KCOM

Customer Interface Publication: CIP037

KCOM Group Limited
WHOLESALE FIBRELINE ACCESS SERVICE DESCRIPTION AND TECHNICAL CHARACTERISTICS

Issue: Version 3.0

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Definitions within this CIP are set out at paragraph 13 below.

Users of this document should not rely solely on the information in this document but should carry out their own tests to satisfy themselves that terminal equipment will work with the networks of KCOM Group Limited.

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1.1 Introduction

This customer interface publication (CIP) has been created to describe and detail the technology to provide the KCOM Wholesale FibreLine Access service (WFLA).

KCOM wholesale, the wholesale division of KCOM Group Limited provides this service to Communications Providers (CPs), enabling the delivery of their IP services between the Service Platform and the service specific equipment within the End User (EU) premise. References to KCOM within this document refer to KCOM wholesale, unless otherwise stated.

A full list of terms and abbreviations used in this document are included in section 13 of this document, titled Glossary.

Changes to the technical architecture and network interface detail that affect the correct working of the service will be published by KCOM Group Limited within documents published on the KCOM website.

This service may be subject to change due to changes in the UK industry standards and specification forums. It may also be impacted by a change in regulatory requirements applicable to these specifications.

Enquiries relating to the technical content of this document and the availability of other publications should be directed to:

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2   Service Description

The WFLA service is designed to provide connectivity between the EU CPE and the CP network via a dedicated BSIL or BSIL(s). The WFLA service is shown in logical form below**Error! Reference source not found.**.
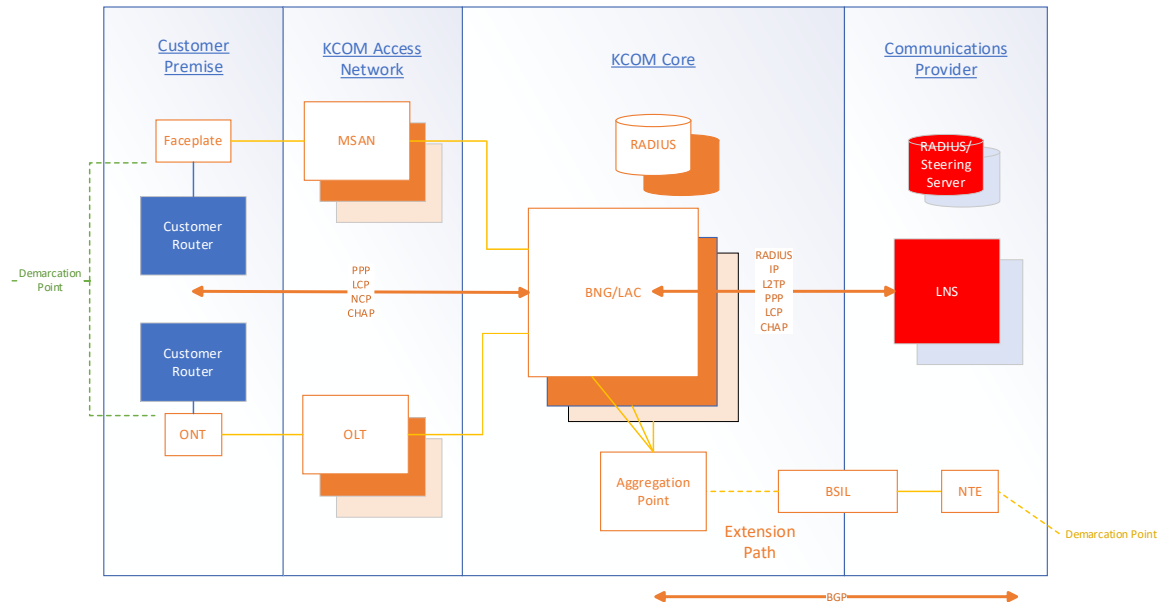

Figure 1 – Logical WFLA topology

The service is available via two termination modes of operation: PTA or L2TP. Only one PPP session per EU is permitted.

The service can be delivered to the EU over either copper using VDSL2 or Fibre to the Premises (FTTP) where available. For delivery to multi occupancy units i.e. where the landlord provides the infrastructure to individual premises within the building, services may be delivered via a KCOM Central Switch instead of individual ONTs.

The BSIL handover (section 3.1) is via 1Gbps or 10Gbps or 100Gbps at the CP Point of Interconnect (POI). Multiple BSILs are recommended to be purchased for resilience.

