SIN 514

Issue 1.5

September 2017

Suppliers' Information Note

For The BT Network

Optical Spectrum Extended Access 6500 (OSEA 6500)

Service & Interface Description

This document does not form a part of any contract with BT customers or suppliers.

Users of this document should not rely solely on the information in this document, but should carry out their own tests to satisfy themselves that terminal equipment will work with the BT network.

BT reserves the right to amend or replace any or all of the information in this document.

BT shall have no liability in contract, tort or otherwise for any loss or damage, howsoever arising from use of, or reliance upon, the information in this document by any person.

Due to technological limitations a very small percentage of customer interfaces may not comply with some of the individual characteristics which may be defined in this document.

Publication of this Suppliers' Information Note does not give or imply any licence to any intellectual property rights belonging to British Telecommunications plc or others. It is your sole responsibility to obtain any licences, permissions or consents which may be necessary if you choose to act on the information supplied in the SIN.

This SIN is available in Portable Document Format (pdf) from: http://www.btplc.com/sinet/

Enquiries relating to this document should be directed to: sinet.helpdesk@bt.com

CONTENTS

1. Introduction

This Suppliers Information Note (SIN) describes the Openreach Optical Spectrum Extended Access 6500 (OSEA 6500) service and its interfaces. OSEA 6500 is an Openreach Connectivity Services product within the Optical Spectrum Services portfolio.

Note: Openreach has provided formal notification that Ciena 6500 2 slot MOTR bearers & expansion chassis products are no longer available for new supply with effect from 11 May 2016. External shifts (re-sites and re-arranges) are also not available from this date.

2. Service Outline

2.1. General

OSEA 6500 is an end-to-end wavelength service between sites delivered over Openreach provided fibre infrastructure using DWDM (Dense Wavelength Division Multiplexing) technology. OSEA 6500 is suitable for linking end user sites, or an end user site to a CP site. OSEA 6500 is remotely monitored by Openreach.

High bandwidth connectivity of up to 100Gbit/s per DWDM wavelength is offered. Wavelengths of 2.5Gbit/s, 10Gbit/s, and 100Gbit/s or a combination of these can be supported on each OSEA 6500 bearer. 40Gbit/s wavelengths are supported on existing OSEA 6500 bearers but are no longer available for new orders.

The elements of the service are:

- **OSEA 6500 Bearer**: this is the DWDM line system which can support a mix of up to 44 wavelengths. The default OSEA 6500 bearer installation is configured to support up to four wavelengths (wavelengths are ordered separately).

- **Expansion units**: these provide the capacity for additional wavelengths and end-point amplification on the OSEA 6500 bearer. Any of the four NTE chassis types are available to use as expansion units depending on the amount of additional equipment required or the rack space available

- **Auxiliary units (Dispersion Compensation Modules – DCMs):** these are used when needed on long lines to counteract the effects of Chromatic Dispersion.

- **End-point amplification**: Dependant on the configuration of the service and the length of the fibre route, additional end-point amplification may be required to ensure the OSEA 6500 bearer system works effectively.

- **Mid-point amplification:** Mid-point amplification is typically required for fibre route distances in excess of 100km. This amplification is usually sited in a suitable BT Node.

- **Wavelengths:** these are ordered separately from the bearer and are specific to the protocol and speeds required. They are installed in the OSEA 6500 bearer.

The OSEA 6500 service has no maximum radial distance between BT serving exchanges. The maximum fibre route distance between OSEA 6500 bearer circuit end points is also not limited; however additional amplification may be required as the fibre route distance increases.

2.2. NTE vendor

The Network Terminating Equipment (NTE) type used is the Ciena 6500.

