



Customer Interface Publication: CIP047

KCOM GROUP PLC

Ethernet Network to Network Interface

Service Description and Technical Characteristics

Issue: Version 1.0

December 2023

The information in this document is provided in accordance with the requirements of the Radio Equipment and Telecommunications Terminal Equipment Regulations 2000 (Statutory Instrument 2000 No. 730) to publish (in accordance with the EC Radio and Telecommunications Terminal Equipment Directive 99/05/EC) technical characteristics of interfaces to the public fixed telephone network.

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1 INTRODUCTION

KCOM provides wholesale network access in the form of Ethernet Network to Network Interface (ENNI), the “Service” to Communications Providers (“CPs”) seeking to use KCOM’s Public Electronic Network (“PECN”) to offer competing communications services.

The Service enables CPs to aggregate multiple KCOM ethernet A end circuits aggregated and presented to them as a single B end.

The Service is provided between a CP’s end user sites in the Hull Area or KCOM’s extended network area outside Hull, termed the Expansion Area, and a CP interface site in the Hull Area, York, Leeds or Sheffield.

This CIP sets out the scope and technical details of the Service provided to CPs. Changes to the technical architecture and network interfaces that affect the correct working of the Service will be published by KCOM.

Changes to the technical architecture and network interfaces that affect the correct working of the service will be published by KCOM Group Ltd in documents made available from the address below. If the changes impact on this document, then it will be updated.

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 KCOM ENNI Product (ENNI) will allow CPs to aggregate multiple Ethernet circuits providing IEEE 802.3 framed connectivity from multiple A-end endpoints, either within the OLA or the EA and deliver them across the KCOM Ethernet core network to B-end handover point within the KCOM OLA estate or as part of a combined KCOM delivery at one of KCOMs transmission network's designated national POP's located in either Leeds, York or Sheffield.

Each individual ethernet A-end circuit's traffic will be encapsulated within a VLAN carried across the KCOM network as a VLAN tagged stream along with the purchased service parameters (CIR, PDR etc) and the multiple VLANs are presented at the handover point separated by VLAN tags on the same physical interface or same logical interface if presented as a LAG across multiple physical interfaces.

Specific VLAN numbering assignment at the presentation interface can be requested by the ordering CP, but final allocation will be determined by KCOM.

Topology is based on point to multi-point connections between an end user site and a KCOM point of interconnection.

The transmission path for this service is fully contained within the KCOM Group infrastructure and plant. Alternate network delivery is not available.

Delivery of ENNI is based on existing ethernet services, Ethernet Connect Access Service (ECAS) and Ethernet Direct Access Service (EDAS).

Client interfaces offered are full duplex only.

ENNI is available with the following physical layer presentations:

- 1Gbps via a standard RJ45 1000BaseT copper presentation or 1000BaseX (SFP) port
- 10Gbps via 10GbE (SFP/SFP+) LC Fibre Connector single mode LX
- 100Gbps via QSFP+/QSFP28 port LC Fibre Connector single mode LX

The access circuit will terminate on the following indicative devices (actual equipment may differ due to availability and third-party product development) but will maintain and support the attributes and feature sets.

Table 1 - Expected NTE Equipment

Speed	OLA	KCOM National POP	Other National POP
1Gbps	NTE Adva GE112/104*	Cable from Adva120Pro to CP	3 rd Party CP NTE#
10Gbps	NTE Adva GE116, XG116Pro, or XG400 Series	Cable from Adva3K3U to CP	3 rd Party CP NTE#
100Gbps	NTE Adva XG400 Series	Cable from Adva3K3U to CP	3 rd Party CP NTE#

*GE112 is limited stock so will be replaced by GE104

3rd Party may not use an NTE but may present a cable from their rack to our customers' rack



2.1 Physical interfaces available for the UNI/client site

FastEthernet-TX

GigaEthernet-TX

GigaEthernet-SX

GigaEthernet-LX

GigaEthernet-ZX 1550nm (80km) – Available on request

Minimum bandwidth required for GigaEthernet UNI: 10 Mbit/s

10 GigaEthernet-LR 1310nm (10km)

Minimum bandwidth required for 10 GigaEthernet UNI: 250 Mbit/s

2.2 Physical interfaces available at the NNI/client site

GigaEthernet-LX 1310nm (5km)