The core network equipment managed by KCOM provides services for multiple CPs. Dynamic CP selection is facilitated through context alignment within the Broadband Remote Access Server(s) (BRAS).

L2TP mode (section 7.1) is facilitated by PPP passthrough, with all sessions forwarded towards the CP LNS within L2TP tunnels. The CP is required to terminate these PPP sessions and assign the appropriate EU IP and associated settings. The CP will receive L2TP tunnels from each BRAS associated to their EU's terminating location.

PTA mode (section 7.2), the CP is required to provide RADIUS responses either defining their own assigned EU IP address or by providing a logically referenced IP Pool containing enough of their own IP address allocation for each EU they provide service to. For more information on this service, please contact KCOM to understand the Product options available.

RADIUS authentication (section 6.3) is required for operation of the WFLA products. Any communication between the components involved in the authentication process will be

done via the BSIL connection.

The FTTP service connections are terminated by Optical Network Termination equipment (ONT) installed on the EU premises. The FEUP Network Termination Point (Fibre NTP) is the designated customer port on the user side of the ONT.

The FTTC VDSL2 service connections are terminated by a copper based NTE as a wires only service on the connection port of the EU premises NTE Faceplate.

Within the access and aggregation network the WFLA service operates by providing a layer two path between Customer Premise Equipment and Broadband Network Gateway. IEEE 802.1q, the IEEE industry trunking protocol, is utilised to provide separation between CPs and services via VLAN stacking.

3 Interfaces

3.1 Point of Interconnect (BSIL) Interface and Data Rates

The CP POI interfaces are available at 1Gbps and 10Gbps or 100Gbps.

The interface characteristics are in accordance with the KCOM Customer Interface Publication CIP 041 (available from https://www.kcom.com/wholesale/media/jwxed1fn/kcom_cip_041_bsil_v11.pdf

The Ethernet interface characteristics are in accordance with the KCOM Customer Interface Publication CIP 016 [2] (available from https://www.kcom.com/wholesale/media/ctynyucl/016_kch_cip_016_v1_3.pdf).

3.1.1 FTTP delivered service

The interface is located on the KCOM ONT sited on the EU premises. The EU standard NTP demarcation is the port interface on the ONT. Exceptionally, in Multi Occupation Units the NTP may be a central switch to which access is provided by the landlord over the landlord's cabling.

This is presented for all connections as an electrical RJ45 1Gb interface.

The ONT, and any associated power supply unit (PSU) will require a wall mountable surface or a suitable horizontal platform compatible with the environmental conditions.

The ONT will require a 240V A.C., at a Nominal 2A, supply to be available within 1m of the EU NTE location. The CP shall ensure that this is available prior to installation.

Connection between the NTP and the End User Equipment is the responsibility of the CP.

The Ethernet interface characteristics are in accordance with the KCOM Customer Interface Publication CIP 016 [2] https://www.kcom.com/wholesale/media/ctynyucl/016_kch_cip_016_v1_3.pdf. The FEUP interface is presented via an RJ 45 socket. The RJ 45 socket will be provided as part of the ONT and the port to be used will be identified on the EU handover document.

3.1.2 Copper VDSL2 services

There is one variant of the VDSL2 service:
- CP supplied CPE

The KCOM copper line is delivered to the End User on an NTE5A Master box as a British Standard 6312 431A or 631A Plug / Socket interface. This will be supplied and installed by KCOM. This NTE remains KCOM property and acts as the point of demarcation.

It is the responsibility of the EU to provide an appropriate xDSL filter and attach it correctly to the line and then attach the EU or CP provided VDSL2 compatible CPE which shall comply with the published KCOM ANFP specification and this CIP to function correctly with this service product.

The VDSL2 service is an overlay service and can only be operated in conjunction with an active voice service, such as KCOM Wholesale Line Rental and can only be supplied where a KCOM copper delivery service is available.

The KCOM copper line delivery can only support one VDSL2 service per line pair.

KCOM VDSL2 service will be automatically ceased should the copper voice service be cancelled or removed.

3.1.2.1 Line rates

The KCOM VDSL2 service supports the VDSL2 service to the VDSL2 line rates as below.

Service	Downstream rate	Upstream rate
VDSL2 G.993.2 [5]	Maximum 80Mbits/s	Maximum 20Mbits/s

The service supplied is based upon local loop quality, environment factors and the distance between the DSLAM and the EU. This variance is due to the physical operation of the VDSL2 technology.

