

Annex 18

Information requests issued to CPs

Introduction

A18.1 We issued a series of notices under section 135 of the Communications Act 2003, requiring various CPs to provide specified information as set out in the Notices. The information requested in the notices is listed in this Annex.

Information request dated 23 May 2011

A18.2 Information request of 23 May 2011 covering specified information about network and network reach, business connectivity retail services, provision of wholesale services to OCPs, purchases of wholesale services from OCPs and internal self-supply (for list of respondents see A13.68). List of questions addressed:

1. Information about your network and network reach

In order to understand how competition varies geographically and to determine the geographic coverage of the markets for business connectivity services, we need to carry out a detailed analysis of the network infrastructure which CPs have in place throughout the UK, which is or could in future be used to provide these services.

In questions 1.1 and 1.2 we are aiming to get a high-level view of your network and the way you provide services.

1.1 Network architecture: please provide a general description of the architecture of your network, and the way in which you provide business connectivity services, possibly by means of generic network diagrams. The description shall also set out:

- a) The number of network nodes at different levels in your network hierarchy, from the nodes nearest the customer up to the core nodes in your trunk network, i.e. total number of flexibility points, access nodes, backhaul and core nodes;
- b) The Transport technology used to provide network connectivity, e.g. SDH, Ethernet, WDM, Optical Transport Network and typical capacities (bandwidth) used in different parts of the network;
- c) whether and to what extent your backhaul and core network convey traffic from different services (e.g. data, voice, broadband, mobile traffic) and whether you have separate TDM and Ethernet networks to provide leased line services; please explain; and

- d) any future plans to increase your network reach by extending your “core” network and/or backhaul networks. Please explain.

1.2 Map of main core/trunk network(s): Please provide logical maps of your main fibre network linking core nodes and urban centres.

1.3 Location of flexibility points: Please provide the location of the flexibility points in your network, where these flex points relate to BT “T-Code” information. Please provide Easting and Northing data for each flexibility point.

1.4 Location of local exchanges and access serving nodes and parenting to main parent nodes: In relation to each local serving exchange, please provide:

- Local Serving Exchange ID;
- Location of Local serving exchange (Easting and Northing);
- Parented SDH Tier 1 node ID;
- Location of that SDH Tier 1 node(s) (Easting and Northing);
- Parented Metro node ID(s); and
- Location of that or those Metro node(s) (Easting and Northing).

1.5 Interconnection with other OCPs: we are interested in the interconnection points your network has with other CPs’ networks which are capable of supporting business connectivity traffic¹:

For Ethernet:

- Please provide exact locations for all of the network nodes that house active equipment;
- Please provide the location of all the points of interconnection your network has with other CPs’ networks and provide the name of the network provider you interconnect with at each of those locations. Do the nodes house co-located equipment?
- Please specify for each location, where applicable, whether interconnection at that location is restricted to picking up or handing-over Ethernet traffic ; and

¹ By interconnection points, we intend those network nodes where you interconnect with BT or another CP to hand-over or pick-up leased lines circuits.

- for each co-location point we are interested in the diversity in terms of the number of separate interconnection links you have to and from that location. Therefore please detail how many connections each node has to other nodes in your network.
- Please also highlight the key network nodes on your network (situated in the UK) that you would use to route leased lines from an end-user's premise situated in the UK to a destination outside of the UK.²

For SDH/PDH:

- a) Please provide the location of all the points of interconnection your network has with other CPs' networks and provide the name of the network provider you interconnect with at each of those locations. Do the nodes house co-located equipment?
- b) Please also highlight the key network nodes on your network (situated in the UK) that you would use to route leased lines from an end-user's premise situated in the UK to a destination outside of the UK.³

2 Business connectivity – retail services

In this section, please provide information on the retail circuits you provide to business customers. This should include any circuit sold to a third party which is not a CP⁴, i.e. it is either a business customer, a reseller, a value added provider or a system integrator.

2.1 Circuit volumes: Please provide the number of retail circuits you supplied to business customers in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, using the format set out in the worksheet '2.1 Retail volumes' of the spreadsheet accompanying this information request.

Circuits shall be broken down by the circuit type and specify the bandwidth of each circuit sold. Please provide a list of the retail services using your relevant product codes and service descriptions, categorising these into one of the list of retail circuit types in the worksheet '1.0 Definitions'.

² As this market review is interested in appropriate regulation of SMP markets in the UK, we need to understand to which main network node or nodes a leased lines from a retail end-user's premise (located in the UK) to a destination outside of the UK would be routed. Therefore, we would like to understand the key network nodes situated in the UK that would be used as the first (or last) node in the UK to route a circuit to and from international destinations.

⁴ Please only include information on sales to OCPs and downstream BT divisions (wholesale information) under the relevant section 3 or 4. In sections 3 and 4, please also include sales to mobile network operators.

2.2 Per-circuit analysis: Please provide a per-circuit analysis of all your types of retail circuits provided over the following interfaces:

- Analogue leased lines;
- Digital leased lines (SDH/PDH);
- Ethernet;
- ATM;
- Frame Relay;
- WDM;
- SDSL; and
- Other (specify by interface type).

Please provide the data at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates).

For each circuit, please provide the following details:

- Circuit identifier⁵;
- Type of circuit (as listed above);
- Product code or brand name of your retail service associated with each circuit;
- Bandwidth⁶;
- Name of customer if bought by another CP;
- The location of the A end and B end (preferably Easting/Northing (E/N) or full postal address);
- The serving exchange ID;
- The network end type (connection to you own network; connection to other CPs' or MNOs' networks; connection to business customer site or unknown); and
- Flag if sold by you as part of a managed VPN solution.

Please provide the information in the format outlined in the table below by filling in the worksheet 'Q2.2 Per circuit retail'.

⁵ The Circuit Identifier is the alphanumeric code unique to a specific circuit that is used by your system(s) to identify each circuit.

⁶ Please specify for each bandwidth increment as set out in the 'Definitions' worksheet. Where another bandwidth was sold not matching the increments specified please provide your own bandwidth increment.

2.3 Revenues from retail business connectivity services: We need to be able to measure the total value of this market in terms of retail sales. To that end, we need to collect information about your UK revenues from business connectivity services. It would be preferable if you could provide separate information on retail revenues from Virtual Private Networks (VPNs) and revenues from other business connectivity services (e.g. retail leased lines), excluding VPN revenues.

- **Retail business connectivity:** Please provide revenues from retail sales of business connectivity services for each of the financial years from 2006/07 to 2009/10 and each of the quarters from 1 April 2010 to 31 March 2011, disaggregated by circuit type and bandwidth, using the format set out in worksheet '2.3 Retail revenues' of the spreadsheet accompanying this information request;
- **VPN revenues:** Please provide the revenues from VPNs contracts, where possible showing annual revenues from circuits used as VPN access tails and revenues from other circuits.⁷

3. Provision of wholesale services to OCPs

In this section, please provide information on the connectivity services you supply to OCPs.