10 GigaEthernet-LR 1310nm (10km)

100 GigaEthernet-LR4 1310nm (10km)

QSFP 28

There will be a requirement for KCOM to install the following equipment into the CP's rack at the NNI:

Dependent on the service requirement:

Device Type, ADTRAN based:

1G – XG108, XG120

10G – XG108, XG120

100G – XG400 Series

Over-subscription at the NNI :

- Permitted for Basic services (up to 400%)
- Not available against Premium services

Ethernet backbone technologies deployed are:

Native Ethernet

EoDWDM

2.3 EVC Speeds

Minimum speed of EVC: 100 Mbit/s

Maximum speed of EVC: 100,000 Mbit/s

2.4 Supported Ethernet Framing at the UNI/client

Access Mode – standard untagged 802.3 Ethernet frames only

- Trunk Mode – 802.1Q – EVC provisioned on a specific VLAN
- Transparent Mode – all VLANs passed on EVC



The SVLAN tag is “popped” at UNI interface.

2.5 Supported Ethernet Frame Types at the NNI/client

The following type of SVLAN tag will be presented at the NNI:

- IEEE 802.1Q (Standard VLAN Bridges, Ethertype = 0x8100)
- IEEE 802.1ad (Provider Bridges, Ethertype = 0x88A8)

2.6 MTU Size supported

At the UNI: Maximum: Jumbo Frames – 9000 bytes

At the NNI: Maximum: Jumbo Frames – 9000 bytes

2.7 802.1D-2004 (802.1P) Traffic Class Expediting

CoS fields (dot1p and DSCP/TOS) are preserved.

CoS is provided based on these values.

2.8 Fault Management OAM Protocols

- The Ethernet link OAM, formerly 802.3ah, is supported;
- Network Interface Devices (NIDs) are deployed to end customer premises which are:
 - y.1731/802.1ag capable
 - RFC2544 capable
- A RFC2544 test is conducted on circuit turn up

2.9 Common L2CP Protocol Transparency

The following protocols are preserved:

- STP (Spanning Tree)
- RSTP (Rapid Spanning Tree)
- PVST (Per VLAN Spanning Tree)
- MSTP (Multiple Spanning Tree Protocol)
- R-PVST (Rapid per VLAN Spanning Tree)
- CDP (Cisco Discovery Protocol)
- LLDP (Link Layer Discovery Protocol)
- VTP (VLAN Trunking Protocol)

2.10 MAC Addresses

These are device dependent e.g, XG480 supports 500k

2.11 SLA Performance Parameters

Mean time to repair 5 hours Service Level Agreement

Standard Lead Time 42 Working Days

Carrier Helpdesk 24 hours, 7 days a week

Reporting available for incidents:

- Availability
- Time to repair
- Performance (RTT, Delay, Jitter, Frame Loss)

Figure 1 below illustrates the network layout.

