# Customer Interface Publication: CIP035

## KCOM GROUP PLC
## KCOM ETHERNET CONNECT ACCESS SERVICE (ECAS) AND ETHERNET DIRECT ACCESS SERVICE (EDAS) SERVICE DESCRIPTION AND TECHNICAL CHARACTERISTICS

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# 1 INTRODUCTION

KCOM provides wholesale network access in the form Ethernet Connect Access Service (ECAS) and Ethernet Direct Access Service (EDAS) (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 use KCOM’s bandwidth wholesale business connectivity services to provide their residential and business End Users with retail services, such as next generation mobile telephony and broadband. The Service is provided between two CP sites in the Hull Area.

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 in documents made available from the address provided below. This CIP will be updated to reflect any such changes, with the most recent version available at: https://www.kcomplc.com/regulatory/kcom-wholesale/service-information/technical-interface-information/.

Changes to the technical architecture and network interfaces that affect the correct working of the service will be published by KCOM Group PLC 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

KCOM Ethernet Connect Access Service (ECAS) and Ethernet Direct Access Service (EDAS) is an Ethernet service which uses the KCOM Ethernet network to provide IEEE 802.3 framed connectivity between two sites to form a Layer 2 Ethernet Connection.

The topology is based on point to point connections between two end user sites or an end user site and a KC Point of interconnection as dictated by the regulated environment. The transmission path for this service is fully contained within the KCOM Group infrastructure and plant. Alternate network delivery is not available.

ECAS and EDAS are a point-to-point Ethernet data service offering bandwidth connectivity over a standard distance of up to 40 km between endpoints based on a measured fibre distance. Extended distances may be available based upon survey results. However, it is unlikely to be beyond 50 km due to the geographical limitations of the network.

An addition to the product, specifically for the mobile industry, is the availability of service specific characteristics to support Ethernet Mobile backhaul providing transportation of Synchronous Ethernet (SyncE) and support of IEEE 1588v2. Where applicable, these are described in the text. Client interfaces offered are full duplex only.
As of April 2, 2014, the available variants of Interface speed are 10Mb, 100Mb, 1000Mb.
As of January 1, 2016, the additional variant of Interface speed 10Gb.
As of April 3, 2019, the additional variant of Interface speed 100Gb.

The service traffic throughput is based on the service product ordered and any sub rating (rate shaping) of the product specification as part of the order.

A diagram showing the available delivery is shown and is indicative of the two products, different exchange at the top and same exchange at the bottom.

**Single Exchange Circuit (Ethernet) service below in Figure 1.**

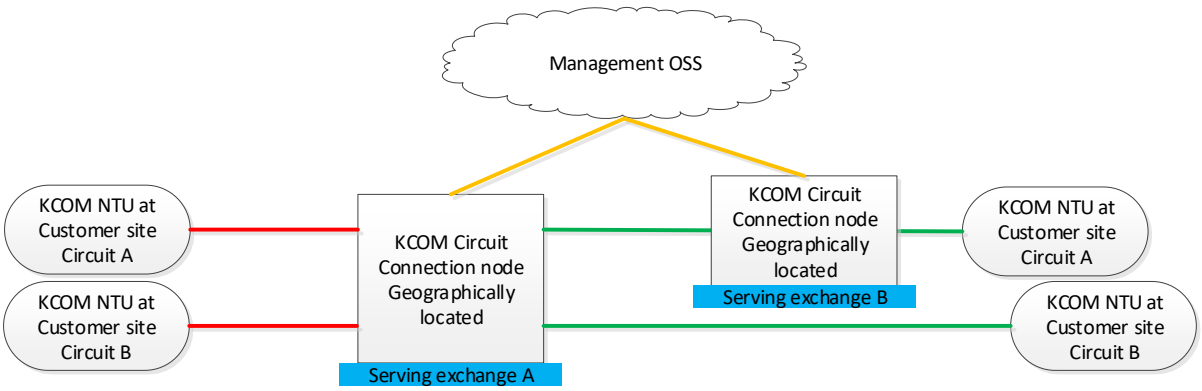


**Figure 1**

The service is based on National and International standards and therefore is subject to change as these and 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.

ECAS and EDAS will support a CP in 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.

