Cerberus Networks

Fibre on Demand (FoD)

Product Overview

What is Fibre on Demand (FoD)?

Fibre on Demand allows customers to upgrade to FTTP speeds when their premises is served by an FTTC enabled cabinet. It is a premium variant of FTTP which makes it possible for customers located in an area served by FTTC to be able to upgrade to FTTP speeds.

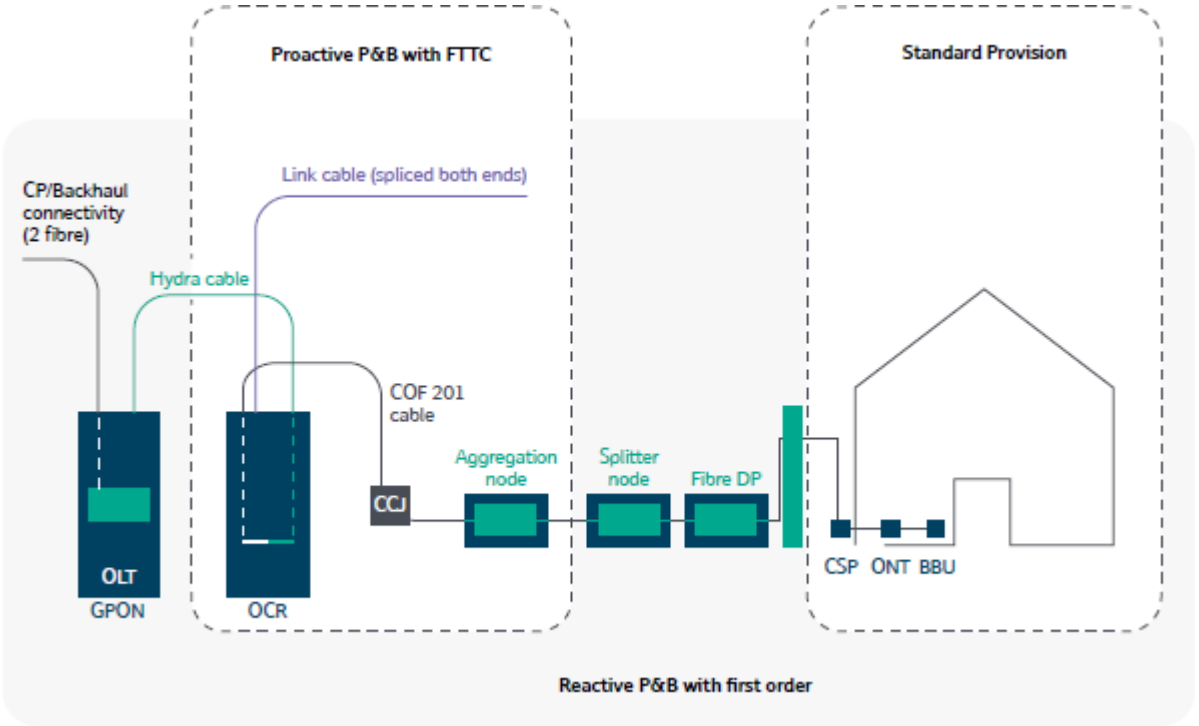
FoD is built as an overlay within an FTTC-enabled cabinet area (the fibre build usually starts from the fibre Aggregation Node serving the FTTC cabinet in the same area) and is enabled by the same physical FTTP network architecture as standard Openreach FTTP.

The product is limited to specific bandwidth options and is provisioned at speeds up to 300Mbps. It has the same FTTP network design as standard FTTP, however the plan and network is built reactively in response to an individual FoD customer order rather than proactively for a geographic area.

FoD has its own pricing and terms.

FoD Infrastructure

The diagram below illustrates the network design and how FoD works.



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The network build for Openreach FTTC extends to the aggregation node. As a FoD order requires a bespoke network build, Openreach will survey, plan and build the network from the aggregation node to your premises and complete the provision of the order.

Fibre on Demand is available with the following bandwidth options:

Product	Downstream Bandwidth	Upstream Bandwidth
FoD Basic	40Mbps	2Mbps
FoD Plus	115Mbps	20Mbps
FoD Pro	300Mbps	50Mbps
FoD XL2*	450Mbps	75Mbps
FoD Ultra2*	900Mbps	115Mbps

Speeds up to 300Mbps are available as a new order.

