WHOLESALE REFERENCE OFFER*

DARK FIBRE PRODUCT SPECIFICATION

JUNE 2022

*Fibrus offer wholesale access in areas where public funding has been used to build the Network. Fibrus Networks is currently building the Network to achieve optimal performance and to support future Services. Fibrus Networks will inform you of product availability during the onboarding and ordering process.

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Introduction

This is the Wholesale Reference Product Specification for Fibrus Dark Fibre. Fibrus provides Retail Service Providers (RSPs) and Communication Providers (RSPs), from herein referred to collectively as RSPs, with access to optical fibre deployed within the Fibrus network in areas where public funding has been used. Fibrus may also offer or accept requests to access Fibrus fibre outside of public funded areas where capacity and operations allow. This document outlines the wholesale products available, order handling, billing and service management.

This Product Specification is designed for use by RSPs who are Wholesale partners of Fibrus Networks (Fibrus). For information on how to become a Wholesale partner with Fibrus please see our guide *How to Become a Wholesale Customer* available at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners.

This document should be read in conjunction with the current Fibrus Networks Wholesale Services Framework Agreement, Wholesale Price List, Wholesale Access Service Level Agreement, Installation Services and Wholesale Access Order & Fulfilment documentation, which are available on the Fibrus website at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners.

Fibrus' approach is to enable wholesale customers to self-serve their requirements via direct digital access to the systems capable of high-volume transactions alongside dedicated relationship management to ensure their needs are met and to deal with specific requirements. The Operator Wholesale Gateway (OWG) is the ordering and fault management system for Fibrus wholesale products and services.

Dark Fibre products may be used in conjunction with other Fibrus wholesale products e.g. Passive Infrastructure or with Third Party physical infrastructure. For the avoidance of doubt, any access to Third Party passive infrastructure and related charges are the responsibility of the RSP.

Wholesale Dark Fibre Product

Overview

Fibrus Dark Fibre provides RSP access to the Fibrus fibre optic network at specified points of connection and flexibility in both the Fibrus Access Network and the Backhaul/Core Network. The dark fibre products are defined in Table 1 below.

Code	Wholesale Dark Fibre	Description
DFAN	Dark Fibre in Access Network	Rental of a Dark Fibre in the Access Network - Segment 1, 2 or 3 priced per metre or part thereof
DFBR	Dark Fibre in Backhaul Network	Rental of a Dark Fibre between Fibrus Active Cabinet Splice Chambers
DFBI	Dark Single Backhaul IRU	Dark Single Fibre between Active cabinet Splice Chambers (20 Year IRU)
DFC1	Dark Fibre single end connection – new patch panel	Dark Fibre Segment Access or Backhaul single end fibre connection to a new patch panel
DFC2	Dark Fibre single end connection – existing patch panel	Dark Fibre Segment Access or Backhaul single end fibre connection to an existing patch panel

Table 1: Dark Fibre Products

The Fibrus fibre access network is illustrated in Figure 1 below, with dark fibre available in three segments between the cabinet and the customer serving distribution point (Figure 2).

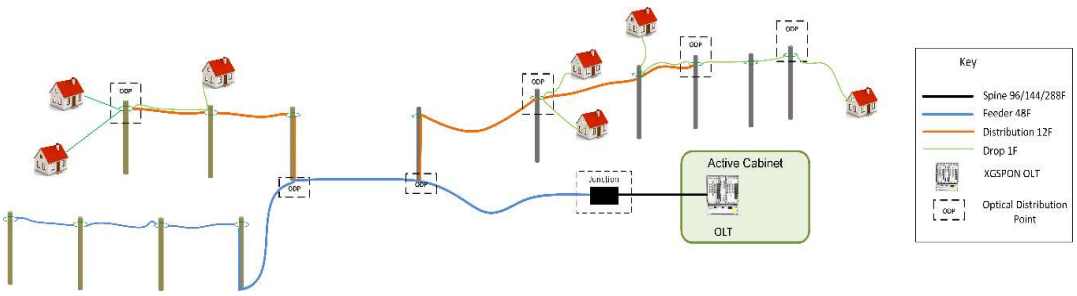

Figure 1: Fibrus Network Overview

Access to at least one fibre per segment is made available to a RSP on an Open Access basis. Each Dark Fibre is defined by two end points, regardless of the actual routing of fibre which may share a common cable.

Dark Fibre Segments

The Dark Fibre Access Network product is available in three segments, Spine, Feeder and Distribution Fibre, the segment tail at each node will be connected to the appropriate segment 1, 2 or 3 fibre and presented in a nearby RSP defined passive infrastructure location (RSP owned or third- party infrastructure).