### 2.1.1 Mobile specific

A specific set of features to support the use of Synchronous Ethernet and IEEE 1588v2 is an option as part of the ECAS and EDAS product. This option is by special order on application only and is not available as an in-situ upgrade. The option is only available at 100Mbps and 1000Mbps and 10Gbps and has the same resilience options as the standard ECAS and EDAS product. Due to the nature of the product the customer equipment must meet all applicable standards and manage the resilience transition for the Sync transfer.

The service will transport the CP provided clock input or the network provided clock to an output at the remote end. This is unidirectional. If a CP provided clock is used, then it is the responsibility of the CP to provide this at the input port of the system.

## 2.2 Service Availability

KCOM Ethernet Connect Access Service (ECAS) and Ethernet Direct Access Service (EDAS) is available within the Hull Original Licensed Area (OLA) as defined by OFCOM as the Kingston upon Hull. It may also be available on request in the East Yorkshire Expansion area of the KCOM Group PLC network but is subject to survey and availability. Excess construction charges may apply as per the product offering.

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

The maximum radial distance between any endpoints is 40 km or as where defined by OLA boundaries. Due to the nature of the area extended actual transmission path lengths may be available upon request and are subject to survey.

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 service delivers an uncontended Ethernet Point to Point service to Business/ Wholesale Service provider CPs. The service may be delivered over differing architecture depending on the product specification and required aggregation capability. The same service will be delivered independent of this architecture except where required by the product specification.

This service to MCSPs 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 by 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 ECAS and EDAS product transmits IEEE 802.3 Ethernet frames with a maximum size of 2000 Bytes as specified in IEEE 802.3 and as amended by 802.3as. The service is compatible with IEEE 802.1q for the use of VLAN tagging.
The service is transparent to VLAN tags and transmits them in the same method as untagged frames.

## 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. This are blocked at ingress.

## 3.4 Link Loss Forwarding

The service is not offered this option. CPs should use alternate methods of link status checking.

## 3.5 CP Interface Auto-Negotiation and Duplex settings

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 used 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 maintain compatibility with certain older equipment, the auto-negotiation can be turned off at both ends of the link for 10Mbps, and 100Mbps services but the CP equipment will need to be set to the appropriate speed and Full Duplex. 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.

## 3.6 SyncE Option

The service provides a Single Point to Point transport service for Ethernet framed traffic with additional features of SyncE between a CP endpoint and a subtended CP endpoint.

The two Options for SyncE clocking:

> Frequency Source - KCOM

Frequency is provided via the exchange equipment to the end point via an in-band timing signal and is presented as a 2Mb BITS OUT clock and SYNC-E compliant messaging. The clock is provided at a shelf or NTE (for the single unit option) level.

> Frequency Source - Customer

CP provided clocking using the BITS IN on each circuit interface supplied. In the multiple circuit chassis (CM), each BITS IN will require a separate clock input. Providing and maintaining this timing source is the responsibility of the CP.

SyncE Timing features:
> CP provided source clock (BITS IN)
> BITS interface G.703 120Ohm RJ48c
> Synchronisation at the physical layer per ITU-T G.8261
> Clock requirements per ITU–T G.8262
> SyncE messaging per ITU-T G.8264
> Relay of timing via multiple end to end ECA products is not supported.
> A single timing domain per chassis. Multiple domains are not allowed.

Timing input options: BITS SSM is the supported input option. Source is provided via the BITS IN connection.

SyncE Clock and configuration format:
> Type : E1
> Code : E1 HDB3
> Format : E1 CRC4
> SA bit : Bit 4
> QL Mode enabled.

By the nature of the SyncE protocol, the Product inserts up to 2 frames per second with the CP traffic on the remote end access port to provide the status updates of the synchronization flow.

Due to the use of a 4 byte management overhead on the SyncE enabled product, a reduction in transmission link capacity of 1% on CP frame sizes above 384 bytes, and increasing to up to 6% for 64 byte frames compared to an identical service without SyncE.

## 3.7 Interface Downstream policing

The service is provided as a rate shaped limiting service. The service is controlled by the application of a rate shaping profile, so the physical interfaces as described in the applicable standard does not control the capacity of the circuit.

## 3.8 Interface Upstream policing

The service is provided as a rate shaped limiting service. The service is controlled by the application of a rate shaping profile, so the physical interfaces as described in the applicable standard does not control the capacity of the circuit.

