Product Specification:

Wholesale Ethernet

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Contents

1 Gigaclear

1.1 Company Overview

Gigaclear builds point to point, gigabit, full fibre access networks in rural areas, commercially where there is demand for better broadband and in areas where it is awarded contracts under the BDUK scheme. By the end of 2019, Gigaclear has approximately 100,000 FTTP premises passed, that is premises with a 'ready for service' connection installed at the property boundary. The Gigaclear business plan supports building to 500,000 properties by 2023.

Gigaclear has been building FTTP networks since 2011 and currently has over 450 communities live or in build across 20 counties.

1.2 Product Overview

Gigaclear provides an active Ethernet, pure fibre broadband access service to homes and businesses in predominantly rural communities providing ultrafast connectivity with symmetric speeds from 30Mbps up to 1000Mbps.

The Wholesale Ethernet product has been developed by Gigaclear to provide partners with ultrafast services for the 'last mile' reach into rural areas of the country where Gigaclear has built networks.

The customer last mile services are delivered as point to point fibre based active Ethernet services offering 30Mbps to 1Gbps symmetrically as a Layer 2 service, delivered back to partner networks over Network to Network Interfaces (NNIs) through one of our two Data Centre locations (Telehouse North2 (THN2) or Equinix Slough LD7).

The Wholesale service provides a tunnelled Layer 2 service between the customer property, across the Gigaclear network to the Partner network, with the Gigaclear network termination at the customer premises being the Gigaclear NTE. The wholesale partner provides the Layer 3 service to the customer (IP address, routing, transit etc.), including the CPE.

Gigaclear has 3 active Ethernet service families detailed in the Wholesale Pricelist, a set of contended Ethernet services for residential use with a standard SLA, contended Ethernet services for Business use with standard and enhanced SLA options, and uncontended GEA type services for Business/Enterprise use.
Wholesale partners may request other services, and each request will be reviewed against a business plan to assess its commercial viability.

Note: Passive, dark fibre or duct services are available, please refer to the Wholesale Pricelist for details.

2 Technical Specification

2.1 Network Specifications

This section of the document outlines the Technical Specifications with relation to the Networking Infrastructure. It covers the layout of the Gigaclear network, how the Wholesale Ethernet service can be delivered and technical configuration requirements.

2.1.1 NNI Sizing and Delivery

There are currently two sizes of Network to Network Interface (NNI) available to partner networks: 1Gb and 10Gb. The Gigaclear Core has been developed with much greater capacity in mind and, when needed, we may be able to support bandwidths greater than 10Gb. We will support etherchannel/bonded connections of 10Gb as long as LACP is used to manage the etherchannel. Please discuss your requirements with the network team if you need bandwidths greater than 10Gb.

NNI connectivity is currently available from the following Gigaclear Data Centre locations:
- Telehouse North 2, London
- Equinix LD7, Slough

When ordering the active Ethernet circuits, you should ensure that an adequate MTU is available. An MTU of 1600 is a minimum and an MTU of 2000 is recommended in order to cater for some of the features offered over a Wholesale Ethernet NNI with Gigaclear.

2.2 NNI Services

There is currently a single NNI service offered over the Gigaclear Wholesale Ethernet product, which is an E-Line.