3.1 Wholesale circuit volumes: Please tell us the number of wholesale circuits you supplied to OCPs in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011 in terms of your installed base of circuits, broken down by the circuit type and bandwidth categories using the format set out in the worksheet 'Q3.1 Wholesale volumes to OCPs' of the spreadsheet accompanying this information request.

3.2 Per-circuit analysis: Please provide a per-circuit analysis of the wholesale circuits you supply to OCPs. Please provide the data at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates).

For each circuit, please provide the following details:

- Circuit identifier;
- Type of circuit (as listed above) ;

⁷ This question seeks information on revenues derived from the sale of circuits you sold as part of VPN packages (e.g. if you sold a VPN service with DSL access tails, please provide revenues attributable to the charges for underlying provisioning of those access tails and separately (where possible) in relation to other revenues from VPNs.)

- Service name associated with each circuit;
- Bandwidth;
- The location of the A end and B end (preferably Easting/Northing (E/N) or full postal address);
- Local Serving Exchange ID of the A end and B end;
- The network end type (connection to you own network; connection to other CPs' or MNOs' networks; connection to business customer site or unknown); and
- Name of customer.

Please provide the information in the format outlined in the table below by filling in worksheet 'Q3.2 Per circuit sold to OCPs'.

3.3 Revenues from wholesale circuits sold to OCPs: Please provide your revenues from the wholesale circuits you have supplied to OCPs in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, broken down by the circuit type and bandwidth categories using the format set out in the worksheet 'Q3.3 Wholesale revenues' of the spreadsheet accompanying this information request.

4. Business connectivity – purchases of wholesale services from OCPs

In this section, please provide information on the wholesale inputs you purchase from OCPs in order to support your retail business connectivity services.

4.1 Wholesale circuit volumes: Please provide the number of wholesale circuits you have purchased from OCPs in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011 in terms of your installed base of circuit volumes, broken down by the circuit type and bandwidth categories using the format set out in the worksheet 'Q4.1 Wholesale volumes form OCPs' of the spreadsheet accompanying this information request.

4.2 Per-circuit analysis: Please provide a per-circuit analysis of the wholesale circuits you purchase from OCPs. Please provide the data as at 31 March 2011 (or the nearest possible date, in which case please state the date to which the information relates).

For each circuit, please provide the following details:

- Circuit identifier;
- Type of circuit (as listed above);
- Bandwidth;

- Name of supplier; The location of the A end and B end (preferably Easting/Northing (E/N) or full postal address);
- Local Serving Exchange ID of the A end and B end;
- The network end type (connection to you own network; connection to other CPs' or MNOs' networks; connection to business customer site or unknown); and
- Where possible, the Circuit Identifier of the retail circuit which the wholesale service supports.

Please provide the information in the format outlined in the table below by filling in the worksheet 'Q4.2 Per circuit from OCPs'.

4.3 Expenditure on wholesale circuits from OCPs: Please provide your expenditure on the wholesale circuits you have purchased from OCPs in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, broken down by the circuit type and bandwidth categories using the format set out in the worksheet 'Q4.3 Wholesale expenditure' of the spreadsheet accompanying this information request. .

5. Internal self-supply

5.1 Wholesale circuit volumes: Where you consume Equivalence of Inputs (Eol) products, please provide the number of wholesale circuits purchased by BT downstream businesses (e.g. BT Wholesale, Global Services, BT Retail) from BT's Openreach in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, broken down by the circuit type and bandwidth categories shown in the worksheet '1.0 Definitions' and in the format set out in the worksheet 'Q5.1 Wholesale volumes internal sales' of the spreadsheet accompanying this information request.

5.2 Per-circuit analysis: Where you consume Eol products, please provide a per-circuit analysis of the wholesale circuits you purchase from other BT businesses. Please provide the data as at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates).

For each circuit, please provide the following details:

- Circuit identifier;
- Type of circuit (as listed above);
- Bandwidth;
- Name of supplier (BT division selling circuit);
- The location of the A end and B end (preferably Easting/Northing (E/N) or full postal address);

- Local Serving Exchange ID of the A end and B end;
- The network end type (connection to you own network; connection to other CPs' or MNOs' networks; connection to business customer site or unknown); and
- Where possible, the Circuit Identifier of the retail circuit which the wholesale service supports.

Please provide the information in the format outlined in the table below by filling the worksheet 'Q5.2 Per circuit internal sales'.

5.3 Expenditure on internal wholesale circuits: Please provide the expenditure of BT downstream divisions to purchase the wholesale circuits from BT upstream divisions in each of the financial years from 2006/07 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, broken down by the circuit type and bandwidth categories using the format set out in the worksheet 'Q5.3 Expenditures internal sales' of the spreadsheet accompanying this information request.

5.4 Methods used to estimate internal sales: where you have estimated the amount of circuits and revenues associated with internal sales (e.g. for PPCs) please provide a detailed explanation of the approach used to estimate internal sale volumes. Please provide working examples, setting out the input assumptions you have used and the calculation steps you followed to derive internal sales volumes and revenues.

Appendix: Definitions

For the purpose of this information request, the following definitions apply:

“Access network”: the part of a communications network between the end-user and the first aggregation or active equipment in the operator's network. Access network can be further sub-divided between end user specific and shared;

“Access nodes”: the location in an operator's network where equipment is housed that is directly connected to an end-customer. Examples of access nodes include street cabinets, local exchanges and equipment rooms;

“Alternative Interface leased lines”: Permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 64kbit/s provided with non SDH/PDH interfaces for example: Ethernet, Fibre Channel, ESCON, and digital video;

“Analogue leased lines”: permanently connected point-to-point or point-to-multi point circuits that use analogue transmission that is engineered for 300 to 3400 Hz;

“Asymmetric Digital Subscriber Line (ADSL)”: A technology that allows the use of a copper line to send a high data rate in one direction and a lower data rate in the other;

“A value added provider”: uses telecommunication services to deliver additional capabilities such as content or applications;

“Backhaul network”: network providing the link between the access and core parts of a communications network. Sometimes sub-divided by type of service being backhauled e.g. mobile backhaul or broadband backhaul;

“Circuit type”: a set of information that defines the bandwidth, transmission technology, resilience and quality of a telecommunications connection. E.g. an E1 is a 2 Mbit/s PDH unprotected circuit and Fast Ethernet is a 100 Mbit/s Ethernet unprotected circuit;

“Communication Provider (CP)”: a provider of Electronic Communications Services as defined in section 32 of the Communications Act 2003;

“Core nodes”: the primary nodes in a communication provider’s network. Often core nodes house large routers, switches and are linked by the largest capacity transmission systems to other core nodes;

