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Suppliers' Information Note

For The BT Network

BT FrameStream ™

Service Description

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TABLES

Note: This product was Withdrawn From New Supply in Dec 2008. It is no longer available for new customers

1. Introduction

This Suppliers Information Note (SIN) describes the BT FrameStream service, which uses Frame Relay (FR) technology. This document provides information about the service for use by Customer Premises Equipment (CPE) manufacturers and developers.

2. Service Availability and Tariffs

The BT FrameStream service covers (where capacity exists) mainland Britain and Northern Ireland (The UK licence area). International connectivity is available via Other Licensed Operators (OLO), for example the Concert Frame Relay Service.

For further information, please see:

http://www.sinet.bt.com/usenum.htm
or
http://www.sc-server1.bt.com/dataservices/framestream.htm

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

3. BT FrameStream Service Description

3.1 General Service Characteristics

The BT FrameStream service provides transport of Frame Relay frames on a point-to-point basis. The service offers both Permanent Virtual Circuit (PVC) connectivity between two FrameStream Virtual Circuit (VC) end-points; as well as connectivity to BT's Multi Protocol Label Switching (MPLS) network offering IP Virtual Private Network (VPN) capability.

The BT FrameStream service conforms to the ITU-T recommendation Q.922 [1] based on an original specification I.122 [2]. In addition, a Local Management Interface (LMI) based on Q.933 Annex A [3] is supported.

The service provides high-speed support of data applications. The current access rates supported are listed in Table 1.

FrameStream Access Rates
64kbit/s
128kbit/s
192kbit/s
256kbit/s
384kbit/s
512kbit/s
1024kbit/s
1984kbit/s

Table 1 FrameStream Access Rates

The service supports Frame Relay Frames conforming to the frame structure defined in the Frame Relay Forum User to Network Interface specification FRF.1 [4] and in ITU-T Recommendation I.233 [5].

The FrameStream service is defined for the customer sending frames with the Discard Eligibility (DE) bit set to zero (i.e. DE=0). If the customer chooses to send frames with DE=1, they may be discarded in preference to DE=0 frames during congested public network conditions.

The Frame Check Sequence (FCS) field will be generated and used in accordance with ITU-T Recommendation Q.921 [6].

Congestion indication is supported by the service and takes two forms, Forward Explicit Congestion Notification (FECN) and Backward Explicit Congestion Notification (BECN).

The FECN bit may be set by a congested Network to notify a receiving user that customer upper-layer congestion avoidance procedures should be initiated where applicable for traffic in the direction of the transmitted frame.

The BECN bit if used may be set by the network to notify a receiving user that customer upper layer congestion avoidance procedures should be initiated where applicable for traffic in the opposite direction to the transmitted frame.

3.2 FrameStream PVCs

Users can select either a Committed Information Rate (CIR) for their point-to-point PVCs or a Committed Delivery Rate (CDR) for IP enabled PVCs which are used to access the IP Enabled service. Applicable values for both CIR and CDR are published in the FrameStream section of the BT Price List [19].

The PVC Identifiers are also known as Data Link Connection Identifiers (DLCIs), and the value ranges supported by the FrameStream service are listed in Table 2. FrameStream PVCs are allocated DLCIs at subscription time. The network validates that users are only using PVCs allocated to them.

PVC DLCI Range	Usage
0	Reserved for Call Control Signalling (in-channel)
1-15	Reserved
16-1007	Assignable to FrameStream PVCs.
1008-1022	Reserved
1023	Local Management Interface

Table 2 DLCI values used by FrameStream

3.3 BT CellStream / FrameStream Service Interworking

The CellStream / FrameStream interworking service has been introduced to enable customers with a CellStream service NTE to transfer information, on a point-to-point per PVC basis, to a FrameStream service NTE, and vice-versa.

For information on the BT CellStream service, including configuration requirements, refer to the BT CellStream Service Description Supplier Information Note [15].