*Speeds above 300Mbps are available as an upgrade once the broadband availability checker shows availability.

Note that 450Mbps and 900Mbps speeds are not available in all areas. If available, these speeds will be indicated on the Broadband Availability Checker once the FoD build is complete.

FoD Availability

FoD is available to order in most areas of the UK, but there are notable exceptions to availability currently, as described below.

FoD is available in most Openreach FTTC enabled areas. This is where FoD provides an upgrade option over and above the capability of the FTTC service offering. In areas that have FTTC availability but cannot reliably obtain an FTTC service, The key requirement is simply that the checker confirms that FoD is available.

FoD is not available currently in the following locations:

- Non-FTTC areas (i.e. areas with no existing fibre Aggregation Node from which to pick-up fibre for the FTTP network build).
- Exchange only line areas (these are also non-FTTC areas).
- To MDU / MOU premises (residential or commercial multi-tenanted premises with additional internal wiring complexity).

FoD will only be available in premises served by an enabled FTTC cabinet and only available in exchanges which are enabled for the product. Before checking FoD availability, it is necessary to ensure you have the correct address information.

Installation Process

The FoD delivery process drives a reactive build of a FTTP network for the customer order.

WBC FoD uses exactly the same FTTP physical network components as standard Openreach FTTP, however the network components (including the splitter and CBT) are built reactively in response to the FoD order.

A Fibre on Demand order has two key parts to it in one end-to-end process:

The FTTP product uses Openreach's Generic Ethernet Access over FTTP (GEA-FTTP) product, defined below:

- Plan and Build phase, including Exchange Headend card, Spine fibre (if needed), Splitter and connecting cable to the CBT in the street.
- Customer premises installation from the CBT to the building (same as a standard FTTP order).

Placing an order

Fibre on Demand can only be ordered against a Gold National Address Database (NAD) key. A Gold key indicates that an address is or has been historically served by Openreach or has a pre-designed association to an Openreach network. The Gold NAD key takes the form of A00000000000.

Customers can request an indicative estimate of the build charges before placing an order for FoD from Cerberus Networks.

The results of the desk-based survey are provided by Openreach and provide a non-binding estimate of the build charges were reasonably practicable. This information provided by Openreach is for information only and the indicative build charge and the total premises passed by the build are likely to change following a full survey, sometimes quite significantly.

It will not always be reasonably practicable to provide an indicative quotation, in which case the results of the desk-based survey will advise of this comment. The desk-based quote comes from Openreach, it is an indicative quote and is non-binding.

The quote is meant to give an idea of what the charges could be based on existing Openreach infrastructure and would avoid any unnecessary cancellation charges if an order was placed. Any recent/new infrastructure may not be accounted for in this indicative costing as they may not be visible when retrieving a desk-based quote.

To confirm the exact costs and to obtain a breakdown of these costs, an order will need to be placed and a full survey conducted.

Upon receipt of the FoD order, Openreach will carry out the planning and survey before supplying a build charge which is conducted by requesting permission at the end user premises to conduct a full survey. The full survey is to determine the actual and final build charges. FoD build charges will inevitably vary from the desk-based estimate and is dependent on the results of the detailed full survey. If these are accepted by the customer, the order will progress, and the fibre network will be built to the customers premises.

Customers who place an order for FoD are committing to pay the full survey charge. The survey charge is non-refundable in the event the order is cancelled, aborted or times out due to non-acceptance of the build charges.

When the build charges are received from Openreach, Cerberus will provide the customer with a quotation. The costs must be accepted within 28 days or the order will cancel automatically on Openreach systems. Should the customer decide to go ahead after an order has timed out, Openreach may re-price the build and a new quote will be issued. A new survey fee is required for all new orders, regardless of whether a new physical survey is required.

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Onsite Surveys

An onsite survey is required at each customers' premises to determine the route of the new fibre cabling from the CBT and the point of entry into the building. The surveyor who carries out this survey may also look at the nearest aggregation node to determine available capacity.