“Ethernet leased lines”: permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 64kbit/s provided with an Ethernet interface;

“Flexibility Point” or *“Flex Point”*: a point in an operator’s network where additional customers can be physically connected or physical media (copper, coax and fibre) can be joined to provide physical network connectivity. Typically flexibility points are footway boxes, street cabinets, equipment rooms and exchanges. However pole and wall mounted enclosures are also available;

“Optical Transport Network (OTN)”: ITU Standard G.709 defined as set of optical network elements connected by optical fibre links, able to provide functionality of transport, multiplexing, switching, management, supervision and survivability of optical channels carrying client signals;

“Other Communication Provider (OCP)”: a provider of Electronic Communications Services as defined in section 32 of the Communications Act 2003 which is not a BT Group operating company;

“Partial Private Circuits”: A circuit allowing operator A to reach an end-customer across operator B’s network. A partial private circuit comprises three components: the point of handover between operator A’s and operator B’s networks, the access circuit linking the end-user to operator B’s network and the circuit linking the point of handover and the access circuit across operator B’s network;

“RBS backhaul”: Backhaul specifically for carrying traffic between mobile base stations and an access node or core node;

“Reseller”: a purchaser of telecommunication services for the purposes of selling to one or more other communication providers;

“Retail business customer”: an end user purchasing business connectivity services for their own use or business that is not a CP;

“System Integrator”: uses telecommunication services as a sub-component in a delivering a service or capability;

“SDH/PDH leased lines”: permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 2.4kbit/s provided with an G703, G957 or X21 interface;

“Symmetric Digital Subscriber Line (SDSL)”: technology that allows the use of a copper line to send an equal quantity of data in both directions;

“Trunk network”: the part of a telecommunication operator’s network that interconnects network core nodes. The trunk network can also be called the backbone network;

“Virtual Private Network (VPN)”: a network used by a company or by several organisations to communicate securely and confidentially over a connection orientated platform. A VPN is

provided over a shared infrastructure platform, which could be a single CP's network, multiple CP's networks or publicly available networks, such as the Internet. Communications protocols are used to make the network private and secured with cryptographic tunneling protocols;

“Wave Division Multiplexing (WDM)”: a technology which multiplexes a number of optical carriers onto a single optical fibre by using different wavelengths. A WDM circuit provides the end user with a high capacity permanently connected point-to-point symmetric bandwidth service able to support multiple interface types.

“Wholesale customer”: a CP purchasing leased lines with the purpose of combining them with its own network and then supply retail customers. Any CP that connects its own network with another CP's network to pick up or hand-over leased line circuits that are then combined to sell retail services downstream are likely to be wholesale customers. This is likely to include (but is not necessarily limited to):

- BT and major CPs that might purchase Partial Private Circuits from BT and wholesale Ethernet services from Openreach (or alternative wholesale services from OCPs) to combine with their own networks to deliver retail leased lines or services to other retail markets (e.g. using wholesale leased lines to support broadband backhaul). For example, such major CPs could include: AT&T, C&W, Colt, Easynet, Exponential-e, Geo Networks, Global Crossing, KCOM, MLL Telecom, Sky, Talk Talk/Opal Telecom, Verizon Business, Virgin Media, Vtesse, Orange Business Services.
- Mobile network operators: where they are purchasing leased lines for the purpose of delivering mobile network connectivity (where mobile network connectivity includes circuits between their radio base stations (RBSs) and for the backhaul of traffic from RBSs to core nodes and between core network nodes).

It excludes customers making retail purchases, e.g.:

- Mobile network operators purchasing retail circuits to connect together their own retail stores to their headquarters.
- Sales of circuits to re-sellers or value-added providers that do not have their own networks, e.g. IBM.

“Wholesale provider”: a CP providing leased lines to Wholesale customers.

Worksheet for completion:



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Information request dated 23 May 2011

A18.3 Information request of 23 May 2011 covering specified information about network and network reach, business connectivity retail services, provision of wholesale services to BT and OCPs, purchases of wholesale services from BT and other OCPs (for list of respondents see A13.69). List of questions addressed:

1. Information about your network and network reach

In order to understand how competition varies geographically and to determine the geographic coverage of the markets for business connectivity services, we need to carry out a detailed analysis of the network infrastructure which CPs have in place throughout the UK, which is or could in future be used to provide these services.

In questions 1.1 and 1.2, we are aiming to get a high-level view of your network and the way you provide services.

1.1 Network architecture: please provide a short general description of the architecture of your network, and the way in which you provide business connectivity services, possibly by means of generic network diagrams. The description shall also set out:

- e) The number of network nodes at different levels in your network hierarchy, from the nodes nearest to the customer up to the core nodes in your trunk network, i.e. the total number of flexibility points, access nodes, backhaul and core nodes;
- f) The transport technology used to provide network connectivity, e.g. SDH, Ethernet, WDM, Optical Transport Network and typical bandwidths used in different parts of the network;
- g) whether and to what extent your backhaul and core network convey traffic from different services (e.g. data, voice, broadband, mobile traffic) and whether you have separate TDM and Ethernet networks to provide leased line services; and
- h) any future plans to increase your network reach by extending your core network and/or backhaul networks over the next four years (i.e. up to and including 2014/15). Please explain.

1.2 Map of main core/trunk network: Please provide a map of your main fibre network linking core nodes and urban centres.

1.3 Location of flexibility points: Please provide the location of the flexibility points in your network (see the definitions below for a description of flexibility points). Please provide Easting and Northing coordinates for each flexibility point.

1.4 Interconnection with BT and other CPs: we are interested in the interconnection points your network has with BT's and other CPs' networks which are capable of supporting business connectivity traffic⁸. We therefore require the following information.

- The exact locations for all of the network nodes that house active equipment;
- The location of all the points in your network where you interconnect with BT's and other CPs' networks and provide the name of the network provider you interconnect with at each of those locations. Do the nodes house co-located equipment?

⁸ By interconnection points, we intend those network nodes where you interconnect with BT or another CP to hand-over or pick-up leased lines circuits.

- For each location, where applicable, please specify whether interconnection at that location is restricted to picking up or handing-over different traffic types (e.g. TDM-based traffic only, Ethernet only, etc);
- For each co-location point we are interested in the diversity in terms of the number of separate interconnection links you have to and from that location. Therefore please detail how many connections each node has to other nodes in your network; and
- Please also highlight the key network nodes on your network (situated in the UK) that you would use to route leased lines from an end-user's premise situated in the UK to a destination outside of the UK.⁹

2 Business connectivity – retail services

In this section, please provide information on the retail circuits you provide to business customers. This should include any circuit sold to a third party which is not a CP¹⁰, i.e. it is either a business customer, or a reseller, a value added provider or a system integrator (not classified as a CP).

