
IP	Internet Protocol

IPR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
L2TP	Layer 2 Tunnelling Protocol
LAC	L2TP Access Concentrator (function in BAS)
LAN	Local Area Network
LNS	L2TP Network Server (e.g. Home Gateway)
LTS	Layer 2 Tunnelling Protocol (L2TP) Tunnel Switch
kbit/s	Kilobits per second
Mbit/s	Megabits per second
MHz	Mega-Hertz
NAT	Network Address Translation
no NAT	Optional removal of NAT for Static IP Addressing
NTE	Network Termination Equipment
OSPF	Open Shortest Path First protocol
OLO	Other Licensed Operator
PAT	Port Address Translation
PBX	Private Branch Exchange
PC	Personal Computer
POP	Point of Presence
PPP	Point to Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PSTN	Public Switched Telephone Network
PTA	PPP Termination and Aggregation
RADIUS	Remote Authentication Dial In User Service
RAM	Random Access Memory
RAS	Remote Access Server
RFC	Request for Comment
RIPE	Réseaux IP Européens
RJ	Registered Jack
ROM	Read Only Memory
SINs	Suppliers' Information Notes
SoHo	Small Office Home Office
SP	Service Provider
TCP/IP	Transmission Control Protocol/ Internet Protocol
USB	Universal Serial Bus

UTP	Unscreened Twisted Pair
VC	Virtual Channel
VCI	Virtual Channel Identifier
VPI	Virtual Path Identifier
WAN	Wide Area Network

13. History

Issue 1 – BT IPstream	July 1999
Issue 2 – BT Broadband IP Products	August 1999
Issue 3 – BT Broadband IP Products	December 1999
Issue 4 – BT Broadband IP Products	Thursday, 03 February 2000
Issue 5 – BT Broadband IP Products	Thursday, 27 April 2000
Issue 5.1 – BT Broadband IP Products	Wednesday, 31 May 2000
Issue 5.2 – BT Broadband IP Products	Friday, 08 December 2000
Issue 5.3 – BT Broadband IP Products	Friday, 11 th May 2001
Issue 5.4 – BT Broadband IP Products	Friday, 17 th August 2001
Issue 5.5 – BT Broadband IP Products	Monday, 14 th October 2002
Issue 5.6 – BT Broadband IP Products	Thursday, 3 rd April 2003
Issue 5.7 – BT Broadband IP Products	Monday, 18 th August 2003
Issue 5.8 – BT Broadband IP Products	Thursday, 11 th September 2003
Issue 5.9 – BT Broadband IP Products	Tuesday, 29 th September 2003
Issue 6.0 – BT Broadband IP Products	Monday, 17 th November 2003
Issue 6.1 – BT Broadband IP Products	Friday, 5 th December 2003
Issue 6.2 – BT Broadband IP Products	Friday, 12 th March 2004
Issue 6.3 – BT Broadband IP Products	Friday, 30 th April 2004
Issue 6.4 – BT Broadband IP Products	Tuesday, 3 rd August 2004
Issue 6.5 – BT Broadband IP Products	Thursday, 19 th August 2004
Issue 7.0 – BT Broadband IP Products	Monday, 5 th October 2004
Issue 7.1 – BT Broadband IP Products	Tuesday, 18 th January 2005
Issue 8.0 – BT Broadband IP Products	Friday, 29 th April 2005
Issue 8.1 – BT Broadband IP Products	Wednesday 08 June 2005
Issue 9.0 – BT Broadband IP Products	Friday 15 July 2005
Issue 9.1 – BT Broadband IP Products	Friday 21 October 2005
Issue 9.2 – BT Broadband IP Products	Friday 2 December 2005

Issue 9.3 – BT Broadband IP Products	Friday 23 December 2005
Issue 9.4 – BT Broadband IP Products	Wednesday 1 st March 2006
Issue 9.5 – BT Broadband IP Products	Tuesday 4 th April 2006
Issue 9.6 – BT Broadband IP Products	Thursday 4 th May 2006

ANNEX A – DIFFERENCES COMPARED TO PREVIOUS ISSUE OF SIN 329

Table A.1 provides a *brief* description of the *major* changes between this issue of Suppliers' Information Note 329 and the previous issue. Please refer to the main body of the document for full descriptions of each topic.

DESCRIPTION	REF. SECTION
Notification of the withdrawal of the BT IPstream S Series products added.	4.1
Notification of the withdrawal of the BT IPstream 500 product added.	5.1

Table A. 1. List of major changes from previous issue of SIN 329

<END>

***WE WOULD BE GRATEFUL IF YOU WOULD SPEND A FEW MINUTES TO
COMPLETE AN ONLINE CUSTOMER SATISFACTION FORM AT
WWW.SINET.BT.COM/HAPPY.HTM.***