2.3. Services supported

The services are available with the following interfaces:

- Gigabit Ethernet, 10 Gigabit Ethernet (LAN Phy), 10 Gigabit Ethernet (WAN Phy), 40 Gigabit Ethernet, 100 Gigabit Ethernet
- SDH STM-1, STM-4, STM-16, STM-64,
- ESCON
- 1G Fibre Channel, 2G Fibre Channel, 4G Fibre Channel, 8G Fibre Channel, 10G Fibre Channel
- FICON, 2G FICON, 4G FICON
- SRM250G (2488.32 Mbps), ESRM250G (2488.32 Mbps)
- IBM ISC-3 Peer Mode1G, IBM ISC-3 Peer Mode 2G, IBM ISC-3 STP
- DVB-ASI
- 5G IBM PSIFB
- OTU1, OTU2, OTU2e, OTU4

OSEA 6500 services are intended for connection to standard optical interfaces of 850 nm multimode or 1310 nm and 1550 nm single-mode types. No electrical interfaces are offered. Table 1 gives details of the optical interface/service options. These interfaces are described in the documents listed against each interface in the "References" section.

OSEA 6500 Client Interfaces				
Service Supported	**Bandwidth (bit/s)**	**850nm (MM)**	**1310nm (MM)**	**1310nm (SM)**
1G Ethernet	1.25G	Yes	No	Yes
10G Ethernet (LAN PHY)	10.3125G	Yes	No	Yes
10G Ethernet (WAN PHY)	9.95328G	Yes	No	Yes
40G Ethernet	41.25G	No	No	Yes
100G Ethernet	103.125G	Yes	No	Yes
SDH STM-1	155M	No	No	Yes
SDH STM-4	622M	No	No	Yes
SDH STM-16	2.4G	No	No	Yes

SDH STM-64	9.95328G	No	No	Yes
ESCON	200M	No	Yes	No
1G Fibre Channel	1.06G	Yes	No	Yes
2G Fibre Channel	2.125G	Yes	No	Yes
4G Fibre Channel	4.24G	Yes	No	Yes
8G Fibre Channel	8.5G	Yes	No	Yes
10G Fibre Channel	10.5187G	Yes	No	Yes
FICON	1.06G	Yes	No	Yes
FICON Express 2G	2.125G	Yes	No	Yes
FICON Express 4G	4.24G	Yes	No	Yes
SRM250G	2.488G	No	No	Yes
ESRM250G	2.488G	No	No	Yes
IBM ISC-3 Peer Mode 1G	1.06G	Yes	No	Yes
IBM ISC-3 Peer Mode 2G	2.125G	Yes	No	Yes
IBM ISC-3 STP	2.125G	Yes	No	Yes
DVB-ASI	270M	Yes	No	Yes
5G IBM PSIFB	5G	No	No	Yes
OTU1	2.7G	No	No	Yes
OTU2	10.709G	No	No	Yes
OTU2e	11.09G	No	No	Yes
OTU4	111.8G	No	No	Yes

Table 1. Interface options

ESCON and FICON are proprietary storage area protocols from IBM, and are used in many SAN customer sites. A 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. For OSEA 6500, the customer uses the IBM-ISC3 (STP) protocol via an optical interface and connect to their server; this would then be transported across the OSEA 6500 bearer exiting the network in the same way.

2.4. Circuit protection

Three levels of fibre/circuit protection are available:

- Optical Spectrum Extended Access Standard
- Optical Spectrum Extended Access Resilience Option 1
- Optical Spectrum Extended Access Resilience Option 2

Wavelength switching protection is only available on RO1 bearers. Wavelength switching protection enables protected wavelengths to be automatically switched to an alternative optical path to maintain service between the same wavelength A and B ends. Wavelength switching to an alternative site is not offered. The incoming line signals are monitored and failure of this will trigger the system to switch the wavelength. This is typically done within 50ms of a failure being detected however some configurations may take slightly longer. User's equipment is not monitored.

Protocols with latency sensitivities (e.g. Fibre Channel, ESCON, FICON) may require customer reconfiguration following an incident resulting in a switch to the protection path. The Openreach equipment will continue to function on the protection path.

Refer to the OSEA 6500 product description for further information on bearer resilience options and wavelength protection http://www.openreach.co.uk/orpg/products/oss/oss.do

2.5. Geographical Availability

The Openreach OSEA 6500 service is offered throughout the United Kingdom subject to survey.

2.6. Buffer crediting

OSEA 6500 equipment does not support buffer crediting but is transparent to customer own equipment distance extension protocols.