As a default KCOM operates VDSL 17a bandplan with a 6dB target SNR.

The line rate is the VDSL2 protocol reported line rate and needs to be reflected in the CP configured payload shaping for optimal transmission of the EU data.

3.1.2.2 Data throughput rates

The VDSL2 protocol requires the inclusion of packet overheads to operate correctly to transport Ethernet frames and payloads.

The packet overheads include
- A 4 byte per frame routing overhead required by KCOM.
- The DSL and PPP overheads required to operate the service.

These overheads impact the actual data rates available to the EU. The scale of this impact depends on the size of the payload packets being transmitted. The ratio of the payload size to the number of packets impacts the total capacity throughput.
For example, number of packets transmitted and therefore overheads required is double at 64k frame sizes than at 128k frame sizes.

The CP should carefully consider how this impacts the service available to them in the onward products they wish to deliver using this service.

The available payload data throughput rates will always be less than the line rate due to the use of the VDSL2 and ethernet protocols to transmit the payload data. CPs should consider how these and the other service factors should be used in setting any downstream or upstream shapers within the CP network.

4   Service Data Rates

The Fibre Service is delivered to the EU premise using GPON technology and is presented to the EU in a way conforming to those specified in KCOM Customer Interface CIP 016 [2], available from
https://www.kcom.com/wholesale/media/ctynyucl/016_kch_cip_016_v1_3.pdf

The Copper VDSL2 service is provided to the EU using technology conforming to ITU-T G.993.2 [5] PTM mode.

Service data rate is based on the service selected as part of the order process.
The CP can check availability of the service using KCOM's Post Code and address checking system.

As the broadband network path is shared, the service will be contended to the maximum determined by the CP. Lower service data rates may on occasion arise due to deployment conditions such as fault related congestion within the KCOM network. KCOM will take all reasonable steps to minimize such occurrences.

5   Ethernet Layer Aspects

5.1   Ethernet service

The EU interface will be presented with an Ethernet Port which will encapsulate all upstream traffic in the Carrier VLAN tag transparent to the EU. Downstream traffic to the EU will be presented to the EU at the Ethernet port with no Carrier VLAN tags and the PPPoE frame outermost.
The data channel will be the PPPoE presentation frame. The service provides a single Ethernet VLAN MAC bridge separated PPPoE service.

5.2   VLAN operation

The service uses a VLAN tag to separate the CP traffic from other CP traffic within the KCOM network. This tag is applied to every frame entering the KCOM access network. The KCOM network terminates this VLAN tag at the KCOM BNG.

5.3   EU Traffic Management

KCOM will apply EU speed limiters within the KCOM network. This enforcement is aligned against the EU package purchased. For the best service experience KCOM strongly advises that the CP should also enforce their EU speed using a traffic shaper.

KCOM will manage traffic as it enters the network and will not operate any distinct QoS classes between the CP's EU customer connections.

For more information on this service, please contact KCOM to understand the EU product options available.

5.4   MTU size

The maximum transmission unit size is in line with the use of PPPoE and is set to 1492 bytes (1500 bytes minus PPP header overhead). The use of certain framing by a CP may reduce this to 1432 bytes.

5.5   Frame duplication

Standard ethernet bridging rules apply and are enforced.

6   Service Features

6.1   Transport

IPv4 is transported from CP to EU via PPPoE using LLC/SNAP as defined in RFC 2516 [4].

The KCOM BNG can provide both LAC & PTA functionality.

The CP selects the version of termination for the whole CP requirement via the CP service selected and not per EU.

When selecting the L2TP mode the CP requires the EU session to be terminated on the CP's LNS, the KCOM BNG acts solely as a LAC, using L2TP pass-through towards the associated CP BSIL(s).

When selecting PTA mode, the CP is required to provide RADIUS responses either defining their own assigned EU IPv4 address or by providing a logically referenced IPv4 Pool containing enough of their own IPv4 address allocation for each EU they provide service to. For more information on this service, please contact KCOM to understand the Product options available.

6.2   PPP layer requirements

KCOM supports the EU connection as a PPPoE service or as the PPPoE Logical Link Control/Sub-Network Access Protocol (LLC/SNAP) configured to support a single PPP session (VDSL2 only).

The KCOM network does not auto sense the encapsulation type for VDSL2 traffic.