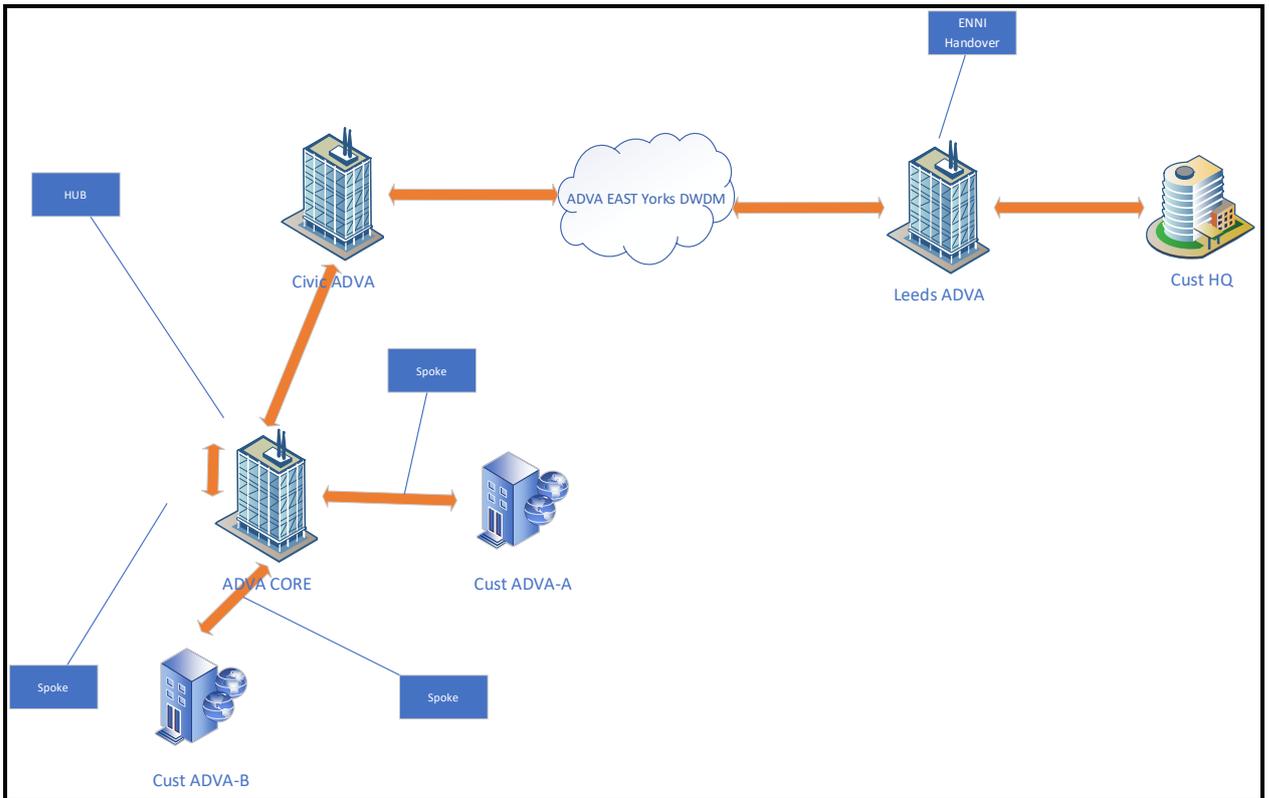


Figure 1

The service is based on National and International standards and therefore is subject to change as new standards are required. KCOM Group reserves the right to change or adapt the service, as required, to comply with these new standards and services.

ENNI will support a CP offering a Business Impact level III service that can be assured to Communications and Electronics Security group (CESG) level 3–3–4. IL3 is not guaranteed by KCOM in the provision of this service. The accreditation is the responsibility of the customer. This includes any site security requirements at the CP end location.

Note: The above classifications are under review by NCSC (Partially replaced CESG) and will be updated as required.

2.12 Service Availability

The KCOM ENNI product enables CPs to take multiple Ethernet circuits from either:

- a) Hull Area
- b) KCOM on-net outside the Hull Area termed the Expansion Area

And have them delivered as a single interface in:

- a) Hull Area
- b) Leeds / Sheffield KCOM National Network POP's
 - i AQL DC5, Canon House, Apex Way, Leeds. LS11 5LN
 - ii Ask4 Data Centres, Brompton Road, Sheffield. S9 2PA
 - iii York IOMART Datacenter, 2 Opus Avenue, York North Yorkshire YO26 6BL



Excess construction charges may apply as per the product offering.

The service is a data circuit permanently connected and available 24 hours, 365 days per year.

All orders are subject to review on order via the KCOM wholesale order point.

Specifications mentioned below are current as of the publication of this document and as such are subject to change in the future. Changes to the technical architecture and network interfaces that affect the correct working of the service will be published by KCOM in documents made available from the address below. If the changes impact on this document, then it will be updated.

It should be noted that KCOM Group reserves the right to alter and adapt where required as new specifications are determined. The use of Industry standard terms does not give or imply any direct or indirect compatibility between users of those terms and are for ease of CP reference only.