## 3.9 Maximum frame size

The maximum frame size is 2000 bytes.

## 3.10 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.

## 3.11 Transparency of the service.

Please see section 3.6
The service accepts valid Ethernet frames except for:

1. 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.
2. Physical layer signalling not designed to be transmitted on this service such as auto negotiation.
3. Slow Protocols – includes LACP.
4. IEEE 802.3x PAUSE
5. IEEE 802.1X Authentication
6. LLF and ULLF

Due to the specialist nature of this service, care has been 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 as long as the CP does not use Maintenance Domain (MD) levels 0 – 3. Whilst these MD levels are not used by KCOM, we have reserved them should this be required at a later date, in agreement with the CP, for monitoring or fault management purposes.

## 3.12 Frame validity checking

CP ingress traffic is checked on ingress to the interface port to be complaint 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 including those discussed in section 3.7 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.

## 3.13 Transmission

The service is transmitted between the Intelligent NTEs on an uncontended wavelength based on a fixed route path contiguous across the KCOM network. This provides for a closely determined transmission time 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 RFU 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 MBROC factors the CP will be informed with as much notice as possible. A reroute is only likely to occur under a major incident on the fibre system.

# 4 CP Interface Equipment

There is one interface that require description. End user (EU) or CP interface. This is present at both end of the circuit.

## 4.1 End CP connection interface

The CP connection is presented as standard as a Physical RJ45 copper connection with an additional option of a SFP based fibre at single-mode or multi-mode at 1000Mb. The port speed is as per the product description and ranges from 100Mb to 1Gb.

| Access Port Speed | ECAS / EDAS 10Mb | ECAS / EDAS 100Mbps | ECAS / EDAS 1000Mbps | ECAS / EDAS 10000Mbps |
|---|---|---|---|---|
| Interface option(s) | 10BaseTX | 100BaseTX | 1000 BaseLX (SMF)<br>1000 BaseSX (MMF)<br>1000 BaseTX (RJ45) | 10GBASE(SMF) |
| Connector | RJ45 | RJ45 | Dual LC (Fibre)<br>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 IEEE 802.3 and support Full Duplex operation and be enabled for Auto-Negotiation.

### 4.1.1 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 unit, 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.

### 4.1.2 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 is 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.

BITS in / BITS out interface specification for SyncE support.
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.

## 4.2 Service NTE

The service is delivered by a CP located Managed NTE.
The 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

### 4.2.1 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, at all times, 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.

### 4.2.2 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.

### 4.2.3 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 connection 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 BS 7671 and isolation by MCB or fuse must be provided by the CP for the supply provided.
The supply leg must be isolatable y at the in 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 should it be need.

### 4.2.4 AC power

For a 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.

## 4.3 Power consumption

The typical power consumption is this application is expected to be 200W

## 4.4 Heat output

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

- ≈ 683BTU/h
    - Conversion factor used 1 BTU/h = 0.293 W.

## 4.5 Electrical safety

The KCOM equipment supplied is compliant with BS EN 60950-1 Information Technology equipment. Safety." BSI Group Web site for further details.

# 5 SAFETY & EMC INFORMATION

## 5.1 Safety

Where the CP Interface is presented in 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 2o1212.

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 RFU handover pack documentation.

Please see section 4.2.2 Power supply for further safety information.

## 5.2 EMC

The network equipment 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. 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 PLC |
| 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 parings. |
| | |
| 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


| | | | |
|---|---|---|---|
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| [3] | BS 7671 | IEE Wiring Regulations - 18th edition<br>Requirements for electrical installations. | 2016 |
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| [5] | ITU-T G.8262 | Timing Characteristics of a Synchronous Ethernet Equipment slave clocks | 2016 |
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| [7] | ITU-T G.8275.1 | Precision time protocol telecom profile for phase / time synchronization with full timing support from the network | 2016 |

| | | | |
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| [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 Virtual Bridges | 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 |
|---|---|---|---|
| 03/12/10 | 0.5 | Initial Document. | CCT KCOM |
| 01/05/14 | 0.7 | Updated document | CCT KCOM |
| 01/04/16 | 1.0 | Change of company name from KC to KCOM and document formatting changes | Amanda Woodard |
| 07/07/17 | 1.1 | Format and content updated. | Ian Peet |
| 16/07/2019 | 1.2 | Format and content updated. | Ian Peet |