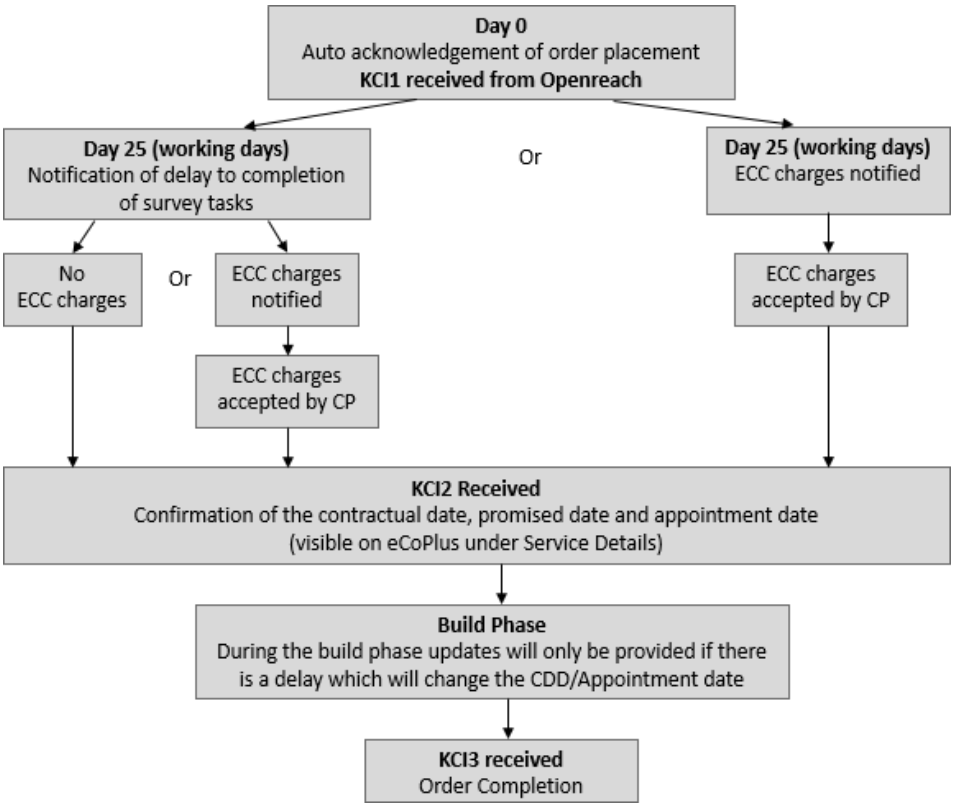
It is important to note that the surveyor is not assigned to look at the entire route for the cabling to the aggregation node. This work is carried out by the planning team at Openreach once the surveyor submits their notes.

With the surveyor only looking at the entry route into a customer's premises, the impression can sometimes be given that the amount of work involved is not complex. Customers should always refer to the diagram for the full network build and understand that this is outside of the remit of the onsite survey.

It should also be noted that surveyors will sometimes highlight existing nearby fibre infrastructure. This is often part of a separate network (ie for Ethernet services) that uses a separate topology and connects to a different pint within the Openreach network. It should not be assumed that nearby fibre equipment will result in reduced costs for the network build as, in all cases, FoD will be installed from a port on the aggregation node.

In some cases, it is possible for a customer to carry out any groundworks ("civils") where new ducting is required to be laid across their own land. Where this is the case, the customer should discuss the option of a "self-dig" with the surveyor and the costs will be supplied as such once the full planning activities have been completed. This may result in an overall reduction of the cost to install fibre into a customer's premises.

The following diagram provides a high-level view of the FoD order journey within Openreach:



FoD Minimum Lead Times

There is no minimum lead time for FoD as the plan and build provided by Openreach is determined upon receipt of an individual customer order.

On average, orders are typically delivered and completed between 6 to 12 months from when the order is placed and the order has been acknowledged.