The circuits connecting to the point of interconnect (hub) are termed spokes to and two classes of service are offered:

1. Premium Service - Presented as uncontended service i.e. with Committed Information Rate (CIR) [minimum guaranteed traffic delivered in the network] equivalent to bearer size [Peak Data Rate/PDR] ordered – 10Mbps/ 100Mbps/ 1Gbps/ 10Gbps. All traffic within the service has equal priority and the full bandwidth can be utilised.
2. Basic Service - Presented as a Committed Information Rate (CIR) of 20% of the spoke circuit speed, Peak Information Rate (PIR) of 100% of the spoke circuit speed or Maximum Burst Size (MBS) at 80% of the spoke circuit speed. e.g. a CIR of 80Mbps over a 100Mbps bearer with a PIR of 100Mbps or 80Mbps Maximum Burst Size (MBS).

This service to Communication Providers (CPs) will only be delivered on KCOM Group infrastructure in accordance with the stated feature set.

This document sets out the scope and detail of the service.

3 SERVICE DESIGN AND OPERATION

3.1 System design operation

The service connections are terminated on appropriate Network Termination Equipment (NTE) installed on the CP premises. The Network Termination Point (NTP) is the CP/end user side of the NTE, called the 'access port'.

3.2 General Features

The ethernet product transmits IEEE 802.3 Ethernet frames with a maximum size of 1500 Bytes, Jumbo frames are available on request as specified in IEEE 802.3 and as amended by 802.3as.

3.3 Frame Transparency Restrictions

All Ethernet frames are forwarded to the other end except the following list of exceptions:

- Transmission or forwarding of Auto-negotiation messages is not supported.
- Transmission or forwarding of Pause or flow control frames is not supported.



- Transmission or forwarding of EFM OAM PDU frames is not supported as per IEEE 802.3 standards. These are blocked at ingress.

3.4 Link Aggregation Groups (LAG)

LAG is a customer option on the Hub ENNIs.

No hardware resilience is offered on this LAG i.e. all physical interfaces could be off the same card in the KCOM equipment and on the same physical chassis (single chassis LAG).

3.5 CP Interface Auto-Negotiation and Duplex settings

The service will be managed wholly by KCOM and associated authorised partners to a point of interconnect and demarcation towards the Customer facing CP and provide a physical interface whether optical or electrical hand-off KCOM owned Equipment or designated Patch panel.

In standard delivery the NTE CP access interface will require the CP equipment to be set to Auto-Negotiate where defined by IEEE standards.

The NTE will advertise its configured speed and duplex settings and will reject any CP settings not advertised by Auto Negotiation.

The service uses Auto-Negotiation as specified in IEEE 802.3 for 10Mbps, 100Mbps, 1Gbps. Auto negotiation is not supported for 10Gbps, and 100Gbps as per the standard. The interface for these speeds will be set to Full Duplex.

On request, to allow compatibility with certain legacy equipment, the auto-negotiation can be turned off at both ends of the link for 10 and 100Mbps services. However the CP equipment will need to be set to the appropriate speed and Full Duplex. Please note, Half Duplex is not supported in any configuration.

It shall be noted that MDI/MDI-X will be affected by this and as the cabling from the access port to the CP equipment is the sole responsibility of the CP they need to be prepared with the appropriate cabling.

3.5.1 Logical Operation-Flows and Flowpoints

Services will be known as Flows within platforms and made up of FlowPoint's creating overall End to End connectivity.

The use of Queues and Policers will identify and reflect either the Premium or basic ENNI allocation of required Peak Data Rate requested.

3.5.2 802.1q VLAN tagged frames-C Tags & S Tags

Transmission of 802.1q VLAN tagged frames are used as transport TAGs to traverse the KCOM network, through to the third party's interconnect and onward where applicable.

All customer traffic at a 'Spoke' will be a port based EPL interfaces.

If Vlan Based EVPL services are requested, then the design must be agreed with the customer's Design Authority and indicated on appropriate documentation (EVPL)

C-TAGS are available across platforms whereas S-TAGS are only supported within a platform.

Should the number of C-Tags reach 4000 on a single device which utilises the same route, the use of S-Tags can be added within the KCOM design.