The CellStream / FrameStream interworking service supports interworking as defined in the Frame Relay/ATM PVC Service Interworking Implementation Agreement, FRF.8, Frame Relay Forum [16].

Both transparent and translation modes of operation are supported for upper layer user protocol encapsulation. Refer to FRF.8 [16] for details.

In translation mode, CPE attached to the NTEs presented by the FrameStream and CellStream services are required to encapsulate customer's traffic according to the respective interface: RFC 1490 Multiprotocol Encapsulation over Frame Relay [17] for FrameStream and RFC 1483 Multiprotocol Encapsulation over ATM Adaptation Layer 5 [18] for CellStream.

Discard eligibility (DE) and cell loss priority (CLP) mapping in the Frame Relay to ATM direction, conforms to Mode 1 operation as defined in FRF.8 [16].

Discard eligibility (DE) and cell loss priority (CLP) mapping in the ATM to Frame Relay direction, conforms to Mode 1 operation as defined in FRF.8 [16].

The FrameStream end of CellStream to FrameStream service interworking PVCs may terminate at any of the NTE interface access rates listed in section 4. All the general service characteristics as described in section 3.1 are supported.

CellStream / FrameStream network interworking as defined in the Frame Relay/ATM PVC Network Interworking Implementation Agreement, FRF.5, Frame Relay Forum [21] is provided as a product option. Mode 1 providing Discard Eligibility (DE) field to ATM Cell Loss Priority (CLP) mapping is supported.

3.4 IP Enabled Service

The FrameStream IP Enabled Service has been introduced to enable customers with a FrameStream service to gain access to BT's MPLS network providing IP VPN connectivity. Access to the service is via a dedicated IP enabled PVC designed to support IP version 4 traffic only. The service requires the attached CPE to encapsulate customer traffic to RFC 1490 Multiprotocol Encapsulation over Frame Relay [17]. The IP Enabled service can be provided on any of the NTE interface access rates listed in section 4. All the general service characteristics as described in section 3.1 are supported.

3.4.1 Dynamic Resilience using BGP

A number of enhanced service reliability options for IP Enabled FrameStream PVCs are offered between the customer and BT's MPLS network. For more information regarding these options, refer to the contact points given in section 2 of this document.

Within these options, the customer has the choice to use static or dynamic resilience. The dynamic resilience service requires that the attached CPE(s) run an external BGP session across a *multihop* link in accordance to RFC 1771 A Border Gateway Protocol 4 (BGP-4) [20]. This external BGP session does not support the passing of BGP communities across BT's MPLS network.

The dynamic resilience options do not support true load sharing; as such the BGP configuration on the CPE should set MED (Multi-Exit Discriminator) values for all route

prefixes which are sent to the MPLS network. This enables the customer to control which connection will be used to send traffic from BT's MPLS platform to them for each individual route that they advertise.

The BGP timer parameters supported by the BT network are given in Table 3.

Timer	BT Service Default	Minimum Value Permitted
BGP neighbour keepalive timer	60 seconds	10 seconds
BGP neighbour hold timer	180 seconds	3 × keepalive timer

Table 3 BGP timer values supported by the BT MPLS network

3.4.2 IP Precedence-based ("3CoS") Class of Service

IP Enabled FrameStream PVCs can support IP Class of Service.

Where CoS features are not enabled (i.e. Class 1 and/or 2 are not ordered), the BT MPLS network will mark all traffic as Class 3 (the default for non–prioritised traffic). The BT network will not re-instate the original precedence value.

Where CoS features are configured, the IP Enabled PVC supports the use of IP precedence bits in the header in order to provide prioritisation of Customer data in accordance with the values employed in the Precedence bit.