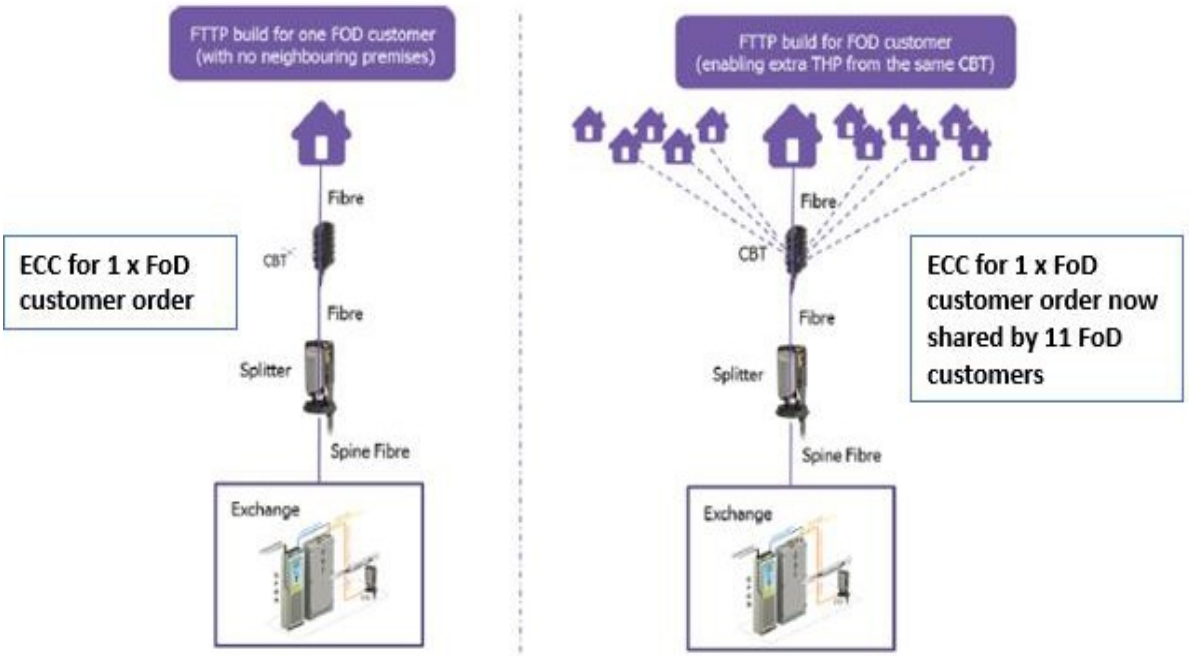
In some instances, lead-times may be longer if significant build work is identified and required especially if the network route requires significant build or clearance of duct blockages.

Further delays could also occur if Openreach need to obtain traffic management permits from a local authority or need to obtain a wayleave agreement from a landowner for part of the cabling route.

Linked Orders

Any neighbouring premises that can be served from the same CBT deployed will also be enabled for FTTP availability. Premises where this occurs are called "Premises Passed" and a discount of £50.00 ex VAT is applied to the FoD build charge to recognise that the charges the customer is paying to enable fibre at their own premises are also benefitting neighbouring premises.

Multiple FoD orders can also be placed at the same time in the same area (confirmed by full survey), where customers can share the build charges (this is illustrated in the diagram below).



FTTP Network Design

Openreach GEA-FTTP services are provided on the Fibre to the Premises (FTTP) network, with a fibre optic connection starting at the Point of Handover within the Exchange that is the "Headend Layer 2 Switch" ("Headend L2S") and carried over fibre all the way to the customer's premises.

A GEA-FTTP service is provided as an Ethernet layer connection, configured as a single Virtual Local Area Network (VLAN) and is presented as Ethernet at both ends. Each service will receive a defined bandwidth rate defined by the product the customer has ordered.

GEA-FTTP services run over a Gigabit Passive Optical Network (GPON) architecture which splits to serve multiple customer premises.

Unlike the FTTC (Fibre to the Cabinet) product, FTTP uses a fibre connection for the entire route between the Exchange and the premises being served, whereas FTTC provides service by means of fibre as far as a cabinet and then copper for the last leg from the cabinet to the premises. FTTP has an Optical Network Termination (ONT) installed to terminate the fibre path within your customer's premises.

Openreach FTTP offers an active wholesale network connection from the AP to the End User premises with Ethernet presentation at the End User Access's Network Interfaces. CPs will be able to provide their broadband services over this active network connection. The FTTP service is delivered on a single Service Virtual Local Area Network (SVLAN).