3.6 Maximum frame size

The maximum frame size is 1500 bytes.

Support of a Jumbo frame size of 9000 bytes is available as an option

3.7 Frame duplication

A single frame conversion takes place in either direction.

The traffic input to the CP is converted in framing once to the line and once on reception before being output to the CP interface at the far end of the circuit.

- No other framing actions are operated on this circuit
- No Frame duplication occurs.

3.8 Transparency of the service

The service accepts valid Ethernet frames except for:

- Transport of EFM OAM PDUs as defined by IEEE 802.3 is not supported. This is defined in IEEE 802.3 standards expected operation for EFM equipment.
- Physical layer signalling not designed to be transmitted on this service such as auto negotiation.
- Slow Protocols – includes LACP.
- IEEE 802.3x PAUSE
- IEEE 802.1X Authentication
- LLF and ULLF

Due to the specialist nature of the service, care is taken to not introduce any traffic for management or monitoring purposes. Therefore, as an exception to normal KCOM practise, IEEE 802.1ag / ITU-T Y.1731 is transparent if the CP does not use Maintenance Domain (MD) levels 0 – 3.

Whilst MD levels are not used by KCOM, we have reserved them should this be required later, in agreement with the CP, for monitoring or fault management purposes.

3.9 Frame validity checking

CP ingress traffic is checked on ingress to the interface port to be compliant to the Ethernet framing standards for transmission to line.

The CP shall note that due to the enhanced transparency of this service some Ethernet features are not valid for this interface type and will either be dropped or transmitted untouched.

Frames transmitted in this category may have an unexpected or undesired impact on the CP operation. It is expected that the CP will manage this situation in all cases.

3.10 Transmission

The service is transmitted between the Intelligent NTEs on an uncontended wavelength based on a fixed route path contiguous across the KCOM network.

Thus, providing a closely determined transmission latency between the CP interfaces to support the CP traffic.

The path measurement and consideration factors of latency and packet loss will be measured as part of the Request for Comments (RFC) certification process and relayed to the CP.

The service is designed for these factors to not vary due to the network operation over time. The use of a fixed path allows for this.



Should a reroute be required due to Matters beyond KCOMs reasonable control (MBORC), the CP will be informed with as much notice as possible. A re-route is only likely to occur under a major incident on the fibre system.

4 CP INTERFACE EQUIPMENT

There is one interface type requiring description. End user (EU) or CP interface.

4.1.1 End CP connection interface

The CP connection is presented as a standard Physical RJ45 copper connection with an additional option of a SFP based fibre. both single-mode or multi-mode are supported at 1000Mb.

Access Port Speed	DIA 1000Mbps	DIA 10000Mbps
Interface option(s)	1000 BaseLX (SMF) 1000 BaseSX (MMF) 1000 BaseTX (RJ45)	10GBASE(SMF)
Connector	Dual LC (Fibre) RJ45 (Copper)	Dual LC (Fibre)

Connection of CP equipment to the Access Port is the responsibility of the CP. The interface on the CP equipment must conform to IEEE802.3, supporting Full Duplex operation and be enabled for Auto-Negotiation.

4.1.2 Auto negotiation and duplex settings

All CP cabling for the requested speed shall meet the requisite specification for the interface type above.

For fibre 1000BaseLX uses Single Mode Fibre (SMF) and 1000BaseSX uses Multi-Mode Fibre (MMF).

When auto-negotiation is set on the NTE, the NTE will attempt to compensate for the use of the incorrect cable type (straight or crossed) by using its MDI/MDI-X capability.

However, if auto-negotiation has been requested to be switched off, then the MDI/MDI-X is automatically disabled so the CP shall ensure the correct cable is used.

4.1.3 Service demarcation at connector

The access interface connector is the service demarcation point between the KCOM service delivery NTE and the CP equipment cabling.

The access interface can be either a RJ-45 (specified in IEEE 802.3) style socket for copper type delivery or dual LC sockets for fibre delivery.

The standard presentation uses LC/PC fibre presentation format as per IEEE802.3. The CP is required to provide suitable cables for the connection between the KCOM CP interface to their equipment interface.