The following RFCs describe the operation and encapsulations:
- PPP over Ethernet RFC 2516 [4]
- PPP RFC 1661 [7]

The KCOM network requires that the PPPoE CPE or software-based client is compliant to RFC 2516[4] and RFC1661 [7] in accordance with UK industry standards.

The PPPoE Maximum Transmission Unit is 1492 bytes.

The service does not correct or mitigate where DF (do not fragment) is set, or the client is not correctly configured to use PPPoE as per the KCOM PPPoE requirements. TCP traffic is required to operate the MSS process correctly for this reason.

6.3   RADIUS

RADIUS (Remote Authentication Dial-In User Service) Authentication is required for normal operation of the WFLA service, the CP must provide communication towards, control and maintain its own RADIUS servers.

RADIUS packets types supported are:
- Access-Request [KCOM to CP]
- Access-Accept [CP reply]
- Access-Reject [CP reply]

- Accounting-Request [KCOM to CP]
- Accounting-Response [CP reply]

The full RADIUS attribute list and attribute handling for all RADIUS configuration and pass-through configuration will be discussed and agreed with each individual CP as required.

If PTA mode is required, then the CP will need to assign KCOM RADIUS servers as clients.

6.3.1 RADIUS Session Steering

RADIUS session steering is relevant to the L2TP delivery mode. This is where the L2TP tunnel endpoints (CP's LNS) are dynamically selected by the CP's RADIUS or steering server and sent back to KCOM's RADIUS as part of the response messages. This is done for each session. It is up to the CP to distribute sessions among their LNS.

Traffic will originate from the KCOM Core RADIUS servers over public IP addressing utilising the agreed shared secret(s). The CP may have multiple RADIUS servers or steering servers available within this service interaction. The CP must provide their RADIUS IP addresses or steering servers (with priority order if more than one is provided), shared secret and defined UDP ports for authentication and accounting (if not UDP/1812 & UDP/1813).

All RADIUS interaction between the KCOM RADIUS and CP RADIUS packets must be acknowledged as timeouts are defined, if no response is received the CP RADIUS servers may be marked as unavailable.

All KCOM RADIUS to CP RADIUS interactions will be carried out over the BSIL service.

6.3.1.1 RADIUS Authentication

All EU PPP sessions will trigger RADIUS Access-Requests.

If PTA mode is chosen RADIUS packets may contain unrelated vendor specific attributes, KCOM may remove these at any time.

All Access-Requests sent to the CP RADIUS within PTA mode can reply with either Access-Accept or Access-Reject. Access-Accept replies from the CP RADIUS should include Framed-IP-Address and DNS servers.

CPs requiring specific attribute configuration, or intending to use non-standard RADIUS attributes, must discuss these requirements with KCOM prior to service connection to avoid the potential for unexpected operation or service denial.

6.3.2 REALMs or Domain identifiers.

Each CP will need to agree with KCOM CP identification realm(s). This realm is used to identify a CP's EUs to the KCOM network within PPPoE Access-Requests.

User ID format: username@realm

The username portion of the User ID is not used by KCOM and the whole User ID will be passed through to the CP.

6.3.3 DNS

The CP is required to provide up to two DNS servers when using the PTA mode of operation. They will work in a primary/secondary operation. The DNS servers must use IPv4 addressing and can either be configured statically by KCOM on local DHCP pools or be included in the CP Access-Accept messages using Cisco VSA Numbers 135 and 136 respectively.

7   KCOM Service Handover

The handover options available to the CP come in two forms:

- L2TP mode - LAC/LNS
- PTA mode - PPP Termination and Aggregation

Further details on the two options are below.

7.1   L2TP mode

The L2TP solution operates by tunnelling PPPoE sessions between a KCOM LAC and a CP owned LNS. IPv4 addressing must be used on the various infrastructure components which make up the service as IPv6 addressing is not supported. The PPPoE session is then terminated on the CP LNS.

Connectivity between the KCOM owned LAC and the CP owned LNS is achieved by using a Point of Interconnect which comes in the form of a KCOM BSIL. The KCOM BSIL is defined in:

https://www.kcom.com/wholesale/media/jwxed1fn/kcom_cip_041_bsil_v11.pdf

The L2TP control packets should be prioritised on both LAC and LNS so that if the Point of Interconnect (BSIL) became congested the L2TP tunnels which run over it do not drop. If the L2TP tunnel between LAC and LNS drops, then the CP EU sessions which run through it will have to start the PPPoE negotiation process again.