The BT MPLS network, which hosts the IP VPN services into which IP Enabled PVCs connect, support prioritisation into three discrete Class of Service:

- Class 1
  – used for low–jitter, low–delay application traffic such as Voice over IP
- Class 2
  – used for data prioritised over 'general' traffic or data with underlying application performance requirements such as video
- Class 3
  – default class used for general or non–prioritised data. Services with no Class 1 or Class 2 configured (i.e. 'non–CoS') use Class 3 precedence marking

In order for the BT MPLS network to handle Customer traffic according to its appropriate Class setting, the Precedence bit in the IP headers of Customer data should be set according to the following scheme:

IP Precedence		IP VPN Class of Service	In/Out of Contract Marking
Value	Binary		
6	110	2	In
5	101	3	In
4	100	1	In

Table 4 IP Precedence Marking Scheme

The precedence value of Customer traffic submitted to the BT MPLS network will be set to the same value on egress from the network. Any received precedence value settings that are not in accordance with the above Precedence marking scheme will be re-marked to Class 3 on egress.

3.4.3 DSCP Class of Service

Where CoS features are enabled under the DSCP (DiffServ Code Point) CoS model, IP Enabled PVC's support the use DSCP bits in the headers of Customers' IP packets in order to provide prioritisation of Customer data according to the values employed in the Precedence bit.

Where the DSCP CoS model is used, IP Enabled PVC's are sold as Layer 2 bandwidth.

The BT MPLS network supports prioritisation into 3 discrete IP Classes of Service:

- Class One/Expedited Forwarding
  used for low-jitter, low-delay application requirements such as Voice over IP
- Class Two/Assured Forwarding
  used for data prioritised over 'general' traffic or data with underlying application performance requirements such as video. Up to four discrete AF classes are available to segregate Customers' performance-sensitive or prioritised data traffic
- Class Three/Default (or "Best Efforts")
  used for general un-prioritised data

In order for the BT MPLS network to handle Customer traffic according to its appropriate Class setting, the DSCP bit in the IP headers of Customer data will be processed according to the following precedence marking scheme:

Marking on BT Network			Classification	
Binary	**Octal**	**Ingress/Egress treatment (In/Out of Contract)**	**DiffServ Code Point**	**Class**
111111	7-7	In		Management
101000	5-0	In	EF	Class 1
101110	5-6	In	EF	Class 1
100000*	4-0*	In		Class 2/AF4
100010	4-2	In	AF41	Class 2/AF4
100100	4-4	Out	AF42	Class 2/AF4
100110	4-6	Out	AF43	Class 2/AF4
011000*	3-0*	In		Class 2/AF3
011010	3-2	In	AF31	Class 2/AF3
011100	3-4	Out	AF32	Class 2/AF3
011110	3-6	Out	AF33	Class 2/AF3
010000*	2-0*	In		Class 2/AF2
010010	2-2	In	AF21	Class 2/AF2
010100	2-4	Out	AF22	Class 2/AF2
010110	2-6	Out	AF23	Class 2/AF2
001000*	1-0*	In		Class 2/AF1
001010	1-2	In	AF11	Class 2/AF1

001100	1-4	Out	AF12	Class 2/AF1
001110	1-6	Out	AF13	Class 2/AF1
000000	0	In	DE	Class 3

*= DSCP Class Selector/Truncated DSCP value

Table 5: DSCP Precedence Marking Scheme (based on RFC2597 [22])

The precedence value of Customer traffic submitted to the MPLS network will be set to the same value on egress from the network. By default, any received precedence value settings that are outside of the DSCP framework will be re–marked to Class 3/Default on egress.

3.4.4 FRF.12 Fragmentation

Where an IP Enabled PVC is ordered with Class of Service that includes Class 1 bandwidth, FRF.12 fragmentation must be enabled on the Customer's FrameStream access in order to support Class 1 traffic effectively for PVC bit rates below 2Mbit/s. The fragment sizes defined in the configuration of FRF.12 settings will vary according to the bit rate of the IP Enabled PVC. FRF.12 settings will need to be configured on the Customer CPE to match those configured on the BT network.