In addition, WBC FTTP On-Demand (FoD) is available for premises served by an enabled WBC FTTC cabinet. FTTP on Demand has the same FTTP network design as FTTP, however the network is built reactively in response to the FoD customer order.

FTTP Access Infrastructure

FTTP infrastructure is pre-built by Openreach to selected areas and defined as follows:

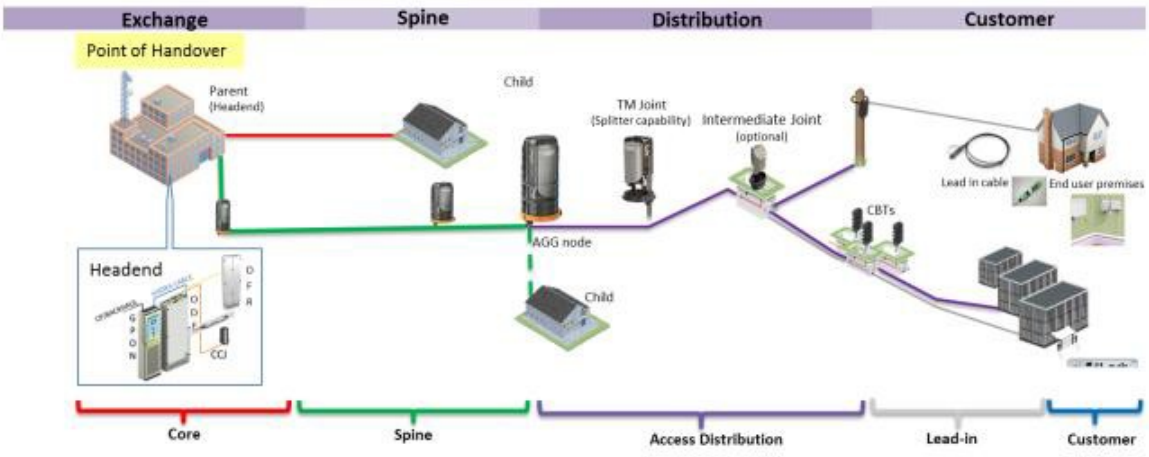
- As fibre overlay to wide areas of premises which already have copper product availability (also known as "Brownfield" premises). In a "Brownfield" area, Openreach prebuild network to a Connectorised Block Terminal (CBT) in the street.
- Fibre only New Sites (also known as "Greenfield" addresses). These are new construction houses, flats and commercial properties where there is no existing copper network / products. For these New Sites and by agreement with the Construction Developer Openreach go further and prebuild FTTP network all the way and into each premises on site with pre-installation of the Optical Network Termination (ONT) box in each premises.

The diagram below illustrates the FTTP network arrangement from Openreach at a high level, starting from the Headend L2S in the Exchange (on the left side of diagram), running over spine fibre and other fibre distribution cables, through Aggregation Nodes and Splitter Nodes and leading to the Connectorised Block Terminal (CBT) which will be in the street, near the premises it is designed to serve.

On the right-hand side of the network diagram, the first FTTP connection (as part of a "Brownfield" order) to a premise will start from the CBT (positioned either underground in a footway box or overhead on a pole). The fibre lead-in to the customer premises will follow an underground or overhead route as illustrated and connects to the ONT which the engineer installs inside the premises.

This is a shared network with a single fibre leaving the exchange carrying multiple services, each of which will be separated at the Splitter Node and routed on separate physical fibre through the rest of the network towards the right customer premises. On the shared fibre section of the network each circuit is kept separate through configuration as a distinctly identifiable VLAN connection. This ensures that the VLAN is routed to the correct customer premises ONT.

The following diagram sets out the CP network/backhaul at a specific Openreach 'Point of Handover' (Exchange):



Within each Openreach FTTP PoH there will be multiple FTTP Headend L2Ss, each serving a defined area covered by the Exchange.

Installation at Customer Premises

FTTP installation is quite different from copper-based broadband. If customers aren't aware of the install arrangements when they order, an installation visit may be unsuccessful, and the customer may end up cancelling or delaying the order. It is therefore important that customers what to expect when their service is installed.