2.1 Circuit volumes: Please provide the number of retail circuits you supplied to business customers in each of the financial years from 2007/08 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, using the format set out in the worksheet '2.1 Retail volumes' of the spreadsheet accompanying this information request.

Please provide the above data in terms of your installed base of circuit volumes at the end of each year (and at the end of each quarter in 2011), broken down simultaneously by: i) the circuit type; and ii) the bandwidth categories; and iii) the name of the retail customer. Please provide a list of the retail services using your relevant product codes and service descriptions, categorising these into one of the list of retail circuit types in the worksheet '1.0 Definitions'.

Where you sell Virtual Private Networks (VPNs), we ask for data on the volumes of circuits sold. Please note that we are only interested in the VPN-access circuits/ VPN-access tails (i.e. from the end-user premises to the point on your network where the service first reaches your VPN "core" network).

2.2 Per-circuit analysis: Please provide a per-circuit analysis of all your types of retail circuits provided over the following interfaces:

- Analogue leased lines;
- Digital leased lines (SDH/PDH);
- Ethernet;
- WDM;
- SDSL; and

⁹ As this market review is interested in appropriate regulation of SMP markets in the UK, we need to understand to which main network node or nodes a leased lines from a retail end-user's premise (located in the UK) to a destination outside of the UK would be routed. Therefore, we would like to understand the key network nodes that would be used to route a circuit to and from international destinations.

¹⁰ Please only include information on sales to OCPs and BT (wholesale information) under the relevant section 3 or 4. In sections 3 and 4, please also include sales to mobile network operators.

- Other (specify by interface type).

Please provide the data at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates).

For each circuit, please provide the following details:

- Circuit identifier¹¹;
- Type of circuit (as listed above);
- Product code or brand name of your retail service associated with each circuit;
- Bandwidth¹²;
- Name of customer if bought by another CP;
- The location of the A end and B end (Easting and Northing [preferred] or full postal address (including postcode) or at a minimum the postcode);
- The network end type (connection to you own network; connection to other CPs' or MNOs' networks; connection to business customer site or unknown); and
- Flag if sold by you as part of a managed VPN solution.

Please provide the information in the format outlined in the table below by filling in the worksheet 'Q2.2 Per circuit retail'.

2.3 Revenues from retail business connectivity services: We need to be able to measure the total value of this market in terms of retail sales. To this end, we need to collect information about your UK revenues from business connectivity services. It would be preferable if you could provide separate information on retail revenues from Virtual Private Networks (VPNs) and revenues from other business connectivity services (e.g. retail leased lines), excluding VPN revenues.

- **Retail business connectivity:** Please provide revenues from retail sales of business connectivity services for each of the financial years from 2007/08 to 2009/10 and for each of the quarters from 1 April 2010 to 31 March 2011, disaggregated by circuit type and bandwidth, using the format set out worksheet '2.3 Retail revenues' of the spreadsheet accompanying this information request.
- **VPN revenues:** Please provide the aggregate revenues from VPNs contracts, where possible showing annual revenues from circuits used as VPN access tails and revenues from other circuits.¹³

3. Business connectivity – purchases of wholesale services from BT and other CPs

¹¹ The Circuit Identifier is the alphanumeric code unique to a specific circuit that is used by your system(s) to identify each circuit.

¹² Please specify for each bandwidth increment as set out in the 'Definitions' worksheet. Where another bandwidth was sold not matching the increments specified please provide your own bandwidth increment.

¹³ This question seeks information on revenues derived from the sale of circuits you sold as part of VPN packages (e.g. if you sold a VPN service with DSL access tails, please provide revenues attributable to the charges for underlying provisioning of those access tails and separately (where possible) in relation to other revenues from VPNs.)

In this section, please provide information on the wholesale inputs you purchase from other CPs in order to support your retail business connectivity services.

3.1 Wholesale circuit volumes: Please provide the number of wholesale circuits you have purchased from BT and other CPs in each of the financial years from 2007/08 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011. Please provide the above data in terms of your installed base of circuit volumes at the end of each year (and at the end of each quarter in 2011), broken down simultaneously by: i) the circuit type; and ii) bandwidth categories; and iii) name of the wholesale supplier. Please provide the above data by using the format set out in worksheet 'Q3.1 Wholesale volumes from OCPs' of the spreadsheet accompanying this information request.

3.2 Per-circuit analysis: Please provide a per-circuit analysis of the wholesale circuits you purchase from BT and other OCPs. Please provide the data as at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates). For each circuit, please provide the following details:

- Circuit identifier, i.e. your internal reference number;
- Type of circuit (as listed above);
- Product code, i.e. the identifier used by the supplier;
- Bandwidth;¹⁴
- Name of the wholesale supplier;
- The location (Easting and Northing [preferred] or full postal address (including post code) or at a minimum the postcode) of the A end and B end;
- The network end type (connection to you own network; connection to other CPs' or Mobile Network Operators' networks; connection to business customer site or unknown); and
- Where possible, the Circuit Identifier of the retail circuit which the wholesale service supports.

Please provide the information in the format outlined in the worksheet 'Q3.2 Per circuit from OCPs'.

3.3 Expenditure on wholesale circuits from BT and other CPs: Please provide your expenditure on the wholesale circuits you have purchased from BT and other CPs in each of the financial years from 2007/08 to 2009/10 and in each of the quarters from 1 April 2010 to 31 March 2011, broken down by the circuit type and bandwidth categories using the format set out in worksheet 'Q3.3 W.sale expenditure'.

3.4 Self-supply: where this is available, please provide information in the format specified in question 3.2 about:

3.5

- The circuits you self supply to offer retail leased line services;

¹⁴ As per footnote 6

- Self-supplied leased lines circuits used as an input to other retail services, e.g. LLU backhaul as an input to retail broadband; and RBS backhaul as an input to mobile network connectivity.

Where this information is not available in the format requested, set out the reasons and provide your most accurate estimate of the percentage of circuits you self-supply. Please, provide the most detailed break-down possible of circuits self-supplied by as many of the following as possible:

- Circuits types (e.g. SDH, Ethernet, WDM);
- Service types (e.g. leased lines, LLU backhaul, mobile network connectivity);
- Bandwidths;
- Locations (e.g. any difference in the extent of self-supply to particular geographic areas).

4. Provision of wholesale services to BT and OCPs

In this section, please provide information on the connectivity services you supply to BT and OCPs.

4.1 Wholesale circuit volumes: Please tell us the number of wholesale circuits you supplied to BT and other CPs in each of the financial years 2007/08 to 2010/11 inclusive. Please provide the above data in terms of your installed base of circuit volumes at the end of each year (and at the end of each quarter in 2011), broken down simultaneously by: i) the circuit type; ii) the bandwidth; and iii) the name of the wholesale customer (see the definition below for the wholesale customer). Please provide the above data using the format set out in worksheet 'Q4.1 Wholesale volumes to OCPs'.