7.1.1   L2TP Pass thorough

When using PPPoE the CP will need to make sure PPPoE clients are conforming to operate as per RFC2516 [4] and RFC1661 [7].

Note:
- a) EU shall send an MRU of a maximum of 1492 to the KCOM LAC.
- b) The KCOM LAC will send an MRU of a maximum 1492 to the EU PPPoE client.
- c) The KCOM LAC and the EU will then agree on the lower MRU.
- d) This value will then be passed to the CP LNS.

If the PPPoE client does not obey the RFCs then there may be a failure in operation of the service. There are many ways that this issue may present itself, KCOM cannot guarantee the successful operation of the service due to non-conformance.

The CP LNS must be setup so that it provides the correct MTU for the service offering, which when using this product is the standard PPPoE value of 1492 bytes.

7.1.2 L2TP Infrastructure Addressing

When using L2TP mode, a CP is required to provide KCOM with a single IPv4 address range of prefix length /28. This will be split up by KCOM and used on the various infrastructure components which make up the service.

The IPv4 address range can be either public or private. If public IPv4 addressing is provided, then it must be owned by the CP which purchased the KCOM WFLA service. If private IPv4 addressing is provided, then it must not be within the range used by the KCOM infrastructure (10.x.x.x/8).

The IPv4 address range provided will be advertised back to the CP via the BGP session which runs over the BSIL.

7.2 PTA Mode

The PTA solution operates by establishing a CP's EU PPPoE sessions on KCOM Broadband Network Gateways (BNG). An IPv4 addressed path is then used to get into the CP's network via a Point of Interconnect. IPv6 addressed paths may be available in future versions of this product.

KCOM utilises the BSIL product as the Point of Interconnect. The KCOM BSIL is defined in:

https://www.kcom.com/wholesale/media/jwxed1fn/kcom_cip_041_bsil_v11.pdf

7.2.1 End User IP Layer

When using PTA mode, the EU IP layer must conform to RFC 791[3] to ensure service operability.

7.2.2 End User IP Addressing

When using PTA mode, the IPv4 addressing assigned to the EU during PPP setup can be of the following types:

- Public IPv4 Addressing
- Private IPv4 Addressing (excluding addressing within 10.x.x.x/8 which is used within the KCOM infrastructure)

The IPv4 address ranges selected for use by the CP need to be disclosed to KCOM so that the appropriate filter entries can be applied. Failure to do so will lead to the EU service being affected.

The CP will determine who allocates IPv4 addressing to the EU during RADIUS authentication. This can be done in two ways:

- The CP can respond in its RADIUS Access-Accept message with a DHCP pool name using IETF RADIUS attribute 88. The DHCP pool name needs to be agreed with KCOM. For each DHCP pool name, the CP will need to supply six IPv4 subnets. Each IPv4 subnet should be sized appropriately and be enough to cover all the CP's EUs being served by the associated BNG. Failure to size the DHCP pools appropriately will lead to EUs not receiving service. The IPv4 subnets used

for the DHCP pools will be advertised back to the CP via the BGP session which runs over the BSIL.

- The CP can provide the IPv4 address to be used by the EU within its Access-Accept message. This gives the CP full visibility of what IPv4 addressing is in use by its EUs.

7.2.3 PTA Infrastructure Addressing

When using PTA mode, a CP is required to provide KCOM with a single IPv4 address range of prefix length /28. This will be split up by KCOM and used on the various infrastructure components which make up the service.

The IPv4 address range can be either public or private. If public IPv4 addressing is provided, then it must be owned by the CP which purchased the KCOM WFLA service. If private IPv4 addressing is provided, then it must not be within the range used by the KCOM infrastructure (10.x.x.x/8).

The IPv4 address range provided will be advertised back to the CP via the BGP session which runs over the BSIL.

8 BSIL Specifics Pertaining to WFLA

Each CP who purchases a WFLA product from KCOM requires one or more Points of Interconnect. A Point of Interconnect is a connection between the KCOM infrastructure and the CP. KCOM utilises its BSIL product to provide the Point of Interconnect. More details on the BSIL product are available from the link below:

https://www.kcom.com/wholesale/media/jwxed1fn/kcom_cip_041_bsil_v11.pdf

When dealing with the WFLA product a BSIL is typically delivered from one of two sites. These sites have been selected as they provide the most appropriate level of diversity and separation within the KCOM infrastructure.