Prior to starting the install:

1. FTTP is not a self-installable product. The customer MUST be present for the internal engineer install appointment and must be available on site for the duration of the appointment. Depending on the complexity of the installation, appointments usually take between 2 and 4 hours.

2. The Openreach engineer will call the customer on the day of the install prior to starting work. If the customer is not contactable or available, abortive visit charges will apply and the customer will need to make a new appointment.

3. The engineer will discuss and agree the installation before they start working. The person at the property needs to be capable of agreeing where the engineer will install the equipment and feed the fibre through into the premises. If they can't/won't give permission, the engineer won't be able to complete the installation.

Outside the premises:

4. The engineer will need to feed the fibre from the outside of the building to the inside (irrespective of whether the network is fed underground or overhead) and will often need to drill a hole specifically for this.

5. In overhead-fed premises, the fibre connection will be brought down from the point on the eaves of the property connected to the telephone pole and a 15 x 13 cm plastic box installed on the wall (called a "customer splice point", or CSP) at ground level that will have the fibre connection point. The engineer will drill a hole for the fibre to be fed into the premises. Power is not required for the CSP.

6. If a ladder is required to access the overhead feed, the engineer will secure the ladder using a Tetra safety system (climbing harness) which will require the engineer to drill temporary holes on the outside of the customer premises wall into which the securing rings can be fixed. The engineer will fill the holes on completion of the job.

7. For customers who are migrating from copper-based services to FTTP, when installing the fibre connection to the outside of the premises, the copper connection to the premises will be removed. This means the existing services will stop working and the customer won't easily be able to go back to a copper-based service if they find that they have an incompatible device.

8. Underground-fed properties fall into two categories. If the copper wire is within a duct and comes up from a duct outside the property, then the CSP will be installed on the wall near where this duct comes up on the property. If the duct opens inside the premises, then the CSP will be installed near that point.

9. If the copper wire isn't within a duct, but instead is buried directly in the ground, then the engineer will need to get the customer's approval for the work needed to get the fibre and the CSP installed.

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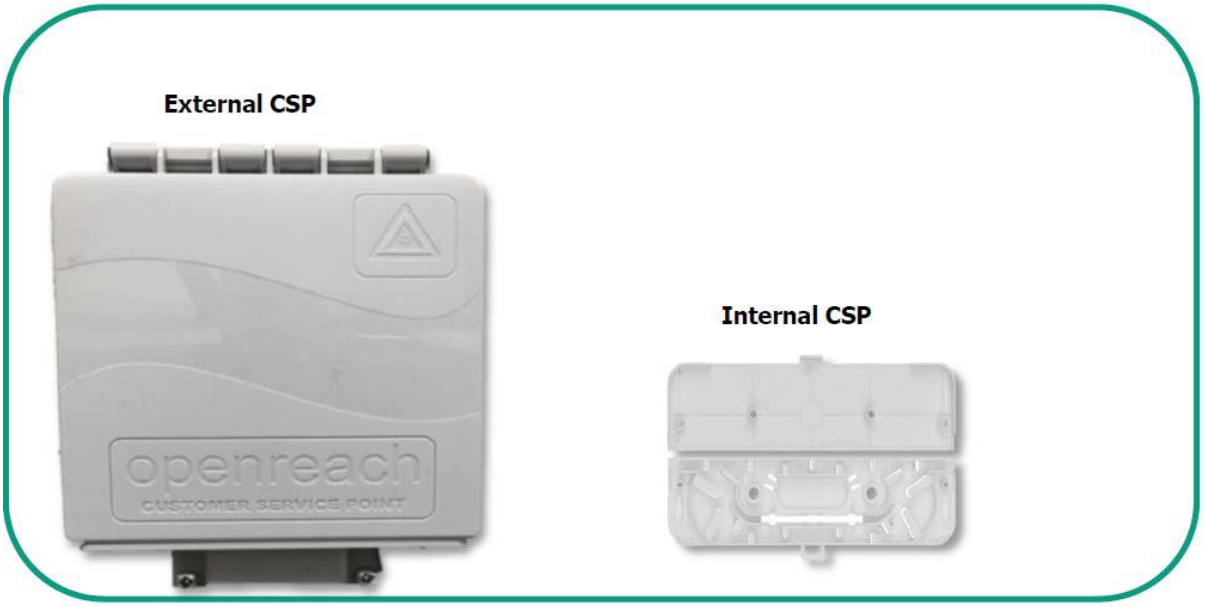
The external CSP is suitable for 80% of premises across the UK but cannot be used outside beyond safe working height or for certain types of building facia so Openreach have designed an internal CSP to use in these scenarios. It is very small and discreet by design and would be for use up to 2 metres from entry inside the premises