2.7. Connector

The patch panel interface is the Network Termination Point (NTP), i.e. the point of connection between the Openreach Network Terminating Equipment (NTE) and the CPE interface. Optical interfaces are presented as LC connectors as the default, SC can be offered as an alternative.

For 100G 850nm client interfaces, MPO [9] compliant connectors on multi-fibre cables will need to be installed and will require direct connection between the Openreach NTE & the CPE. Openreach, via their partners, will provide a 25 meter MPO compliant connector terminated multi-fibre cable and will be responsible for the connection to the OSEA 6500 interface. The remaining cable will be coiled at the bottom of the cabinet in preparation for the customer to connect to their own equipment.

2.8. Fibre

Where a service employing a local or remote 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[2].

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 @ 850nm according to ITU-T G.651[1].

2.9. Transmission

The NTE is capable of transporting data at up to 100Gbit/s per wavelength. Multiplexing is carried out by passive filter components that combine the light of different optical channels using different wavelengths on to a single fibre pair. De- multiplexing is carried out by passive filter components that break out the aggregate signal from a single fibre pair into optical channels.

2.10. Client Side Optics

Table 2 provides details of the optical power margins for both the receive and transmit interfaces of the client facing optical interfaces.

Supported Client Rates	Interface Type	Receiver Minimum (dBm)	Receiver Overload (dBm)	Transmit Minimum (dBm)	Transmit Maximum (dBm)
GE, STM1,4,16, FC100/FICON, FC200/FICON express, DVB-ASI, ISC-3/STP, SRM250G, ESRM250G	SM	-18	-3.0	-9.5	-3.0
GE, FC100/FICON, FC200/FICON express,	MM	-15	0	-9.5	-1.5
FC100/FICON, FC200/FICON express, FC400/FICON4G	MM	-14	0	-9.0	-9.0
FC100/FICON, FC200/FICON express, FC400/FICON4G	SM	-17.2	-3.0	-11.2	-3.0
STM64, 10GE LAN PHY, 10GE WAN PHY, FC800, FC1200, OTU2, OTU2e	SM	-11	-1	-6	-1
10GE LAN PHY, FC800, FC1200	MM	-11.2	0	-8.2	0
40GE,	SM	-11.5	2.3	-7	2.3
100GE, OTU4	SM (1310)	-8.6	4.5	-2.3	4.5
100GE	MM	-9.5	3	-7.6	2.4

Table 2. Optical Power Margins

2.11. OTU Interface options

The table below provides details of the OTU client interface options for both the receive and transmit interfaces of the client facing optical interfaces. Aggregation of client signals into OTU payloads is only permissible at OTU1. Aggregation of more than one client signal into OTU2, or OTU4 is not available.

Option	Client ports	Wavelength
1.	Non OTU client one end to OTU1 client other end	OTU1 (known as 2.7G wavelength)
2.	Non OTU client one end to OTU1 client other end	OTU2 (known as 10G wavelength)
3.	Non OTU client one end to OTU2 client other end (Note:- Non OTU client options can only be STM-64 or 10GEWAN PHY)	OTU2 (known as 10G wavelength)
4.	OTU1 client one end to OTU1 client other end	OTU1 (known as 2.5G wavelength)
5.	OTU1 client one end to OTU1 client other end	OTU2 (known as 10G wavelength)

6.	OTU2 client one end to OTU2 client other end	OTU2 (known as 10G wavelength)
7.	Non OTU client one end to OTU4 client other end	OTU4 (known as 100G wavelength)
8..	OTU4 client one end to OTU4 client other end	OTU4 (known as 100G wavelength)

Table 3. OTU interface Options

Note that 10G client interfaces will map into two types of OTU2 in the transport layer.

- STM64, 10GE WAN PHY and lower bit rates (e.g. 8G Fibre Channel) map into OTU2
- 10GE LAN PHY and 10G Fibre Channel map into an OTU2e

The OTU2e is an extended rate OTU2 enabling it to transport the larger payloads of certain signals.

2.12. "Friendly" Alien Wavelengths

A "Friendly" Alien wavelength has a transponder at one end and a coloured light hand-off via a filter at the other end. They can be used by a CP to connect from a remote site to their own network without converting back to an electrical signal.

