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Suppliers' Information Note

For The BT Network

BT WaveStream Connect™ Service & Interface Description

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1. Introduction

This Suppliers Information Note (SIN) describes the BT WaveStream Connect service, and its interfaces.

It should be noted that the Digital Video (270 Mbit/s) DVB ASI interface from the BT WaveStream Connect service was withdrawn in April 2004.

2. Service Outline

2.1 General

WaveStream Connect is an end-to-end wavelength service between customer's sites up to 35 km (radial) apart, delivered over a BT provided infrastructure using DWDM (Dense Wavelength Division Multiplexing). Wavelengths of high bandwidth connectivity of up to 10 Gbit/s per wavelength are offered, however, due to technical limitations, 10 Gbit/s services will be offered on the first 16 wavelengths only and may be limited to 25 km fibre route distance.

The service allows the point to point transport of the following services between customer sites: -

STM-64 (9.9532 Gbit/s)

STM-16 (2.488 Gbit/s)

STM-4 (622 Mbit/s)

STM-1 (155 Mbit/s)

Gigabit Ethernet (1.25 Gbit/s)

10Gb Ethernet LAN PHY (10.3125 Gbit/s)

10Gb Ethernet WAN PHY (9.9532 Gbit/s)

FICON (1.062 Gbit/s)

FICON Express (2.125 Gbit/s)

Fibre Channel 1Gb FC100 (1.062 Gbit/s)

Fibre Channel 2Gb FC200 (2.125 Gbit/s)

Fast Ethernet (125 Mbit/s clock rate, 100 Mbit/s data rate)

ESCON (200 Mbit/s)

Coupling Link (ISC1 -1.062 Gbit/s) (ISC2 -1.062 Gbit/s) (ISC3 compatibility mode 1.062 Gbit/s & peer mode 2.125 Gbit/s)

Sysplex Timer ETR & CLO (8 Mbit/s)

The WaveStream Connect services are intended for connection to standard optical interfaces of 850 nm multimode or 1310 nm single-mode/multimode types. Table 1 gives details of the optical interface/service options.

This service is offered on a point-to-point basis with the following configuration options:

- **WaveStream Connect A**

All channels are protected using dual fibre routes for additional route resilience. An optical line protection switch provides protection against a fibre cable breakage on a route. The protection is performed on a fibre link carrying the multiplexed wavelengths, protection is not provided on a per optical channel basis.

The line protection is completely automatic.

- **WaveStream Connect B**

A single fibre pair is used to connect customer sites for each WaveStream Connect B link.

For both options, the channel count is offered on the basis that the first four wavelengths, subject to the constraint that the maximum bit rate is Gigabit Ethernet, i.e. 1.25 Gbit/s, are supplied as part of the standard service. If the customer wishes a higher bit rate for these initial wavelengths an additional charge will be made. The system can be further upgraded by adding additional wavelengths up to a maximum of 32 channels.

A typical WaveStream Connect service configuration is shown below in Figure 1.