2.2.1 Layer 2 – E-Line

Single E-Line services presenting a Layer 2 connection from the customer site or point in the Gigaclear Core can be delivered to the partner via either of the NNI connections. These circuits will be delivered as a QinQ packet (VLAN definitions is in section 3.3.1) and partners will need to handle this type of frame.
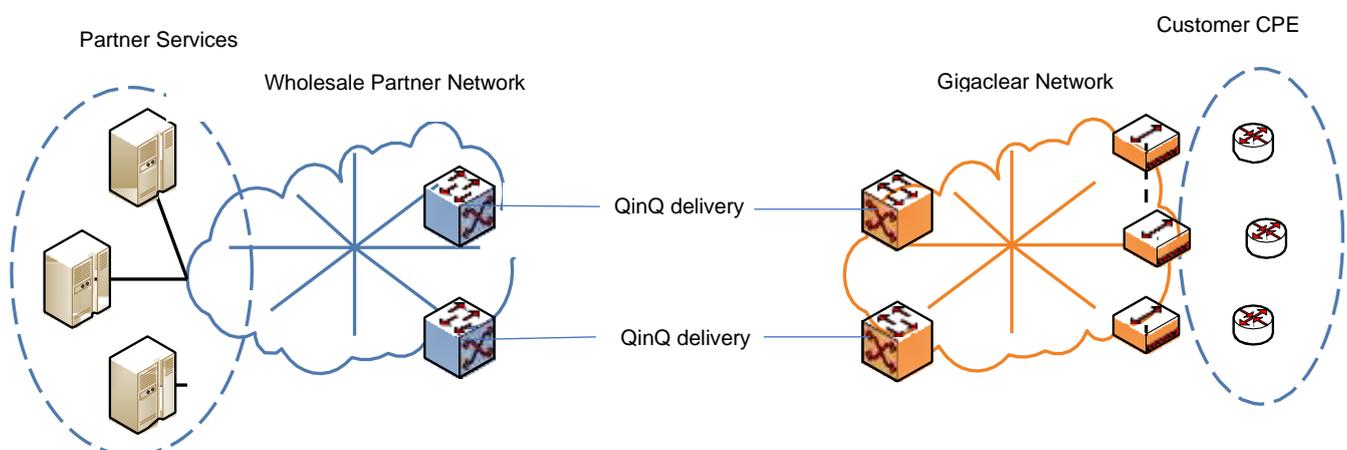
3 NNI Partner Control

Gigaclear is passionate about giving our partners as much control as possible within the network to ensure that connections are able to run through a chosen NNI without Gigaclear getting involved. To support this, we have developed a method for NNI and product identification.

3.1.1 VLAN Identification

In order to segregate the services offered by Gigaclear and to ensure that partners have control over the circuits delivered, we have developed a method for both service specification and NNI selection.

This method is based on an "S" (or outer) VLAN with a "C" (or inner) VLAN behind it in the frames sent to the partner network over the NNI circuits.

- The S/outer VLAN will be used to define the service family and the NNI over which a circuit is built (e.g. Residential, Business, Enterprise)
- The C/inner VLAN will be used to identify an individual customer link.

A range of 3 "S" VLANs will be automatically assigned by Gigaclear to identify service families over a specific NNI with a customer. The "C" VLANs will then be automatically assigned per order by our internal systems.

The following tables are _examples_ of full "S" and "C" VLAN definitions for a partner taking the three NNI connection types from Gigaclear: -

Code	Service Family	NNI	S-VLAN	C-VLAN
WR	Wholesale Residential	GIGA-LD7-CUST-01	4011	2-4088
WB	Wholesale Business	GIGA-LD7-CUST-01	4012	2-4088
WE	Wholesale Enterprise	GIGA-LD7-CUST-01	4013	2-4088

Code	Service Family	NNI	S-VLAN	C-VLAN
WR	Wholesale Residential	GIGA-LD7-CUST-02	4014	2-4088
WB	Wholesale Business	GIGA-LD7-CUST-02	4015	2-4088
WE	Wholesale Enterprise	GIGA-LD7-CUST-02	4016	2-4088

Code	Service Family	NNI	S-VLAN	C-VLAN
WR	Wholesale Residential	GIGA-THN2-CUST-01	4017	2-4088
WB	Wholesale Business	GIGA-THN2-CUST-01	4018	2-4088
WE	Wholesale Enterprise	GIGA-THN2-CUST-01	4019	2-4088

Thus, when an order is placed over a certain NNI, we will assign the "S" and "C" VLANs automatically within our system based on the service family ordered, ensuring that the E-Line circuit is delivered where the partner requires it. The Layer 2 frames handed over to the partner over the NNI connection will still have these two VLAN tags on them and the partner should strip them off, as required; that is, the frames will arrive at the partner equipment double tagged.

During the on-boarding process for the partner the VLAN allocations will be defined and presented to the customer.

IMPORTANT: The wholesale partner is responsible for adhering to the NNI specification in this document. The only device to connect to the NNI must be the Partner QinQ termination device. Loop testing must NOT be performed on the Gigaclear Network, as this will disrupt services for other customers. Breaking these rules will result in Gigaclear shutting down the NNI termination point facing the individual NNI partner.