Only 100G coherent "Friendly" Alien wavelengths are supported by OSEA 6500.

This solution is predicated on the CPs network being based on a Ciena ROADM & DOC (Domain Optical Controller) controlled 6500 platform.

Openreach **will not** permit "Friendly" Alien wavelength services to be interconnected to Non-Ciena 6500 DOC controlled ROADM networks.

The CP/customer is responsible for providing the channel plan and other optical/provisioning characteristics for "Friendly" Alien wavelengths. Available wavelengths, based on 50GHz and 100GHz spacing Ciena 6500 channel plans, are shown in the following table:

Channel ID	Wavelength (nm)	Frequency (THz)	OSEA 6500 50Ghz Wavelength Plan	OSEA 6500 100Ghz Wavelength Plan	Channel ID	Wavelength (nm)	Frequency (THz)	OSEA 6500 50Ghz Wavelength Plan	OSEA 6500 100Ghz Wavelength Plan
1	1530.33	195.9	Y	Y	45	1547.72	193.7	Y	Y
2	1530.72	195.85	Y		46	1548.11	193.65	Y	
3	1531.12	195.8	Y	Y	47	1548.51	193.6	Y	Y
4	1531.51	195.75	Y		48	1548.91	193.55	Y	
5	1531.9	195.7	Y	Y	49	1549.32	193.5	Y	Y
6	1532.29	195.65	Y		50	1549.72	193.45	Y	
7	1532.68	195.6	Y	Y	51	1550.12	193.4	Y	Y
8	1533.07	195.55	Y		52	1550.52	193.35	Y	
9	1533.47	195.5	Y	Y	53	1550.92	193.3	Y	Y
10	1533.86	195.45	Y		54	1551.32	193.25	Y	
11	1534.25	195.4	Y	Y	55	1551.72	193.2	Y	Y
12	1534.64	195.35	Y		56	1552.12	193.15	Y	
13	1535.04	195.3	Y	Y	57	1552.52	193.1	Y	Y

14	1535.43	195.25	Y		58	1552.93	193.05	Y	
15	1535.82	195.2	Y	Y	59	1553.33	193	Y	Y
16	1536.22	195.15	Y		60	1553.73	192.95	Y	
17	1536.61	195.1	Y	Y	61	1554.13	192.9	Y	Y
18	1537	195.05	Y		62	1554.54	192.85	Y	
19	1537.4	195	Y	Y	63	1554.94	192.8	Y	Y
20	1537.79	194.95	Y		64	1555.34	192.75	Y	
21	1538.19	194.9	Y	Y	65	1555.75	192.7	Y	Y
22	1538.58	194.85	Y		66	1556.15	192.65	Y	
23	1538.98	194.8	Y	Y	67	1556.55	192.6	Y	Y
24	1539.37	194.75	Y		68	1556.96	192.55	Y	
25	1539.77	194.7	Y	Y	69	1557.36	192.5	Y	Y
26	1540.16	194.65	Y		70	1557.77	192.45	Y	
27	1540.56	194.6	Y	Y	71	1558.17	192.4	Y	Y
28	1540.95	194.55	Y		72	1558.58	192.35	Y	
29	1541.35	194.5	Y	Y	73	1558.98	192.3	Y	Y
30	1541.75	194.45	Y		74	1559.39	192.25	Y	
31	1542.14	194.4	Y	Y	75	1559.79	192.2	Y	Y
32	1542.54	194.35	Y		76	1560.2	192.15	Y	
33	1542.94	194.3	Y	Y	77	1560.61	192.1	Y	Y
34	1543.33	194.25	Y		78	1561.01	192.05	Y	
35	1543.73	194.2	Y	Y	79	1561.42	192	Y	Y
36	1544.13	194.15	Y		80	1561.83	191.95	Y	
37	1544.53	194.1	Y	Y	81	1562.23	191.9	Y	Y
38	1544.92	194.05	Y		82	1562.64	191.85	Y	
39	1545.32	194	Y	Y	83	1563.05	191.8	Y	Y
40	1545.72	193.95	Y		84	1563.45	191.75	Y	
41	1546.12	193.9	Y	Y	85	1563.86	191.7	Y	Y
42	1546.52	193.85	Y		86	1564.27	191.65	Y	
43	1546.92	193.8	Y	Y	87	1564.68	191.6	Y	Y
44	1547.32	193.75	Y		88	1565.09	191.55	Y	