KCOM recommends that CPs who purchase the WFLA product also purchase a Point of Interconnect (BSIL) at each of the two available sites. This is so the CP can provide the highest level of resilience to its EUs.

The BSIL can also be provided as for use with an onward connection to a third party backhaul service from the CP Site within the Hull Area.

8.1 Service Presentation

The KCOM WFLA product requires that an 802.1Q tagged path is created over the Point of Interconnect. The exact 802.1Q tag value used for this service will be agreed by KCOM and the CP.

The MTU of this path should be able to carry IPv4 traffic of 1900 bytes without fragmentation. This value excludes any ethernet and 802.1Q encapsulation overhead so the CP should ensure their infrastructure can support this.

The Point of Interconnect (BSIL) service will utilise a single IPv4 subnet across the 802.1Q path. It is recommended that the CP-side of the IPv4 subnet be directly connected to the Point of Interconnect (BSIL) instead of passing through other Layer 2 devices as this could reduce service resiliency.

The following IPv4 addressing options are available:

- KCOM assigned Private IPv4 addressing.
- CP assigned Private IPv4 or Public IPv4 addressing.

All IPv4 addressing must be agreed by KCOM and KCOM reserves the right to refuse an order to avoid clashes with other parties for fault management purposes.

The IPv4 subnet required will be of prefix length /30 and KCOM will utilise the lowest usable IPv4 address within that subnet.

8.2 Service Reachability

Each Point of Interconnect (BSIL) will run a single EBGP Version 4 session between the KCOM and CP IPV4 addressing used upon it. In line with standard practice the EBGP session will only have a TTL of 1. The EBGP session will be secured with a password which will be agreed between KCOM and the CP.

KCOM will select a 16-bit BGP Autonomous system number from within the reserved private use range defined in RFC 6996 [12]. KCOM will agree this Autonomous system

number with the CP. The CP is permitted to use any BGP Autonomous system number assigned to them by IANA whether that be 16 or 32-bit. The CP can also use BGP Autonomous system numbers reserved within the private use range defined in RFC 6996 [12]. The CP cannot use the same BGP Autonomous system number that KCOM has selected.

The BGP session will support the IPv4 unicast sub-address family. No other address families or sub-address families are supported on the BGP session. The KCOM BGP session timers will be left at the default values of a 60 second keepalive and a 180 second hold time. The KCOM BGP session timers can be negotiated down by the CP's BGP peer to a minimum value of a 10 second keepalive and a 30 second hold time in order to provide faster convergence.

The KCOM BGP peer will impose limits on the number of IPv4 prefixes it can receive from the CP BGP peer. The KCOM BGP peer will enforce a hard limit of 500 prefixes received from the CP's BGP peer. A breach of the limit will cause the BGP session to be dropped and remediation work by KCOM personnel would be required to establish the session again and resume service. This is to protect the KCOM network and its customers from a CP's operational error.

In order for the WFLA service to function correctly it is important that IPv4 reachability between the various KCOM and CP components is available. This reachability is facilitated by the passing of IPv4 prefixes between EBGP peers.

When using the L2TP mode of operation, the KCOM BGP peer will advertise the following IPv4 prefixes to the CP BGP peer:

- KCOM RADIUS subnets (public IPv4 addressing)
- CP assigned /28 subnet used by KCOM for Infrastructure components (private or public IPv4 addressing)
- KCOM or CP assigned /30 subnet used on the Point of Interconnect (private or public IPv4 addressing)

When using the L2TP mode of operation, the CP BGP peer must advertise the following IPv4 prefixes to the KCOM BGP peer:

- CP RADIUS/Session Steering servers (public IPv4 addressing)
- CP LNS L2TP tunnel endpoints (public or private IPv4 addressing)

When using the PTA mode of operation, the KCOM BGP peer will advertise the following IPv4 prefixes to the CP BGP peer:

- KCOM RADIUS subnets (public IPv4 addressing)
- CP assigned /28 subnet used by KCOM for Infrastructure components (private or public IPv4 addressing)
- KCOM or CP assigned /30 subnet used on the Point of Interconnect (private or public IPv4 addressing)
- CP DHCP pools assigned to KCOM for EU allocation (public or private IPv4 addressing)

When using the PTA mode of operation, the CP BGP peer must advertise the following IPv4 prefixes to the KCOM BGP peer:

- CP RADIUS servers (public IPv4 addressing)

- A Default route

Any specific IPv4 prefixes which the CP would like to control the traffic flow of within a resilient design (a 500 prefix limit is still enforced).