Maximum distances supported.

- For copper using standard Category 5E cabling, the supported limit is 100 meters of



actual cable length including all patch leads and panels.

- For 62.5/125 multimode fibre the limit is 200 meters.
- For 50/125 multimode fibre the limit is 500 meters.
- For single mode 9/125 cable this limit is 10000 meters based on the 1000BaseLX standard dB loss per meter. To be discussed and agreed during the design stage.

The Interface available for the supplied interface clock T1/E1 External Clock Input and Output uses RJ-48c connectors in balanced 120 Ohm impedance mode.

4.1.4 Service NTE

The service is delivered by a CP located Managed NTE.

The NTE unit requires:

- 1 rack U of space vertically and occupies half the width of the 19" rack.
 - 19" / 23" kits are available as required to mount directly in a rack space.
- Dimensions are (H x W x D) 43.6mm x 220mm x 212mm
- Units can be wall mounted.
- At least 38 mm air gap is required on all sides for environment airflow.
- Passive cooling to maintain a maximum air temperature of 40°C

4.1.5 Environmental

The NTE unit is designed to operate in the following environmental conditions.

- Temperatures between -40°C and +65°C with an ambient room temperature of between 0 and +40°C.
- Humidity levels of 5% to 90%.
- The units are passively cooled, therefore, always, the heat sinks, and ventilation grills must remain clear and unobstructed.
 - The heat sinks shall not be in contact with any other surface or object at any time.

The environmental conditions of the area used to contain the NTE must always remain within the limitations specified below.

KCOM will share any details of NTE equipment, that differ from the environmental information discussed above.

4.1.6 Power supply

The NTE is locally powered and is offered with AC power as standard. There is an option for DC powered versions. This option must be requested at time of order.

The NTE is locally powered, and all supplies must be closely located to the NTE installation location.

For AC power, the CP will be required to supply standard 50Hz AC power via Single 13Amp power sockets or for DC -48V power connections and Earth Connection. All wiring must conform to BS7671 IEEE Wiring Regulations. It is the full responsibility of the CP to ensure that the power supplies are compliant to all applicable regulations and are marked, fully rated and fused correctly and safe for KCOM use.

During the installation and any testing in life a spare mains 50Hz AC 13 Amp power socket is required

The CP is responsible for providing the correct power source and capacity as identified as



part of the survey process.

The maximum power requirements are shown below for each power variant.

All wiring schemes shall conform to BS7671.

The CP is responsible for ensuring all power supply are correctly fused and safe for use by KCOM.

4.1.7 DC power option

Maximum Power consumption for a DC-powered chassis: 300W

For the installation of a DC powered unit, KCOM will work with the CP to ensure the correct connectors for the unit are identified, and where needed supplied.

The wiring up to the CP identified power connection is the responsibility of the CP. The wiring must be compliant to BS7671 and isolation by a Miniature circuit breaker (MCB) or fuse must be provided by the CP for the supply provided.

The supply leg must be isolatable at the 'internal-rack' isolation / connection points.

The power connections shall be in the same rack as the unit will be installed. The CP shall also provide KCOM with power supplies that are:

- Correctly fused for the load.
- Wired with the correct colour wiring compliant with BS 7671.
- Labelled as per BS 7671 and clearly identifiable without reference elsewhere.
- Cable that is correctly sized for the voltage drop from the power source to provide the required voltage at the unit for the maximum rated load of the unit.

The CP should also have available a standard 13A, AC power socket available for test equipment as required.

4.1.8 AC power

For an AC powered NTE the supply voltage range is 230V to 240V.

Maximum Consumption at 220V (Input voltage): 300 W

As part of the survey process the power supply cards will be identified by KCOM.

KCOM will require the CP to provide a standard 13A socket supply.

The CP should also have available a further 13A AC power socket available for test equipment should it be need.

4.1.9 Power consumption

The typical power consumption in this application is expected approx.. 200W

4.1.10 Heat output

In line with the typical power consumption the expected heat output:

- $\approx 683\text{BTU/h}$
 - Conversion factor used $1\text{ BTU/h} = 0.293\text{ W}$.