4.2 Per-circuit analysis: Please provide a per-circuit analysis of the wholesale circuits you supply to BT and other OCPs. Please provide the data at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates). For each circuit, please provide the following details:

- Circuit identifier;
- Type of circuit (as listed above) ;
- Service name associated with each circuit;
- Bandwidth¹⁵;
- Name of wholesale customer (e.g. BT, another CP or MNO).
- The location (Easting and Northing -preferred- or full postal address (including post code) or at a minimum the postcode) of the A end and B end;
- The network end type (connection to you own network; connection to other CPs' or MNOs' networks; connection to business customer site or unknown).

Please provide the information in the format outlined in the table below by filling in worksheet 'Q4.2 Per circuit sold to OCPs'.

¹⁵ As per footnote 6

4.3 Revenues from wholesale circuits to BT and other CPs: Please provide your revenues from the wholesale circuits you have supplied to BT and other CPs for each of the financial years from 2007/08 to 2009/10 and for each of the quarters from 1 April 2010 to 31 March 2011, broken down by the circuit type and bandwidth categories using the format set out in worksheet 'Q4.3 W.sale revenues'.

Appendix: Definitions

For the purpose of this information request, the following definitions apply:

“Access nodes”: the location in an operator’s network where equipment is housed that is directly connected to an end-customer. Examples of access nodes include street cabinets, local exchanges and equipment rooms;

“Access network”: the part of a communications network between the end-user and the first aggregation or active equipment in the operator’s network. Access network can be further sub-divided between end user specific and shared;

“Alternative Interface leased lines”: Permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 64kbit/s provided with non SDH/PDH interfaces for example: Ethernet, Fibre Channel, ESCON, and digital video;

“Analogue leased lines”: permanently connected point-to-point or point-to-multi point circuits that use analogue transmission that is engineered for 300 to 3400 Hz;

“Asymmetric Digital Subscriber Line (ADSL)”: A technology that allows the use of a copper line to send a high data rate in one direction and a lower data rate in the other;

“Backhaul network”: network providing the link between the access and core parts of a communications network. Backhaul networks can often be referred to the type of service being backhauled, e.g. mobile backhaul or broadband backhaul;

“Circuit type”: a set of information that defines the bandwidth, transmission technology, resilience and quality of a telecommunications connection. E.g. an E1 is a 2 Mbit/s PDH unprotected circuit and Fast Ethernet is a 100 Mbit/s Ethernet unprotected circuit;

“Communication Provider (CP)”: a provider of Electronic Communications Services as defined in section 32 of the Communications Act 2003;

“Core nodes”: the primary nodes in a communication provider’s network. Often core nodes house large routers, switches and are linked by the largest capacity transmission systems to other core nodes;

“Ethernet leased lines”: permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 64kbit/s provided with an Ethernet interface;

“Flexibility points”: These are the points a) where existing infrastructure can be accessed to connect an end-user premise; and b) from which you would consider, within your current network planning practice, extending your network reach in order to provide services to

additional end-user premises. For example, flexibility points may be buildings where fibre terminates on an Optical Distribution Frame or underground chambers where fibre can be accessed, such as where ducts meet at a junction.

“Optical Transport Network (OTN)”: ITU Standard G.709 defined as set of optical network elements connected by optical fibre links, able to provide functionality of transport, multiplexing, switching, management, supervision and survivability of optical channels carrying client signals.

“Other Communication Provider (OCP)”: a provider of Electronic Communications Services as defined in section 32 of the Communications Act 2003 which is not a BT Group operating company;

“Partial Private Circuits (PPCs)”: A circuit allowing operator A to reach an end-customer across operator B’s network. A partial private circuit comprises three components: the point of handover between operator A’s and operator B’s networks, the access circuit linking the end-user to operator B’s network and the circuit linking the point of handover and the access circuit across operator B’s network;

“RBS backhaul”: Backhaul specifically used for carrying traffic between radio base stations and an access node or core node;

“Reseller”: a purchaser of telecommunication services for the purposes of selling to one or more other communication providers;

“Retail business customer”: an end user purchasing business connectivity services for their own use or business that is not a CP (cf the wholesale customer definition below);

“SDH/PDH leased lines”: permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 2.4kbit/s provided with an G703, G957 or X21 interface;

“Symmetric Digital Subscriber Line (SDSL)”: a technology that allows the use of a copper line to send an equal quantity of data in both directions;

“Systems Integrator”: a firm which uses telecommunication services as a sub-component in a delivering a service or capability;

“Trunk network”: the part of a telecommunication operator’s network that interconnects network sites rather than end-customers. The trunk network can also be called the backbone network;

“Value added provider”: a firm which uses telecommunication services to deliver additional capabilities such as content;

“Virtual Private Network (VPN)”: a network used by a company or by several organisations to communicate securely and confidentially over a connection orientated platform. A VPN is provided over a shared infrastructure platform, which could be a single CP’s network, multiple CPs’ networks or publicly available networks, such as the Internet. Communications

protocols are used to make the network private and secured with cryptographic tunneling protocols;

“*Wave Division Multiplexing (WDM)*”: a technology which multiplexes a number of optical carriers onto a single optical fibre by using different wavelengths. A WDM circuit provides the end user with a high capacity permanently connected point-to-point symmetric bandwidth service able to support multiple interface types.

“*Wholesale customer*”: a CP purchasing leased lines with the purpose of combining them with its own network and then supply retail customers. Any CP that connects its own network with another CP’s network to pick up or hand-over leased line circuits that are then combined to sell retail services downstream are likely to be wholesale customers. This is likely to include (but is not necessarily limited to):

- BT and major CPs that might purchase Partial Private Circuits from BT and wholesale Ethernet services from Openreach (or alternative wholesale services from OCPs) to combine with their own networks to deliver retail leased lines or services to other retail markets (e.g. using wholesale leased lines to support broadband backhaul). For example, such major CPs could include: AT&T, C&W, Colt, Easynet, Exponential-e, Geo Networks, Global Crossing, KCOM, MLL Telecom, Sky, Talk Talk/Opal Telecom, Verizon Business, Virgin Media, Vtesse, Orange Business Services.
- Mobile network operators: where they are purchasing leased lines for the purpose of delivering mobile network connectivity (where mobile network connectivity includes circuits between their radio base stations (RBSs) and for the backhaul of traffic from RBSs to core nodes and between core network nodes).

It excludes customers making retail purchases, e.g.:

- Mobile network operators purchasing retail circuits to connect together their own retail stores to their headquarters.
- Sales of circuits to re-sellers or value-added providers that do not have their own networks, e.g. IBM.

