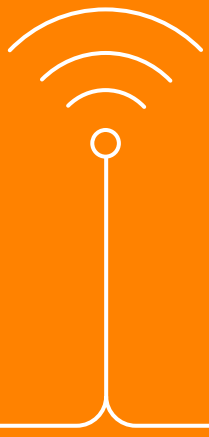
Gigaclear®

Product Specification:

Wholesale Ethernet



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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 mid-2019, Gigaclear has approximately 80,000 FTTP premises passed (premises with a Gigaclear 'ready for service' fibre installed at the property boundary), and a further 400,000 scheduled for build over the next 3 years.

Gigaclear has been building FTTP networks since 2011 and currently has over 200 live communities across 20 counties.

1.2 Product Overview

Gigaclear provides an active Ethernet pure fibre broadband access service to homes and businesses in 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 (THE or Slough LD4).

The Wholesale product provides a tunneled Layer 2 service between the Gigaclear Network and the Partner Network, the Gigaclear network termination at the customer premise 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 product families detailed in the Wholesale Pricelist, a set of contended Ethernet products for residential use with a standard SLA, contended Ethernet products for Business use with standard and enhanced SLA options, and uncontended GEA type products for Business/Enterprise use.

Wholesale partners may request other products, 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 product 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 will also be able to support 40Gb and 100Gb NNI connections.

NNI connectivity is currently available from the following Gigaclear Data Centre locations: -

- Telehouse East, London (E14 2AA)
- LD4, Slough (SL1 4NB)

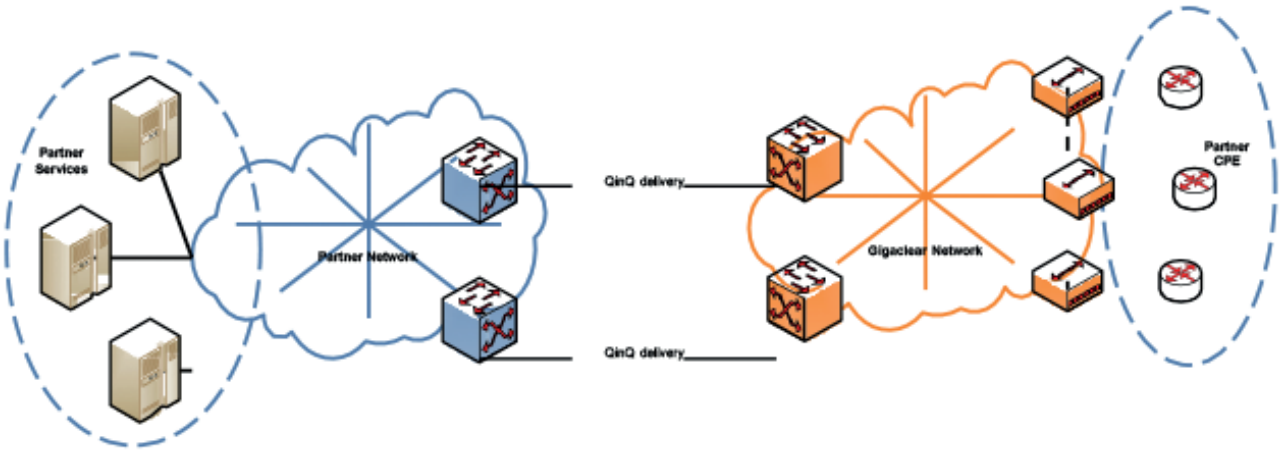
When ordering the active Ethernet circuits, you should ensure that an adequate MTU is available. An MTU of 1600 is a minimum and an MTU of 2000 is recommended in order to cater for some of the features offered over a Wholesale Ethernet NNI with Gigaclear.

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 down 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 various services offered by Gigaclear and to ensure that partners have control over the circuits delivered, we have developed a method for both product 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 product 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 product 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 an example of full “S” and “C” VLAN definition for a customer taking three NNI connections from Gigaclear: -

Code	Product Family	NNI	S-VLAN	C-VLAN
WF	Wholesale Residential	GIGA-LD4-CUST-01	4011	2-4088
WB	Wholesale Business	GIGA-LD4-CUST-01	4012	2-4088
WE	Wholesale Enterprise	GIGA-LD4-CUST-01	4013	2-4088

Code	Product Family	NNI	S-VLAN	C-VLAN
WF	Wholesale Residential	GIGA-LD4-CUST-02	4014	2-4088
WB	Wholesale Business	GIGA-LD4-CUST-02	4015	2-4088
WE	Wholesale Enterprise	GIGA-LD4-CUST-02	4016	2-4088

Code	Product Family	NNI	S-VLAN	C-VLAN
WF	Wholesale Residential	GIGA-THE-CUST-01	40117	2-4088
WB	Wholesale Business	GIGA-THE-CUST-01	4018	2-4088
WE	Wholesale Enterprise	GIGA-THE-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 product 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.

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
		Multimode fibre
	Ten Gigabit Ethernet	Single-Mode fibre
		Multimode 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.

NNI Interface Specification		
Description	**Network Parameters**	
Connectivity Type	Gigabit Ethernet	Copper (RJ45)
Encapsulation	Gigabit Ethernet	Port based
MTU Size	2000 Bytes	

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.

Data Centre	Address	Cabinet Details	Port Termination
Telehouse East (THE)	Coriander Avenue, London, E14 2AA, United Kingdom	TFM61 SFM rack A1/105 Docklands East	SFM LC 10km SFP+
Equinex LD4 Slough	2 Buckingham Avenue, Slough Trading Estate Slough Berkshire SL1 4NB	Grd Flr COLO 1 Rack B11/0211	SFM LC 10km SFP+

Note: Please leave 3 meters of coiled cable in the rack so we can connect to the Gigaclear Core.

4.2 NTE Physical Specifications

The Gigaclear NTE (currently a Genexis Hybrid Gateway but will be replaced by the DKT unit during CY Q4 2019) terminates the fibre from the Gigaclear cabinet and presents the customer with 1-4 Gigabit Ethernet ports (1 Port for the DKT unit). The Gigabit Ethernet port(s) are set to auto-negotiate. **The E-Line service is delivered over port 1 only on the multiport Genexis unit.**

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

Gigaclear Genexis NTE	Specification
Dimensions (H x W x D)	241x104x56mm
Dimensions (incl. mounting plate)	241x104x75mm
Weight	250g
Power Supply	240V
Power Dissipation	8W
Operating Temperature	0-40C
Storage Temperature	0-70C

Gigaclear DKT NTE (from Q4 2019)	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

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.