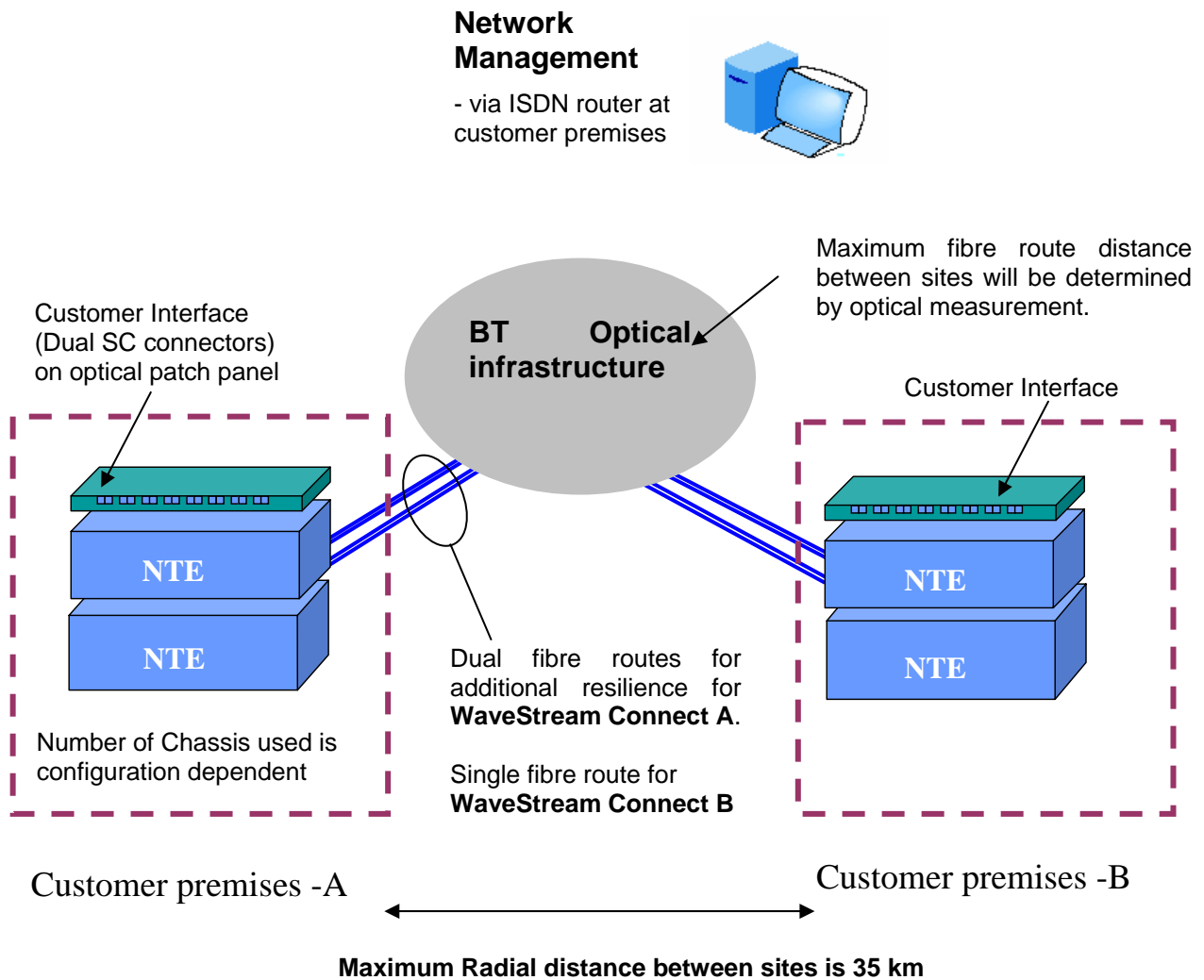


Figure 1 Typical WaveStream Connect service configuration

3. Customer Interface

Customer interfaces that will be offered are presented via an optical patch panel using Dual SC interfaces.

Service	Bandwidth	Customer Interface Options		
		Single-mode @1310 nm	Multimode @1310 nm	Multimode @850 nm
STM-64	9.9532 Gbit/s	✓	✗	✗
STM-16	2.488 Gbit/s	✓	✗	✗
STM-4	622 Mbit/s	✓	✓	✗
STM-1	155 Mbit/s	✓	✓	✗
Gigabit Ethernet	1.25 Gbit/s	✓	✗	✓
10Gb Ethernet LAN PHY	10.3125 Gbit/s	✓	✗	✗
10Gb Ethernet WAN PHY	9.9532 Gbit/s	✓	✗	✗
FICON	1.062 Gbit/s	✓	✗	✓
FICON Express	2.125 Gbit/s	✓	✗	✓
1G Fibre Channel	1.062 Gbit/s	✓	✗	✓
2G Fibre Channel	2.125 Gbit/s	✓	✗	✓
Fast Ethernet	125 Mbit/s	✓	✓	✗
ESCON	200 Mbit/s	✗	✓	✗
Coupling Link ISC1 and ISC2	1.062 Gbit/s	✓	✗	✗
Coupling Link ISC2		✓	✗	✗
Coupling Link ISC3 Compatibility Mode	1.062 Gbit/s	✓	✗	✗
Coupling Link ISC3 Peer Mode	2.125 Gbit/s	✓	✗	✗
Sysplex Timer ETR/CLO	8 Mbit/s 16 Mbit/s	✗	✓	✗

Table 1 Optical Interface / Service Options

3.1 Connector

The patch panel interface is the Network Termination Point (NTP), i.e. the point of connection between the BT Network Terminating Equipment (NTE) and the CPE interface. All optical interfaces are presented as dual SC connectors.

3.2 Fibre

Where a service employing a single-mode interface is provided, all fibre optic connections to and from the patch panel use single-mode fibre 9/125 micron according to ITU-T G.652.

Where a service employing a multimode interface is provided all fibre optic connections to and from the patch panel use multimode fibre 62.5/125 micron or 50/125 micron according to ITU-T G.651.

3.3 Transmission

The NTE is capable of transporting data at 10 Gbit/s per wavelength on the aggregate point to point fibre link. Multiplexing is carried out by passive filter components that combine the light of up to 32 different optical channels using up to 32 different wavelengths on to a single fibre. De-multiplexing is carried out by passive filter components that break out the aggregate signal from a single fibre into (up to 32) optical channels.

- Please note that due to technical limitations, 10 Gbit/s channels are only offered on the first 16 wavelengths.
- Please also note that the addition of 10 Gbit/s wavelengths to existing DWDM systems not already running 10 Gbit/s channels may require planned downtime of the service in order to add amplification and carry out fibre measurements.