8.3   Service Control

In order to provide flexibility and resilience KCOM allows the CP to control the traffic flow if they purchase two or more Points of Interconnect (BSIL). This is achieved by the CP manipulating the Multi-Exit Delimiter path attribute within their EBGP updates. The KCOM infrastructure will honour any MED values received.

Given the use of MED for traffic control it is important to note that on the EBGP peering session which runs over each Point of Interconnect in a resilient design, the same BGP Autonomous system number should be used.

Given the traffic flow is within the control of the CP, any asymmetric routing is the responsibility of the CP to manage and control. Any traffic issues caused by asymmetric routing will be the responsibility of the CP. It is recommended that the CP creates a traffic flow policy and limits the number of changes it makes during normal service.

8.4   Service Management

Traffic will be policed to the CP's contracted rate (Extension Path) upon ingress and egress at the Point of Interconnect (BSIL). The traffic will be discarded at the ethernet frame level, independent of QoS markings. KCOM advises CPs to monitor their usage at the Point of Interconnect (BSIL) and make sure congestion is at a minimum.

8.5   Quality of service

This service is provided as a single traffic domain. Within the aggregate system for each individual ESCP the traffic will be treated equally within the boundaries of the markings. Traffic may be prioritised in various sections of the network based on these markings. However, the markings will only be recognised within the containers configured for each individual CP.

Under certain congestion conditions some discards may take place across the network. KCOM will be responsible for any congestion on shared portions of the infrastructure provided.

9   Possible End User Terminal Equipment

9.1   Fibre to the premises option

The supplied optical terminal equipment specification is: ITU-T G.984.1 [6] – GPON standard.

An example of typical EU terminal equipment to enable successful inter-working with the service is an Ethernet PPPoE capable or RFC bridge CPE connected to a personal computer (PC). In this case, the combined PC and CPE must be able to:

- Support PPPoE as defined in section 6 above;
- Support Challenge Handshake Authentication Protocol (CHAP) in accordance with RFC 1994 [8];
- Obtain an IP address via a PPPoE LCP process;
- Use Ethernet framing to IEEE 802.3[1] Standards

KCOM is not responsible for the provision or operation of any EU equipment, PC operating systems, drivers and any associated software.

9.2   VDSL2 based option

The Minimum recommendation is G993.2 VDSL2equipment, this must support 17a Bandplan.
All CPE must be capable of operation to this specification or optimal stable service or delivery rates may not be achieved.
G993.5 - G.Vector is NOT supported.
SRA is not guaranteed but EU hardware must be capable as some KCOM DSLAMS may offer this mode of operation

An example of typical EU terminal equipment to enable successful inter-working with the service is an Ethernet PPPoE capable or RFC bridge CPE connected to a personal computer (PC). In this case, the combined PC and CPE must be able to:

- Establish a PPP session in accordance with RFC 1661 [7]. support PPPoE as defined in section 6 above;
- Support Challenge Handshake Authentication Protocol (CHAP) in accordance with RFC 1994 [8];
- Obtain an IP address via a PPPoE LCP process;
- Use of PTM mode is native per the G993.

KCOM is not responsible for the provision or operation of any EU equipment, PC operating systems, drivers and any associated software.

10 Safety & EMC Information

10.1 Safety

Where the CP Customer Interface is presented in optical presentation this is classified as a class 1M laser product as defined in the laser safety product standards BS EN 60825-1/2 [9].

The 10/100/1000Mbps electrical interfaces are classified as unexposed as defined in CENELEC Reports/ETSI Guide ROBT-002/EG 201 212.[10] – Annex B [10]. https://www.etsi.org/deliver/etsi_eg/201200_201299/201212/01.02.01_60/eg_201212v010201p.pdf

10.2 EMC

The network equipment and network terminating equipment related to the provision of the interface comply with the current EMC regulations.

Whilst predominantly intended to be installed in commercial and light industrial environments, this does not preclude the Customer Interface or EU NTEs being installed in other environments e.g. industrial.

All KCOM ONTs will meet the relevant CE compliance, and CA compliance.