IP Enabled FrameStream PVC Bandwidth	Fragment size (bytes)
48	150
64	150
96	150
128	150
192	200
256	300
384	300
512	400
640	500
768	600
896	700
1024	800
1152	900
1280	1000
1408	1100
1536	1200
1984	N/a
2048	N/a

Table 6 FRF.12 fragment sizes for IP Enabled FrameStream

Where a Customer specifies Class 1 bandwidth on their IP Enabled FrameStream service, the Customer's FrameStream access will need to be Voice Enabled.

4. Interface Descriptions

FrameStream Access connections support the following types of customer interface (DS0 represents Digital Signal 0):

1) n*DS0 (64, 128, 192, 256, 384, 512, 1024kbit/s)

   Electrical presentation X.21

2) E1 (2 Mbit/s interface) with the following options:

   - E1 G.703 with G.704 framing - 1984 kbit/s usable bandwidth
   - E1 G.703 clear channel - 2048kbit/s usable bandwidth
   - X.21 - 2048 usable bandwidth

4.1 n*DS0 Presentation (X.21)

The service supports customer access of 64, 128, 192, 256, 384, 512 and 1024kbit/s, which conform to ITU-T Recommendation X.21 [7]. Electrical characteristics for this interface are specified in ITU-T Recommendation X.27 [8], and ISO4903 [9] defines the mechanical connector arrangements.

4.2 2048kbit/s (E1) Presentation (G.703/4)

The service supports customer access at 2048kbit/s, which conform to ITU-T Recommendation G.703 [10] for electrical characteristics and optionally, to ITU-T Recommendation G.704 [11] for frame structure, presenting a 1984kbit/s channel. HDB3 line coding is used as defined in ITU-T Recommendation G.703 [10].

The physical presentation of the service is via a pair of BNC unbalanced 75 Ohm sockets, one for each direction of transmission. The sockets conform to the general requirements of IEC 169-8 [12] with the mating dimensions specified in annex B of BS ISO/IEC 10173: 1991 [14].

4.3 X.21 2048kbit/s (E1) Presentation

The service supports customer access at 2048kbit/s, which conform to ITU-T Recommendation X.21 [7]. Electrical characteristics for this interface are specified in ITU-T Recommendation X.27 [8], and ISO4903 [9] defines the mechanical connector arrangements.

5. Physical Arrangements

5.1 Physical Location of Connectors

The FR UNI is located at the connector on the BT Network Terminating Equipment (NTE), with a plug (male) on the customer side as described in the relevant part of section 4.

5.2 NTE Power Supply Requirements

Various types of NTE maybe installed, some require an a.c. mains power source, and others require a -50 V d.c. power feed. Power consumption varies dependent on type of NTE, between 5 Watts and 20 Watts. The -50 V d.c. supply can be provided by BT or by the customer (see note below). A customer supplied a.c. mains power source will be required close to the installation to operate the -50 V d.c. power supply or to power the NTE directly depending on the type of NTE.

Where the NTE is powered by a customer provided -50 V d.c. supply, the NTE will be supplied with a connection lead which will be presented as wires only. As power supplies can vary slightly in output voltage and characteristics, the NTE will function with customer provided power supplies, which conform to British Telecommunications Network Requirements (BTNR) 2511 [13].

Note. Customer provided power supplies for connection to this service shall conform with relevant safety standards.

6. Abbreviations

AF	Assured Forwarding
ATM	Asynchronous Transfer Mode
BECN	Backward Explicit Congestion Notification
BGP	Border Gateway Protocol
BNC	Bayonet Neill Cancelman
BSI	British Standards Institution
BTNR	British Telecommunications Network Requirements
CDR	Committed Delivery Rate
CIR	Committed Information Rate
CLP	Cell Loss Priority
CPE	Customer Premises Equipment
CTR	Common Technical Regulation
DE	Discard Eligibility
DLCI	Data Link Connection Identifier
DS0	Digital Signal 0 - One 64 kbit/s Channel.
E1	(European) 2 048kbit/s transmission rate
FCS	Frame Check Sequence
FECN	Forward Explicit Congestion Notification
FR	Frame Relay
HDB3	High Density Bi-polar 3
ITU-T	International Telecommunication Union - Telecommunication Standardisation Sector
IP	Internet Protocol
LMI	Local Management Interface
MED	Multi-Exit Discriminator
MPLS	Multi Protocol Label Switching
NTE	Network Termination Equipment
PHB	Per-Hop-Behavior
PVC	Permanent Virtual Circuit
SIN	Suppliers' Information Note
UNI	User Network Interface
VC	Virtual Circuit
VPN	Virtual Private Network