The Access Network fibre connection points are:

- Fibrus Active Cabinet (Patch Panel)
- Fibrus Junction Chamber Splice Joint
- Fibrus Splitter ODP1
- Fibrus Distribution ODP2

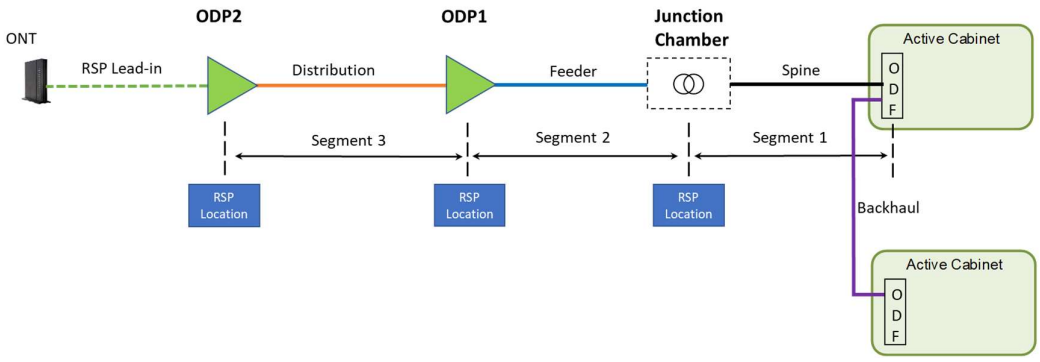

Figure 2 – Dark Fibre Product Overview

Segment 1 (Spine); is the fibre between a Fibrus Active Cabinet (Patch Panel) and the Junction Chamber node or aggregation point in the network.

Segment 2 (Feeder); is the fibre between the first aggregation point (e.g. Junction Chamber) and the splitter located at the first Optical Distribution Point (ODP1) or other aggregation point in the network.

Segment 3 (Distribution); is the fibre between the splitter node (ODP1) and a Customer serving Optical Distribution Point (ODP2)

Backhaul; is the fibre connection between Fibrus Active Service Cabinets utilised for 'node to node' backhaul traffic where Fibrus builds such network.

Note: Fibrus utilise existing infrastructure where available e.g. leased dark fibre, active connectivity solutions for inter cabinet connectivity.

Connection

For segment fibre (excluding in cabinet) Fibrus will supply a terminal connector point, for example, the BPEO Size zero (2x4way splitters) or BPEO Size 1.5 for larger volume splitters. The drop point connection is via a Corning Ecam connector.

Corning 4 Port Ultra SC/APC with pre-connected network tails suitable to be installed directly into the duct which will be connected to the Dark Fibre segment, is also used in urban deployment. This RSP interface has (up to) 4 Optitap hardened SC/APC female connectors.

Figure 3: Corning 4 Port Ultra SC/APC and BPEO Size zero

Spine fibre segments require connection to a Fibrus patch panel, which is subject to a connection fee per termination point, per fibre. Subsequent fibres utilising an in-situ patch panel enjoy a lower connection fee. (Please see the Fibrus Wholesale Price List for further information).

It is the RSP's responsibility to provide a connection from the Fibrus termination into optical transmission equipment owned by the RSP, its customer or agent. Optitap SC/APC patch cable will be required to connect to the RSP's equipment and it is the responsibility of the RSP to supply and install these correctly.

Technical Specification

Fibrus Dark Fibre conforms to the **G.657.A1** single mode optical fibre standard. An estimated optical loss figure will be provided by Fibrus based on network configuration and standard losses.

Note: Chromatic Dispersion Compensation is not provided. Polarization mode dispersion (PMD) is not measured nor controlled.

RSPs must ensure that equipment connected to a Dark Fibre segment incorporates

safety features that ensure lasers cannot operate at optical powers greater than Class 1M (as defined in IEC 60825-1) even under fault conditions and are safe for live working. Higher optical powers present a significant risk to people working on the network.

Non-standard Installations

There will be additional charges for non-standard installations. Fibrus standard installation service covers all installations except for those which meet any one or more of the following criteria:

- Locations that require a bespoke solution i.e. not suitable for the standard Fibrus presentation (Corning 4 Port Ultra SC/APC);
- Fibre tail cable length over 20m between the Fibrus Splice Point and the RSP designated location;
- Overhead location which is not co-located adjacent to the Fibrus Splice Point (typically same pole);
- Non-typical, hazardous or unusual location requiring specialist skills or equipment to access.

It is the RSP responsibility to assure connections do not meet these criteria; a charge will be levied for failed connections where any of these conditions occur. Non-standard Installations will require a survey to define the work required and additional charges.