11 Customer Base

KCOM's target customer base is intended to be providers of broadband Internet. The KCOM Broadband platform is capable of offering services to CPs wishing to provide service to all residential telephony customers and businesses that are served by Fibre or in exception for VDSL2 copper local loop cable. For the avoidance of doubt, service will not be provided on Centrex or PABX Group exchange lines.

12 Availability

The service will only be available within the Hull Area or as otherwise specifically agreed with the CP. All service delivery is subject to the caveat over fibre rollout related restrictions of service as set out in Schedules 3 and 4 of the Reference Offer for Wholesale FibreLine Access Services as published on the KCOM website.

13 Definitions

AAA	Authorisation, Authentication and Accounting
BNG	Broadband Network Gateway
BSIL	Broadband Service Interconnect Link
BRAS	Broadband Remote Access Server
CHAP	Challenge Handshake Authentication Protocol
CIP	Customer Information Publication
CP	Communications Provider
DDOS	Distributed Denial Of Service
DSLAM	Digital Subscriber Line Access Multiplexor
EBGP	External Border Gateway Protocol
EU	End User
FEUP	Fibre End User Port
FTTC	Fibre To The Cabinet
FTTP	Fibre To The Premise
Hull Area	the area defined as the 'Licensed Area' in the licence granted on 30 November 1987 under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communications (Hull) plc
IETF	Internet Engineering Task Force
IP	Internet Protocol
ITU-T	International Telecommunications Union – Telecom Standardisation
LAC	L2TP Access Concentrator
L2TP	Layer 2 Tunnelling Protocol
LLC	Logical Link Control
LNS	L2TP Network Server
MED	Multi-Exit Discriminator
MRU	Maximum Receivable Unit
MTU	Maximum Transmission Unit
MSS	Maximum Segment Size
MSAN	Multi Service Access Node
NTE	Network Terminating Equipment
NTP	Network Termination Point
OLT	Optical Line Terminator
ONT	Optical Network Termination
PC	Personal Computer
POI	Point of Interconnect
PPPoE	Point to Point Protocol over Ethernet
PSTN	Public Switched Telephone Network

PSU	Power Supply Unit
PTA	Point to Point Protocol Termination and Aggregation
PTO	Public Telecommunications Operator
RADIUS	Remote Authentication Dial In User Service
RFC	Request For Comment – IETF Publications
SNAP	Sub Network Access Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
VDSL2	Very-high-bit-rate Digital Subscriber Line
VLAN	Virtual Local Area Network
VRF	Virtual Routing/Forwarding
WFLA	Wholesale FibreLine Access

14 References

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[4]	RFC 2516	A Method for Transmitting PPP Over Ethernet (PPPoE)	
[5]	ITU-T G.993.2	Very high speed digital subscriber line transceivers 2 (VDSL2)	
[6]	ITU-T G.984.1	Gigabit-capable passive optical networks (GPON): General characteristics	
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[10]	ROBT-002/EG 201 212	Electrical Safety ; Classification of interfaces for equipment to be connected to telecommunications networks	1998
[11]	ITU-T G993.5	Self-FEXT cancellation (vectoring) for use with VDSL2 transceivers	
[12]	RFC 6996	Autonomous System (AS) Reservation for Private Use	

Reference [1] may be obtained through http://www.ieee802.org/

References [5], [6] and [11] may be obtained from https://www.itu.int/en/Pages/default.aspx

Reference [2 may be found at: https://www.kcom.com/wholesale/products/service-information/technical-interface-information/

References [6] [10] and [18] may be found at:
http://www.etsi.org/WebSite/Standards/Standard.aspx

References [3], [4], [7], [8] and [12], may be found at: http://www.ietf.org/rfc.html

Reference 17 may be obtained through http://www.standardsuk.com/

15 History

Date	Issue	Comments	Author
18/10/2017	1.1	Version 1. New document to support new interface	D&D TSO KCOM GROUP Limited
27/08/2021	3.0	Fully reviewed and revised document, main changes include: • Re structured the document to make it clearer for the reader • More detailed descriptions of the two modes of working • Simplified the traffic management descriptions and removed references to CIR and PIR to cope with all network deployment options • Changes to incorporate a solution delivered to Multi Occupancy with Central Switch • Added more detail to describe the RADIUS functions • Added more detail to BSIL service specifics • Removed detail around BSIL product and referenced CIP041 • Change KCOM Group PLC to KCOM Group Limited • Changed ECSP to CP, VDSL to VDSL2, and End User and ECU to EU • Website URL's updated	Product Architecture KCOM Wholesale