7. References

[1]	ITU-T Recommendation Q.922 - ISDN Data Link Layer Specification for Frame Mode Bearer Services, February 1992.
[2]	ITU-T Recommendation I.122 - Framework for Frame Mode Bearer Services, March 1993.
[3]	ITU-T Recommendation Q.933 - Layer 3 Signalling Specification for Frame Mode Bearer Services, October 1995.
[4]	Frame Relay Forum FRF.1 - User to Network Implementation Agreement, January 1992.
[5]	ITU-T Recommendation I.233 - Frame Relaying Bearer Services, 1991.
[6]	ITU-T Recommendation Q.921 - ISDN UNI Data Link Layer specification, March 1993.
[7]	ITU-T Recommendation X.21 - Interface between data terminal equipment and data circuit-terminating equipment for synchronous operation on public data networks, September 1992.
[8]	ITU-T Recommendation X.27 - Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications, March 1993.
[9]	ISO 4903 - 15 Pole DTE/DCE Interface Connector and Contact Number Assignments, 1989.
[10]	ITU-T Recommendation G.703 - Physical/electrical characteristics of hierarchical digital interfaces, April 1991.
[11]	ITU-T Recommendation G.704 - Synchronous Frame Structures used at 1544, 6312, 2048, 8488 and 44 736kbit/s Hierarchical Levels, July 1995.
[12]	IEC 169-8 Radio-frequency connectors - Part 8 : R.F. coaxial connectors with inner diameter of outer conductor 6.5 mm (0.256 in) with bayonet lock - Characteristic impedance 50 ohms (Type BNC), 1978.
[13]	BTNR 2511 - Interface of Telecommunications equipment - nominal 48 volt negative dc power supply, (latest issue).
[14]	BS ISO/IEC 10173 - Integrated Services Digital Network (ISDN) Primary Access Connector at Reference Points S and T, 1991.
[15]	BT CellStream Service Description, Supplier Information Note No. 264 (latest issue).
[16]	Frame Relay/ATM PVC Service Interworking Implementation Agreement - The Frame Relay Forum Document Number FRF.8, April 14, 1995.
[17]	IETF - RFC 1490 Multiprotocol Encapsulation over Frame Relay, July 1993.
[18]	IETF - RFC 1483 Multiprotocol Encapsulation over ATM Adaptation Layer 5, July 1983.
[19]	BT Price List, British Telecommunications plc.
[20]	IETF RFC 1771 “A Border Gateway Protocol 4 (BGP-4)”, March 1995.
[21]	Frame Relay/ATM PVC Network Interworking Implementation Agreement. The Frame Relay Forum Document Number FRF.5, December, 1994
[22]	IETF 2597 Assured Forwarding PHB Group

For further information or copies of referenced sources, please see document sources at http://www.sinet.bt.com/usenum.htm#docsources

8. History

Issue 1	January 1998
Issue 2	March 1999
Issue 2.1	February 2001 - Editorial changes
Issue 2.2	March 2001 - Inclusion of IP Enabled
Issue 2.3	July 2001 - inclusion of X.21 2 Mbit/s interface option and CellStream/FrameStream network interworking option.
Issue 2.4	June 2003 - Section 3.4.1, Dynamic Resilience through BGP enhanced service reliability option added, Section 3.4.2, IP CoS support for PVCs, information added. Approval Requirements statement removed, information available via SINet Useful Contacts page.
Issue 2.5	October 2004 – Addition of new CoS model based on DSCP.
Issue 2.6	May 2010 – Text inserted to reflect status of product.

-END-

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