“*Wholesale provider*”: a CP providing leased lines to Wholesale customers.

Worksheet for completion:



s135
23.05.2011.xlsx

Information request dated 23 May 2011

A18.4 Information request of 23 May 2011 covering specified information about network and network reach and about leased lines volumes and revenues, in particular about purchases of wholesale services from BT and other CPs and self-supplied circuits used to deliver MNO’s mobile network connectivity requirements (for list of respondents see A13.70). List of questions addressed:

1. Information about your network and network reach

In questions 1.1 and 1.2, we are aiming to get a high-level view of your network and the way you provide services.

1.1 Network architecture: please provide a general description of the architecture of your network, and the way in which your network is configured, possibly by means of generic network diagrams. The description should also set out:

- 1.1.1. The number of network nodes at different levels in your network hierarchy, as set out in Table 1.1.1 in worksheet Q1.1.
- 1.1.2. The transport technology and the physical medium used to provide network connectivity, e.g. by providing the number of circuits using SDH over copper, SDH over microwave, Ethernet over fibre, Ethernet over WDM, etc. Please refer to Table 1.1.2 in worksheet Q1.1 of the spreadsheet accompanying this information request.
- 1.1.3. Provide the total number of circuits interconnecting the different nodes in your network split by the physical medium type as specified in Table 1.1.3 (see worksheet Q1.1).
- 1.1.4. The technologies and transport protocols employed to synchronize the transmission of voice and data over your backhaul network;
- 1.1.5. Any investment plan approved by your company to increase your network capacity over the next four years (i.e. up to and including 2014/15) or any significant changes in the technologies you plan to use in different levels in your network hierarchy (e.g. investment in Ethernet backhaul and the typical bandwidth requirements expected). In particular, please provide details of whether you think your self supply will increase or decrease, why and where.

1.2 Interconnection points with BT and other CPs: we are interested in the major interconnection points your network has with BT's and other CPs' networks. These are the interconnection points where leased lines provided by BT / other CP's are presented to your core network (e.g. if you purchase RBS backhaul at what location is this circuit handed back to your network?). In this regard, by following the format specified in worksheet Q1.2, please provide:

- 1.2.1. The location of all the main network nodes¹⁶ that are used as points of interconnection with BT's and other CPs' networks in Easting and Northing coordinates (preferred) or postcodes; and
- 1.2.2. The name of the network provider you interconnect with at each of those locations.¹⁷

¹⁶ In relation to the main network nodes, we exclude from this meaning radio base stations. For example, if you buy radio base station backhaul from BT, we would only be interested in the interconnection points into your core network rather than interconnection point for each base station.

2. Leased lines volumes and revenues – purchases of wholesale services from BT and other CPs and self-supplied circuits used to deliver your mobile network connectivity requirements

In this section, please provide information on the wholesale inputs you purchase from other CPs in order to deliver mobile network connectivity as well as the network connectivity you self-supply. We would like to know whether it is used for radio base station backhaul or core connectivity (e.g. between your MSCs), the circuit bandwidths and the technology used to deliver the service. If applicable, please also include any circuits either self-supplied or purchased from a third party used to deliver downstream retail leased lines services and other fixed business connectivity services relevant to this market. Please note that we are not interested in circuits used for other purposes – such as support circuits to connect offices and stores.

2.1 Volumes of purchased wholesale circuits : please provide the number of wholesale circuits you have purchased from BT and other CPs in each of the financial years from 2007/08 to 2010/11 inclusive in terms of your installed base of circuit volumes at the end of each year (and at the end of each quarter in 2011), broken down by the wholesale service type and bandwidth categories using the format set out in worksheet Q2.1.

2.2 Volumes of self-supplied circuits: please provide the number of wholesale circuits you self-supplied (for example self supplied network connectivity by way of fixed microwave links, SDH/PDH, Ethernet, WDM, etc.) in each of the financial years 2007/08 to 2010/11 inclusive in terms of your installed base of circuit volumes at the end of each year, broken down by the wholesale service type and bandwidth categories using the format set out in worksheet Q2.2

2.3 Expenditure on wholesale circuits from BT and other CPs: Please provide your expenditure on the wholesale circuits you have purchased from BT and other CPs in each year from financial year 2007/08 to 2010/11 inclusive, broken down by the CP supplying the circuit, by the circuit type and bandwidth categories using the format set out in worksheet Q2.3.

2.4 Per-circuit analysis Please provide a per-circuit analysis of both the wholesale circuits you purchase from BT and other OCPs (worksheet Q2.1) and the circuits you self supply (worksheet Q2.2). Please provide the data as at 31 March 2011 (or a nearest possible date, in which case please state the date to which the information relates).

For each circuit, please provide the following details:

- Type of circuit¹⁸;
- Product code or service name (where relevant)¹⁹;

¹⁷ Please note that we are not interested in interconnection points that you have to support markets other than for picking up traffic from leased lines. For example, this question is not seeking information on your interconnection points associated with mobile and fixed voice call termination.

¹⁸For circuit types please specify the interface and technology types e.g. SDH, Ethernet, WDM, Optical Transport Network, fixed wireless, etc.

¹⁹ For circuits supplied by BT and other OCPs, please specify service sub-categories as set out in the 'Definitions' worksheet. Where other service sub-categories exist not matching the services identified please provide details of each additional sub-category.

- Bandwidth²⁰;
- Name of supplier (where relevant);
- Type of A End and B End, i.e. type of network node, e.g. BTS, BSC, RNC, etc.
- Location of the A end and B end (Easting and Northing [preferred] or postcode); and
- Purpose (Linking RBS sites, RBS backhaul, core connectivity)

Please provide the information in the format outlined in the table below.

Circuit Type*	Product code (service name)	Circuit Bandwidth**	Name of circuit supplier or self supplied (where relevant)	A End		B End		Purpose
				A End - type of node	A - End postcode or Easting/Northing	B End - type of node	B End postcode or Easting/Northing	

Definitions

For the purposes of this information request, the following definitions apply:

“Access network”: The part of a communications network between the end-user and the first aggregation or active equipment in the operator’s network. Access network can be further sub-divided between end-user specific and shared. In mobile networks, the access network is based on radio transmission;

“Backhaul”: provides the link between the access and core parts of a communications network. Sometimes sub-divided by type of service being backhauled e.g. mobile backhaul or broadband backhaul;

“Communication Provider (CP)”: a provider of Electronic Communications Services as defined in section 32 of the Communications Act 2003;

“Core nodes”: the primary nodes in a communication provider’s network. Often core nodes house large routers, switches and are linked by the largest capacity transmission systems to other core nodes;

“Ethernet leased lines”: permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 64kbit/s provided with an Ethernet interface;

“Mobile Switching Centre (MSC)”: is the mobile core network node responsible for routing mobile calls, text messages and other mobile services within the mobile network and in case it is a *Gateway MSC* towards the fixed network;

“SDH/PDH leased lines”: permanently connected point-to-point or point-to-multi point symmetric circuits at speeds in excess of 2.4kbit/s provided with an G703, G957 or X21 interface;

“Wave Division Multiplexing (WDM)”: a technology which multiplexes a number of optical carriers onto a single optical fibre by using different wavelengths. A WDM circuit provides

²⁰ Please specify for each bandwidth increment as set out in the 'Definitions' worksheet. Where another bandwidth was sold not matching the increments specified please provide your own bandwidth increment.

the end user with a high capacity permanently connected point-to-point symmetric bandwidth service able to support multiple interface types.