Inside the premises

10. The customer will need two boxes inside their home – the Openreach equipment (ONT) that brings the fibre into the premises and the CP router that connects the service to the devices in the premises.

11. The ONT will be positioned as close to the point where the fibre comes into the home as possible. The ONT box installed requires electrical mains power in close proximity (whereas copper NTEs do not need power) and so that influences the location of the ONT and may influence the routing of the fibre as a result.

12. The router will also be mains powered and is connected to the ONT with an Ethernet cable and can be positioned anywhere within the reach of the supplied cable. For data extensions, connection between the ONT and the router should be via CAT5e or CAT6 cables. Depending on whether a Standard or Premium Install has been selected, the wiring limits of 10m or 30m from point of entry apply. A finished installation might look something like this:

Optical Network Termination (ONT)

The Optical Network Termination (ONT) box is the termination point for the fibre and the FTTP service delivered to the customer's premises. The ONT will have either 1 or 4 'Data' Ethernet presentation ports. The ONT is owned by Openreach and the different ONT box types are described below. Routers or other appropriate equipment will be plugged into the designated port(s).

All ONTs are wall mounted. The ONT is fixed firmly to the wall to avoid movement and potential damage to the fibre, and to allow sufficient space for ventilation. The ONT requires an external power supply (from AC mains), as it cannot be line-powered over fibre. If necessary, an extension socket can be used. The ONT is designed to remain connected to the power at all times. Customers should leave the ONT permanently powered-on and for this reason the ONT does not include an on/off button.

Single port ONT (used since Summer 2020)	**1+1 ONT (used from 2017 until October 2020)**	**4+2 ONT (used up to 2017)**
This ONT offers only one end customer facing Ethernet data port. It has no separate voice ports.	This ONT offers one end customer facing Ethernet data port and one ATA-enabled port for FVA-based voice.	This ONT offers four end customer facing Ethernet data ports 4 data and on Huawei ONTs only there are two ATA-enabled ports for FVA-based voice.
		

4+2 ONTs

There are 4 Ethernet data ports available on the ONT. For the 4+2 ONT there are two manufacturers (ECI and Huawei) used to supply the exchange head-end and ONT network components, they appear similar and both offer the same facilities. Each exchange area uses only one manufacturer's technology and will not be mixed, so the ONTs should not be treated as compatible between manufacturers.

Dimensions of a 4+2 ONT:

H x W x D 195mm × 155mm × 34mm OR 180mm x 124mm x 33mm

1+1 ONTs

1 Ethernet data port is available on the ONT and 1 Analogue Telephone Adapter (ATA) enabled port. For the 1+1 ONT there will only be one manufacturer (Huawei), it is a like for like replacement of the 4+2 ONT except that it is smaller – capabilities and functionalities are the same. In some deployments this ONT will be supplied within an external enclosure. Older deployments will have the external enclosure also containing a battery backup unit (no longer supplied).

Dimensions of a 1+1 ONT:

H x W x D 134mm x 115mm x 25mm

1+0 ONTs

1 Ethernet data port is available on the ONT and no voice ports. This is a new style ONT which will also be used for new installations.