Wholesale Dark Fibre Ordering

Overview

Ordering and delivering Dark Fibre products is a complex process requiring interaction between the RSP and Fibrus for enquiry, definition, pricing offer, acceptance before product design and build. Small or single requests will be managed via email; larger requests will require an agreed project plan. Fibrus has defined a standard approach summarised below:

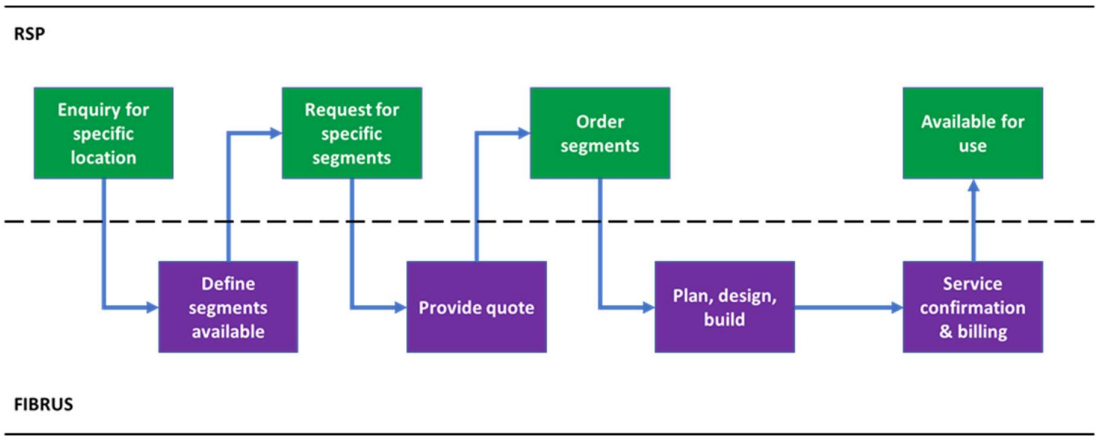

Figure 4 – Ordering Process Flow

Enquiry and Availability

RSP contacts Fibrus to register interest in Dark Fibre products in specific location(s). Fibrus review enquiry and subject to clarification will provide a list of available segments to the RSP in the area of interest if applicable.

Pricing

Based on the information required the RSP may request pricing for specific segments. In this case the RSP should specify the segments to be priced by Fibrus Wholesale. Fibrus will then calculate pricing against the RSP requirements and return it to the RSP as an offer letter with relevant standard business terms.

(**Note**: there is a cost to Providers for survey where applicable, which is defined in Fibrus Wholesale Pricing document at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners.

Acceptance and Order

If the RSP accepts the offer, terms and conditions, the RSP places an order and agreements are signed. Fibrus Wholesale will process the request as an order to fulfil the individual RSP requirements.

Plan to Build

Fibrus Wholesale on receipt of the order will commence planning and design activity, leading to network build and inventory recording.

Confirmation and Billing

Fibrus Wholesale will confirm the service to the RSP as it is completed and commence the generation of billing for the service.

Escalation Process

Where an RSP requires to escalate a service order it must contact the Relationship Manager. Orders may only be escalated where they are beyond SLA parameters.

Service Management

Fibrus operates to a principle of enabling RSPs to manage their network and customers directly. As such, it is a fundamental principle that a RSP must prove any service issues or faults are outside its own network and equipment before raising a trouble ticket.

Where the RSP cannot identify and remediate the issue, a trouble ticket can be raised within OWG for the attention of Fibrus Wholesale. Each trouble ticket should contain the following information:

- Infrastructure affected as defined in inventory
- Geographic location inventory
- Nature of trouble
- Time of first alarm or notification

Trouble Ticket Resolution Process

Trouble tickets should only be raised when the CP has identified the trouble as being within the Fibrus network or cannot localise the source of the trouble. The five key steps in trouble ticket resolution are:

- Trouble ticket reported – RSP
- Trouble diagnosis and isolation – Fibrus
- Trouble repair - Fibrus
- Trouble ticket updated and closed – Fibrus
- Customer updated - RSP

To complete diagnosis and repair Fibrus may be required to work in conjunction with RSP personnel. The RSP will be responsible for the availability and capability of such personnel and any resultant impact on fault duration.

Escalation Process

Where a RSP requires to escalate a trouble ticket for resolution it must contact their Wholesale Relationship Manager. Trouble tickets may only be escalated where they are beyond SLA parameters.

Outages

Planned Outages

It is recognised that Planned Outages are a necessary, normal and regular occurrence. Where a Planned Outage will impact on the Passive Infrastructure services provided to a RSP, the RSP will be notified by email, including a description of the outage, customer impact, date, time and expected duration. Fibrus will endeavour at all times to carry out Planned Outages during the preferred hours of 00:00 to 06:00.

Unplanned Outages

Where an outage occurs that impact on multiple end-customers, Fibrus will inform RSPs to enable them manage operations and customer expectations effectively.

Billing

All connection, usage and recurring charges associated with the provision of the Passive Infrastructure products are charged on the next billing cycle following completion of an order. All charges are as defined in the contractual agreement with the RSP and/or as published where appropriate.

Any queries regarding billing and charges can be raised with the Wholesale Relationship Manager for resolution.