Worksheet for completion:



s135 23.05.11.xlsx

Information request dated 10 August 2011

A18.5 Information request of 10 August 2011 covering specified information related to the identification of the telecommunications markets for retail leased lines, any other forms of retail business connectivity services and associated wholesale services and the assessment of market power within them (In particular information about typical Ethernet purchasing scenarios, the new Openreach Ethernet network and optical spectrum products) (for list of respondents see A13.71). List of questions addressed:

1. Typical Ethernet purchasing scenarios

- 1.1. Please identify the typical purchasing scenarios for which communications providers buy wholesale Ethernet services from Openreach and describe the associated network configurations. It would be helpful if you could explain how the scenarios vary by type of communications provider e.g. small CP selling Ethernet based VPNs, LLU provider, large CP with existing network infrastructure and large business customer base etc.
- 1.2. For the scenarios identified above, please include information about Openreach service pricing and explain how pricing influences communications providers' choice for example by making a particular solution more cost effective.
- 1.3. Please explain in which circumstances CPs need to co-locate their equipment in BT exchanges when they buy wholesale Ethernet services from Openreach and explain what equipment that would be likely to deploy.

2. New Openreach Ethernet network

- 2.1. Please explain whether Openreach has defined catchment areas for the Openreach Handover Points (OHPs) and Trunk Aggregation Nodes (TANs) in terms of the local exchange areas they serve. Please provide a full list of the mapping of local exchanges to OHPs and TANs.
- 2.2. With reference to the Openreach PowerPoint presentation annexed to this formal request and titled "EAD Routing rules - proposal for discussions", we ask Openreach to update Ofcom on the progress of the three phases outlined in slide 3 and, as a result, how EBD chains are now mapped into TANs.

- 2.3. With reference to the routing rules summarised in the table of slide 4 of the aforementioned presentation, please explain what routes are currently forbidden between TANs and explain why.
- 2.4. Does the equipment Openreach use for EAD and EBD services support Synchronous Ethernet and/or IEEE1588v2?
3. Questions relating to Optical Spectrum products
 - 3.1. Please provide a description of the OSA and OSEA products and their variants. Your answer should include:
 - 3.1.1. The key differences between the OSA and OSEA products and the Ethernet high bandwidth products;
 - 3.1.2. the differences in initial charges, annual fees and charges for additional (incremental) wavelengths between OSA and OSEA services;
 - 3.1.3. Configuration options and any usage limitations; and
 - 3.1.4. Whether the products can be used for backhaul as well as access and whether they can be daisy-chained.
 - 3.2. Please provide us with the prices for your OSA and OSEA products. If the prices have changed in the last year, please also provide the older prices.
 - 3.3. Please provide the names of the customers to which OSA and OSEA circuits have been sold.

Information request dated 13 September 2011

A18.6 Information request of 13 September 2011 covering specified information about OCP's network extension practice (for list of respondents see A13.72). List of questions addressed:

Information about your network extension practice

In order to understand how competition varies geographically and to determine the geographic coverage of the markets for business connectivity services, we need to carry out a detailed analysis of the network infrastructure which CPs have in place throughout the UK, which is or could in future be used to provide these services. As part of this work we need to understand communications providers' network extension practices and network extension costs in order to determine how the networks might be extended to provide business connectivity services in future.

1. For each instance in the period 2008-2011 where your company has extended its own network infrastructure (for example by installing new duct, fibre or microwave link) to connect a business premise for the purposes of supplying business connectivity services, please provide the following information using the format set out in the spreadsheet accompanying this request:

- a. location where the network extension took place (preferably the eastings/northings of the business premises served or if not available the postcode);
 - b. date when the network extension was completed;
 - c. length of the network extension and whether the measurement is the point to point distance or the route distance;
 - d. the main technology used for the network extension (e.g. fibre or microwave);
 - e. the number of circuits provided;
 - f. the type(s) of circuits provided (e.g. Ethernet, SDH etc);
 - g. the bandwidth of the circuit(s) provided;
 - h. the contract length for circuits provided;
 - i. the overall value of the contract that the network extension was part of; and
 - j. the customer name.
2. Please list the cost assumptions that your company uses for network extension planning for the purposes of supplying business connectivity services, This might for instance include call-off contract rates agreed with a civil engineering contractor. Please provide as full a list as possible covering at minimum costs for duct construction, fibre installation and associated activities and state:
- a. costs for each activity, the unit of purchase and any geographic or other variation in rates (e.g. Urban/rural, road/footway etc);
 - b. whether the costs relate to direct labour activities or activities undertaken by a third party; and
 - c. any minimum purchase requirement, site visit or other charges that may also be incurred in relation to network extension activities.

Worksheet for completion:



s135
13.09.2011.xlsm

Information request dated 5 October 2011

A18.7 Information request of 5 October 2011 covering specified information related to the identification of the telecommunications markets for retail leased lines, any other forms of retail business connectivity services and associated wholesale services and the assessment of market power within them (in particular additional information on Wavestream products) (for list of respondents see A13.73). List of questions addressed:

1. With reference to your response to our previous information request on Wavestream products, dated 8 July 2011, please provide the following additional information?

- 1.1. In your submission, retail revenues are provided as single annual or quarterly figures for all bandwidths i.e. 1.25; 2.5 and 10 Gbit/s. Please provide disaggregated revenues for each bandwidth to accompany the volume figures which were disaggregated.
- 1.2. In addition to the information provided in the retail Wavestream per-circuit breakdown, please provide an updated circuit listing that includes the names of the business customers to which Wavestream circuits have been sold?
2. Questions relating to retail Wavestream products provided by BT to businesses
 - 2.1. Please provide a description of the main Wavestream products and their variants. Do customers need to buy the circuit bearer and the wavelengths separately? How easy is for a Wavestream customer to buy additional wavelengths once the circuit is set up, e.g. what are the average provisioning timescales?
 - 2.2. Please list any other retail high bandwidth Alternative Interface products that you provide to businesses that are comparable to Wavestream (i.e. Ethernet or similar).
 - 2.3. For Wavestream and Ethernet (1 and 10 Gbit/s bandwidth) and any other comparable products (as listed in 2.1 above) please provide:
 - 2.3.1. An explanation of the key differences in between the services e.g. bandwidth options or flexibility;
 - 2.3.2. Retail prices;
 - 2.3.3. A list of wholesale inputs supplied by other parts of BT;
 - 2.3.4. A full breakdown of costs, separated by bandwidth if available. This should include:
 - 2.3.4.1. Transfer charges for any wholesale inputs provided by Openreach or BT Wholesale;
 - 2.3.4.2. Retail costs; and
 - 2.3.4.3. Capital employed.