4. Power supply

The NTE is powered from an AC mains supply. The customer may choose the option to provide their own DC power supply.

4.1 DC Power Supply

Where this option is selected the power equipment must conform to specific requirements for DC powered installations. Complete details for this requirement will be available upon request.

The number of chassis deployed at a single customer site is configuration dependent.

5. Application

ATM, ESCON, FICON, Fast Ethernet, Gigabit Ethernet, Fibre Channel, Coupling Link, IP Routers with Packet over SONET/SDH interfaces.

ESCON and FICON are proprietary storage area protocols from IBM, and are used in many SAN customer sites. The coupling link is required if the customer is running sysplex timing

on their Storage Area Network, as a special timing signal is broadcast over the network to ensure data integrity.

6. Further Information

For enquiries concerning connection availability between particular sites and for further information on the BT WaveStream Connect service please contact the Advanced Data Services Helpdesk, details available at: <http://www.sinet.bt.com/usenum.htm>

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

7. References

G.651	Recommendation G.651 (02/98) – Characteristics of a 50/125 µm multimode graded index optical fibre cable
G.652	Recommendation G.652 (04/97) - Characteristics of a single-mode optical fibre cable
10 Gigabit Ethernet	SIN 429 LES10000 Service Description
Gigabit Ethernet	IEE 802.3z or SIN 360 Gigabit Ethernet for the BT Network
Fibre Channel	ANSI/NCITS X3.288-1996 or SIN 345 Channel Extension Service 1000
2G Fibre Channel	Fibre Channel Physical interface (FC-PI), ANSI 212-642-4900 ANSI INCITS 352-2002
STM -1	SIN 333 SDH Customer Interfaces at the STM-N level (where N= 1,4,16)
STM -4	SIN 333 SDH Customer Interfaces at the STM-N level (where N= 1,4,16)
STM -16	SIN 333 SDH Customer Interfaces at the STM-N level (where N= 1,4,16)
STM -64	SIN 429 LES1000 Service Description
ESCON, FICON, FICON Express, Coupling Link, Sysplex Timers	IBM Proprietary as specified in IBM Red Book Standard for GDPS.

Please see information available at: <http://www.sinet.bt.com/docsources.htm> regarding the availability of standards.

8. Abbreviations

AC	Alternating Current
ANSI	American National Standards Institute
ASI	Asynchronous Serial Interface
ATM	Asynchronous Transfer Mode
CLO	Control Link Oscillator
CPE	Customer Premises Equipment
DC	Direct Current
DVB	Digital Video Broadcast
DWDM	Dense Wavelength Division Multiplexing
ESCON	Enterprise Systems CONnectivity architecture [IBM]
ETR	External Time Reference
FICON	FIbre CONnectivity
IBM	International Business Machines
IP	Internet Protocol
ISC	InterSystem Channel (Coupling Link)
ITU-T	International Telecommunication Union - Telecommunications Standardization Sector (formerly CCITT)
LAN	Local Area Network
Mbit/s	Megabits per second
Gbit/s	Gigabits per second
GDPS	Geographically Dispersed Parallel Sysplex [IBM]
MUX	Multiplexer
NCITS	National Committee for Information Technology Standards
NTE	Network Terminating Equipment
NTP	Network Terminating Point
PHY	Physical Layer
SAN	Storage Area Network(s)
SC	Structured Connector
SDH	Synchronous Digital Hierarchy
SIN	Suppliers' Information Note
SONET	Synchronous Optical Network
STM	Synchronous Transport Module
WAN	Wide Area Network

9. History

Issue 1.0	29 November 2000	First publication,
Issue 1.1	6 June 2002	Service renamed from “DWDM1” to “WaveStream Connect”; various editorial changes to aid clarity.
Issue 1.2	4 July 2002	Rewording of section 2.1 to better reflect the service offering
Issue 2.0	23 December 2002	Inclusion of 2.5 Gbit/s customer interface and editorial changes to aid clarity
Issue 2.1	20 January 2003	Section 2.1 Simplification of “WaveStream Connect A” resilience information. Section 4: Removal of text relating to supplementary mains outlets on NTE power supply.
Issue 2.2	31 March 2003	Section 3 Note 1 added. 2G Fibre Channel option added. Section 4.1 DC Power supplies added.
Issue 2.3	January 2004	Notice given of proposed withdrawal of the Digital Video interface. Editorial changes.
Issue 2.4	January 2005	Digital Video interface deleted, and other editorial changes made, due to withdrawal of this interface.
Issue 3.0	May 2006	Addition of new interfaces customer interfaces: FICON Express, STM-64 & 10 Gb Ethernet. Inclusion of new radial distance limits.
Issue 3.1	August 2007	Service outline clarified to show first four wavelengths are only standard up to a maximum bit rate of 1.25 Gbit/s.

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