4.1.11 Electrical safety

The KCOM equipment supplied is compliant with BS EN 60950-1 Information Technology equipment. Safety.”



Please refer to BSI Group Web site for further details.
[Electronic and electrical standards | BSI \(bsigroup.com\)](https://www.bsigroup.com)

5 SAFETY & EMC INFORMATION

5.1.1 Safety

Where the CP Interface is presented with an 'optical' presentation this is classified as a Class 1 laser product as defined in the laser safety product standards BS EN 60825-1/2 [17].

The 10/100Mbps interfaces are classified as 'unexposed' as defined in CENELEC Reports/ETSI Guide ROBT-002/EG 201212.

The CP shall note and pay heed that this equipment uses and operates transmission grade optics on the network interface.

At no time should any non-KCOM appointed personal interact with the network equipment or the optical connections to it.

Should any issue or concerns arise then the CP should contact KCOM on the telephone number given in the RFC handover pack documentation.

Please see section 4.2.2 Power supply for further safety information.

5.1.2 EMC

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

Whilst predominantly intended to be installed in 'commercial' and 'light' industrial environments, this does not preclude the CP Interface or End User NTEs being installed in other environments e.g., heavy industrial.

6 GLOSSARY

Definitions of Terms Used:	
Term (e.g. abbreviation or technical term)	Explanation
AC	Alternating Current. Electrical supply type.
CP	Communications Provider. (Providers of Electronic Communication Services)
CP	Customer contracting the service from KCOM
DC	Direct Current. Electrical supply type.
EFM	Ethernet Facility Management.
End User	The primary end user of the service.
Ethernet	IEEE 802.3 Ethernet standard including interface specifications, framing and transmission.
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force

KCOM	KCOM Group Ltd
LAG	Link Aggregation Group
NTP	Network Terminating Point
OAM	Operations, Administration, & Maintenance
MDI/MDI-X	Medium Independent Interface / Medium Independent Interface – Crossover. A Feature of many standards this is the specification of the physical cable handover between interfaces. Commonly used to describe the individual cabling pairings.
NTE	Network Terminating Equipment
PDU	Protocol Data Unit
PDU	Packet Data Unit
RFC	Request For Comment – IETF Publications
RJ11	Registered Jack Type 11
RJ45	Registered Jack Type 45
VLAN	Virtual Local Area Network
VLAN TAG	Virtual Local Area Network 802.3 Ethernet Header field used to identify the specific VLAN in use for the attached Ethernet frame payload. See IEEE802.1Q specification.

7 REFERENCES

[1]	IEEE 802.3	Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—	1988 to 2015
[2]	IEEE 802.1ag	IEEE Connectivity fault management	2007
[3]	BS 7671	IEE Wiring Regulations - 18th edition Requirements for electrical installations.	2016
[4]	ITU-T G.8261	Timing and Synchronisation Aspects in Packet network.	2013
[5]	ITU-T G.8262	Timing Characteristics of a Synchronous Ethernet Equipment slave clocks	2016
[6]	ITU-T G.8264	Distribution of timing information through packet networks	2015
[7]	ITU-T G.8275.1	Precision time protocol telecom profile for phase / time synchronization with full timing support from the network	2016
[8]	ITU-T Y.1731	Technical characteristics of the Single Analogue Line Interface	
[9]	BS EN 60825-1/2	Safety of laser products – Part 1: Equipment classification and requirements	2007
[10]	BS EN 60825-1/2 (BSI)	Safety of laser products. Equipment classification and requirement.	2014

[11]	IEEE 802.3	IEEE Standard for Ethernet.	2012
[12]	IEEE 802.1Q	IEEE Standard for Local and metropolitan area networks. Media Access Control (MAC) Bridges and	2012

Reference [1] [2] [11] and [12] may be obtained through <https://www.ieee802.org/>

References [4], [5], [6], [7], [8] may be obtained from: <https://www.itu.int/>

References [3] [9] and [10] may be obtained from: <https://www.BSIgroup.com>

8 HISTORY

Date	Issue	Comments	Author
08/12/2023	1.0	New document	Andrew Machin / Jordan Ambler / Tim Rood