Table 4. “Friendly Alien wavelength plan

2.13. ROADM

OSEA 6500 provides the capability to remotely switch traffic by utilising ROADM (Reconfigurable Optical Add Drop Multiplexer) Wavelength Selective Switch (WSS) modules. It allows individual or multiple wavelengths (carrying data) to be added and/or dropped from a transport fibre without the need to convert the signals on all of the WDM channels to electronic signals and back again to optical signals.

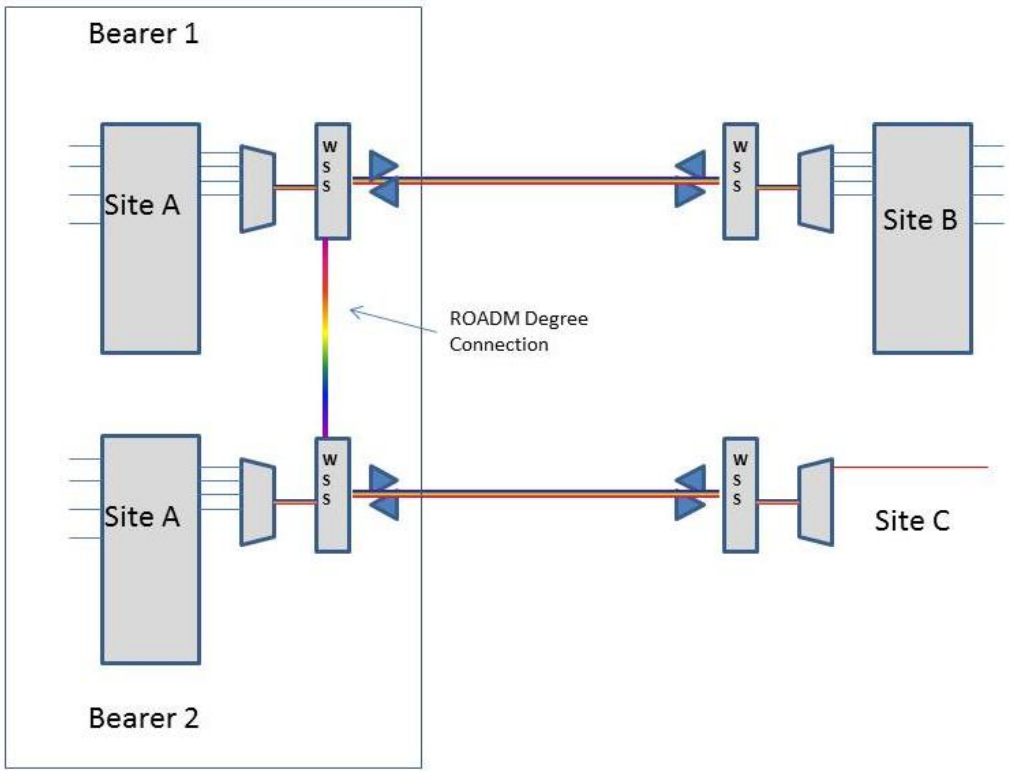

Figure 1 Example ROADM configuration

3. NTE specifics

By default OSEA 6500 chassis are installed into a customer's cabinet(s).

- The 2-Slot, 7-Slot & 14-Slot shelves may use either ETSI or 19" rack mounting practice. The 32-Slot shelf can only use ETSI rack mounting practice. Where there is a choice, it is the responsibility of the CP to inform Openreach of the mounting practice to be used
- The rack should be grounded with a clean earth supply.
- On request from CP, Openreach can provide suitable cabinet(s) at an additional charge.
- BT cabinet is 600mm x 600mm footprint with a height of 2.2 meters.