4 Interface Specifications

4.1.1 NNI Interface Specifications

The NNI specification used by Gigaclear is shown below for the physical and logical connectivity required over the NNI connections.

NNI Interface Specification		
Description	**Network Parameters**	
Connectivity Type	Gigabit Ethernet	Single-Mode fibre
	Ten Gigabit Ethernet	Single-Mode fibre
Encapsulation	Gigabit Ethernet	QinQ
	Ten Gigabit Ethernet	QinQ
Sub-Interface for NNI	Gigabit Ethernet	dot1q
	Ten Gigabit Ethernet	dot1q
MTU Size	2000 Bytes	

4.1.2 NTE Interface Specifications

Alongside the NNI standards, there is a separate interface standard for the NTE installed by Gigaclear for the active Ethernet circuits. The interface specification for the current NTE is shown below.

NTE Interface Specification		
Description	**Network Parameters**	
Connectivity Type	Gigabit Ethernet	Copper (RJ45)
Encapsulation	Gigabit Ethernet	Port based
MTU Size	1500	

4.1.3 Cross-connect specifications & Ordering of NNI Port

The cross-connect should be ordered by the Wholesale Partner at the appropriate Data Centre using the following details to locate the Gigaclear cabinets.

Please email network-team@gigaclear.com to tell us when your NNI will be installed. A member of the Networks team will then contact you to arrange the commissioning and configuration of the NNI*, *including providing port/cabinet/ODF references and a Letter of Authority (LOA) permitting the cross connect installation.

Data Centre	Address	Port Termination
Telehouse North 2	Coriander Avenue, London, E14 2AA, United Kingdom	SM LC 10km SFP+
LD7 Slough	1 Banbury Avenue, Slough Trading Estate Slough Berkshire SL1 4LH	SM LC 10km SFP+

Note: Gigaclear will provide details of the patch panel and port to use in the LOA document.

4.2 NTE Physical Specifications

The Gigaclear NTE (currently a DKT unit) terminates the fibre from the Gigaclear cabinet and presents the customer with a single copper RJ45 Gigabit Ethernet port (1 Port for the DKT unit). The Gigabit Ethernet port(s) are set to auto-negotiate. Whilst the unit has multiple RJ45 ports, only the first port will be enabled.

Please note: The Wholesale Partner is responsible for providing and installing a separate CPE which must be connected to the Gigaclear NTE.

Gigaclear DKT NTE	Specification
Dimensions (H x W x D)	88x88x50mm
Dimensions (incl. mounting plate)	88x88x65mm
Weight	300g
Power Supply	240V
Power Dissipation	<4W
Operating Temperature	0-40C
Storage Temperature	0-70C

Model: DKT 79741
Type: NTE (Network terminating equipment)
Input: Fibre G657.A1/SC-UPC
Output: Ethernet 10/100/1000 Mbps (CAT5e compliant)
Power: 5v DC via UK PSU adapter

Side panel lights:
POWER: Solid green = ON
WAN: Solid green = LINK UP
WAN: Flash green = ACTIVITY
CATV: Unused

Ethernet lights:
LEFT: Solid green = 1000Mbs
LEFT: No Lights = 10/100Mbs
RIGHT: Solid yellow = LINK UP
RIGHT: Flash yellow = DATA
RIGHT: OFF = No Link

Connection: Only LAN1 currently in use/enabled. Connect wholesale service CPE to NTE's LAN1 socket with at least CAT5e compliant Ethernet cable. Wholesale customer receives all network addressing and routing from the wholesale Partner.
Check service: On NTE unit side - POWER and WAN lights should be lit solid green for active Gigaclear connection, flashes on activity.

Notes: Device may take circa 5 minutes to initialise and update firmware on first connection.

5 Bandwidth and Oversubscription

When the customer connections are built over the NNI links, a specified amount of bandwidth is allocated to each connection.

The total interface bandwidth can run in one of the two models; either dedicated bandwidth or oversubscribed bandwidth. In the dedicated bandwidth model, the total of all customer bandwidth allocations must not exceed the total interface bandwidth. In the oversubscribed bandwidth model, the partner can elect to have more customers using the connections, taking into account the actual utilisation of the circuit, rather than its potential utilisation.

This utilisation and oversubscription is managed by the partner.