Information request dated 3 November 2011

- A18.8 Information request of 3 November 2011 covering specified information related to the identification of the telecommunications markets for retail leased lines, any other forms of retail business connectivity services and associated wholesale services and the assessment of market power within them (in particular information on retail traditional interface leased line services at 8Mbit/s and below) (for list of respondents see A13.74). List of questions addressed:

This information request concerns retail traditional interface leased line services at 8Mbit/s and below as defined in Ofcom's 2008 Business Connectivity Market Review, namely:

- Digital SDH/PDH services at 2Mbit/s (and multiples thereof) – e.g. Megastream;

- Retail PDH services at 64kbit/s and n*64 kbit/s – e.g. Kilostream; and
- Analogue leased lines.

For each of the above services in each of the financial years 2008/09, 2009/10, 2010/11 please provide:

- Total net sales revenue;
- Operating costs; and
- Operating profit (before interest and tax).

Please provide a breakdown of all main cost categories included in operating costs.

Information request dated 22 December 2011

A18.9 Information request of 22 December 2011 covering specified information related to the identification of the telecommunications markets for retail leased lines, any other forms of retail business connectivity services and associated wholesale services and the assessment of market power within them (in particular information on the equipment costs associated with the provision of new wholesale Ethernet-based leased line services and information on the relative costs of provisioning WDM services) (for list of respondents see A13.75). List of questions addressed:

1. This question concerns the equipment costs associated with the provision of new wholesale Ethernet-based leased line services, namely:

- Ethernet Access Direct (EAD) at 10Mbit/s;
- EAD at 100Mbit/s;
- EAD at 1Gbit/s;
- EAD Local Access (EAD LA) at 10Mbit/s;
- EADLA at 100Mbit/s;
- EADLA at 1Gbit/s;
- EAD Extended reach at 1Gbit/s;
- Wholesale extension service (WES) at 2.5Gbit/s; and
- Wholesale extension service at 10Gbit/s.

For each of the above services please provide the following equipment details for the provision of a new leased line (i.e. no existing equipment) between an end-user premise and a CP POP located in a BT exchange collocation space:

- a. A full list of the equipment used at the customer premises based on the vendor's product name (e.g. ADVA FSP150), including if applicable equipment that supports multiple individual circuits.

- b. The name of the equipment box and/or line card used at the exchange (where applicable).
- c. For the exchange equipment please also provide details of the shelf space, control cards and power supply cards that would be associated with the typical configuration for each service. In particular please provide details of the “interface density” (i.e. the number of interfaces each control and power supply card and how many line cards does the LE located shelf support).
- d. The most recent unit price paid to that vendor for each piece of equipment/line card; control card; power supply card and housings.
- e. Full details of any quantity discount agreed in your contract with the vendor (for instance the contract with the vendor might specify the requirements to qualify for the discount (e.g. the volume of purchases required) and the price per unit of equipment for the given volume of purchases). For this question please express any discounts that apply relative to the most recent unit price paid.

2. We are also interested in the relative costs of provisioning WDM services (presented with relevant interfaces including Ethernet) and in particular the costs associated with providing multiple circuits over WDM services. This question concerns the provision of Gigabit Ethernet and 10 Gbit/s Ethernet point to point services using the following products:

- Optical Spectrum Access; and
- Optical Spectrum Extended Access.

For each of the above services please provide details of the most modern equipment (for instance ADVA FSP3000) that you would install at the exchange and customer premises for the provision of a WDM service between an end-user premise and a CP POP located in a BT exchange collocation space:

- a. A full list of the equipment used at the customer premises and exchange based on the vendor’s product name (e.g. ADVA FSP3000).
- b. Please also provide details of the shelf space, control cards and power supply cards that would be associated with the typical configuration for each service. In particular please provide details of the “interface density” (i.e. the number of interfaces each control and power supply card supports and how many line cards the equipment supports).
- c. Whether network based equipment (such as amplifiers) is required and if so what it is.
- d. The most recent (or agreed) unit price to be paid to that vendor for individual equipment itemised by basic shelf and card variants (as set out in table 1 below

for customer premises configurations) for services delivered with Ethernet protocols.

- e. Full details of any quantity discount agreed in your contract with the vendor (for instance the contract with the vendor might specify the requirements to qualify for the discount (e.g. the volume of purchases required) and the price per unit of equipment for the given volume of purchases). For this question please express any discounts that apply relative to the most recent unit price paid.

Table 1: WDM Customer premise configurations to be provided

Port type	Bandwidth to be carried	Card option	Chassis options (at customer premises)			Additional equipment (specify cost differences for different configurations)		
			Slim line chassis (1U)		High chassis (7U)	Control card	Power line card	Other (specify)
			Single 1 slot	Standard (2 slots)	Specify number of slots			
Chassis (no port cards)	n/a	n/a	(e.g. provide equipment cost of single 1 slot slim line chassis)					
Single port cards	1 Gbit/s Ethernet	1 x 2.7 Gbit/s transponder	(e.g. provide incremental equipment cost of 1 x 2.7Gbit/s wavelength only)					
		n x 2.7 Gbit/s transponder	(e.g. provide equipment cost of n x 2.7Gbit/s wavelengths only)					
	10 Gbit/s Ethernet	1 x 10 Gbit/s transponder	(e.g. provide equipment cost of 1 x 10Gbit/s wavelengths only)					
		n x 10 Gbit/s transponder	(e.g. provide equipment cost of n x 10Gbit/s wavelengths only)					

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Multi-port cards (mux-ponders) (2 port)	2 by 1 Gbit/s Ethernet	1 x 2.5 Gbit/s transponder	(e.g. provide incremental equipment cost of 1 x 2.5Gbit/s wavelength only)					
		n x 2.5Gbit/s transponder	(e.g. provide equipment cost of n x 2.5Gbit/s wavelengths only)					
Multi-port cards (mux-ponders) (10 port)	9 by 1 Gbit/s Ethernet	1 x 10Gbit/s transponder	(e.g. provide incremental equipment cost of 1 x 10Gbit/s wavelength only)					
		n x 10Gbit/s transponder	(e.g. provide equipment cost of n x 10Gbit/s wavelengths only)					