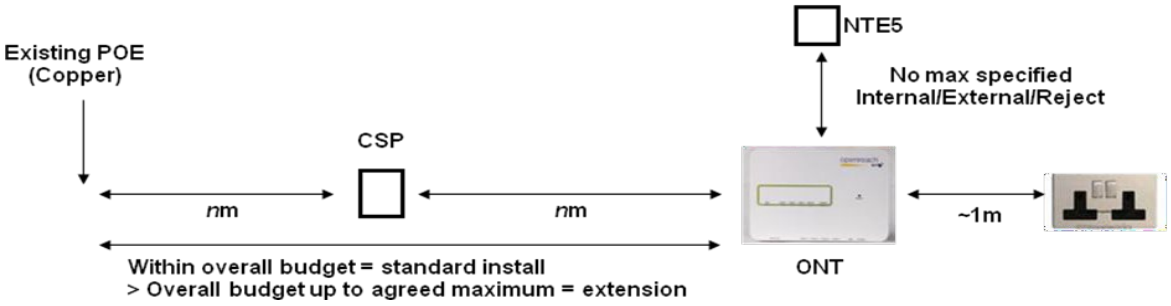
Dimensions of the 1+ 0 ONT:

H x W x D 89mm x 82mm x 27mm

ONT Placement

The exact location of equipment installed is agreed between the Openreach engineer and End User on the day of installation. Customers should be aware of the installation requirements to avoid a failed engineer visit which will be charged for. To enable the flexibility and extension proposals, ONT placement will follow the following guidelines:

- Target ONT placement location would be within 1m from entry point
- Standard install will allow up to 5m from any existing copper entry point
- Premium install will allow up to 30m from any existing copper entry point
- ONT to be within 1m of master power socket



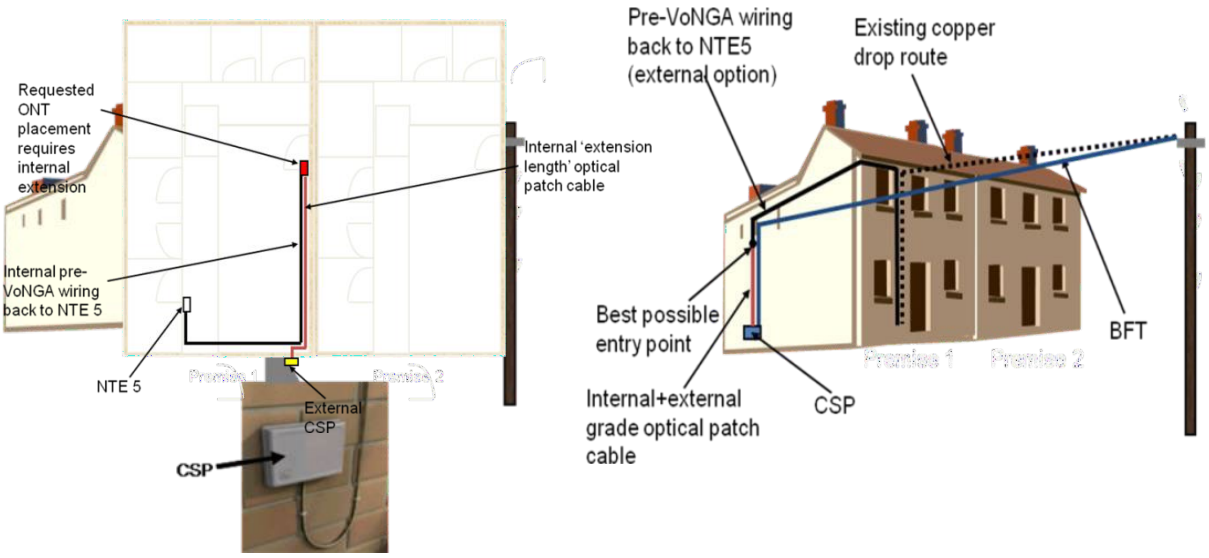
Telephony wiring back to NTE5 – an End User can choose internal or external (where practicable):

- Support for upper floor ONT placement
- Internal ONT placement and extension process/rules aligned with FTTC

ONT Placement Examples

In a ground floor scenario. the flexible entry point sought would be closest to the end user's preferred ONT placement point. The CSP is fitted externally. From the CSP a patch cable is provided to the end-user's preferred ONT placement point.

In an upper floor scenario. the flexible entry point would be closest to the end user's preferred ONT placement point (e.g., upper floor, study, rear). CSP needs to be at ground level for comfortable/safe splicing work – either below the OH bracket or next to the duct capping.



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