There are four chassis types available in either AC or DC power, these are detailed in table 5. For all chassis types and power options Openreach requires the following additional power supplies:

- A 240V AC supply using a 13A switched socket to power the remote network management system. The socket must be within 1.5m of that equipment.
- A 240V AC power supply to power Openreach test equipment during both initial commissioning and subsequent maintenance support activities. This socket must be within 1.5m of the NTE.

Chassis type	Height	AC power	DC power
2 Slot	2U	Yes	Yes
7 Slot	6U	Yes	Yes
14 Slot	13U	Yes via a rectifier	Yes
32 Slot	22U	Yes via a rectifier	Yes

Table 5 Chassis options

More information on specific power requirements can be found in the Openreach AC/DC planning guide which can be found here: www.openreach.co.uk

4. Further Information

For enquiries concerning connection availability between particular sites and for further product information about this service please visit the website at www.openreach.co.uk or contact your Openreach Sales & Relationship Manager or sales specialist.

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

5. References

1	ITU-T G.651	Recommendation G.651 (02/98) - Characteristics of a 50/125 µm multimode graded index optical fibre cable
2	ITU-T G.652	Recommendation G.652 (04/97) - Characteristics of a single-mode optical fibre cable
3	ESCON	IBM Proprietary as specified in IBM Red Book Standard for GDPS.
4	Fast Ethernet	IEEE 802.3
5	Fibre Channel	ANSI/NCITS X3.288-1996
6	FICON	FICON, the IBM zSeries zOS channel protocol succeeding ESCON
7	Gigabit Ethernet	IEE 802.3z or SIN 360 Gigabit Ethernet for the BT Network
8	ITU-T G.957	Optical interfaces for equipment and systems relating to the synchronous digital hierarchy
9	IEC 61754-7	Standard for “Fibre Optic Interconnecting Devices & Passive Components – Fibre Optic Connector Interfaces – Part 7: Type MPO Connector Family”
10	ETSI	European Telecommunications Standards Institute

For information on where to obtain these referenced documents, please see the document sources list at http://www.btplc.com/sinet/

6. Abbreviations

CP	Communications Provider
CPE	Customer Premises Equipment
DCMs	Dispersion Compensation Modules
DOC	Domain Optical Controller
DWDM	Dense Wavelength Division Multiplexing
DVB	Digital Video Broadcasting
ESCON	Enterprise Systems Connectivity architecture
ESRM	Enterprise Storage Resource Management
FC	Fibre Channel
FICON	Fibre Connectivity
Gbit/s	Gigabits per second
IBM	International Business Machines
IEC	International Electrotechnical Commission
ITU-T	International Telecommunication Union- Telecommunications standardization Sector
km	Kilometre
LC	Lucent Connector
LAN	Local Area Network
MM	MultiMode
MPO	Multi-fibre Push On
NTE	Network Terminating Equipment
NTP	Network Terminating Point
OSEA	Optical Spectrum Extended Access
OTU	Optical Transport Unit
PHY	Physical Layer
ROADM	Reconfigurable Optical Add Drop Multiplexer
SAN	Storage Area Network
SC	Subscription Channel
SDH	Synchronous Digital Hierarchy
SIN	Supplier Information Note
SM	Single Mode
SRM	Storage Resource Management
STM	Synchronous Transport Module

WDM	Wavelength Division Multiplexing
WSS	Wavelength Selective Switch

7. History

Issue	Date	Changes
Issue 1	February 2014	First Issue
Issue 1.1	April 2014	Table 1 and Table 5 updated Change SINet site references from http://www.sinet.bt.com to http://www.btplc.com/sinet/
Issue 1.2	January 2016	Updated link on page 11, section 3- NTE specifics under Table 5
Issue 1.3	March 2016	Amendments to client interface tables and removal of 40G coherent friendly alien Wavelength options.
1.4	August 2016	Addition of note in section 1 to state that the Ciena 6500 2 slot MOTR bearers & expansion chassis products are no longer available for new supply as from 11 May 2016.
1.5	September 2017	Correction of 40G Ethernet 850nm entry from Yes to No Section 2.7, removal of 40G text Section 2.11, removal of OTU3 text Table 4 correcting of Channel 44 frequency and wavelength values Section 3, update of mounting practice text

< END >