



Customer Interface Publication: CIP046

KCOM GROUP PLC

Direct Internet Access Services

Service Description and Technical Characteristics

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1 INTRODUCTION

KCOM provides wholesale network access in the form of Direct Internet Access Service (DIA), 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 and IP Transit to provide their business ‘End Users’ with locally uncontended internet access services. The Service is provided between a single CP site in the Hull Area and KCOM’s internet peering sites.

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 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

2.1 Service Description

KCOM Direct Internet Access Service (DIA) 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 an end user site and a KCOM 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.

Therefore, delivery of DIA is based on the following services.

Ethernet Connect Access Service (ECAS) and Ethernet Direct Access Service (EDAS) are point-to-point Ethernet data services 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.

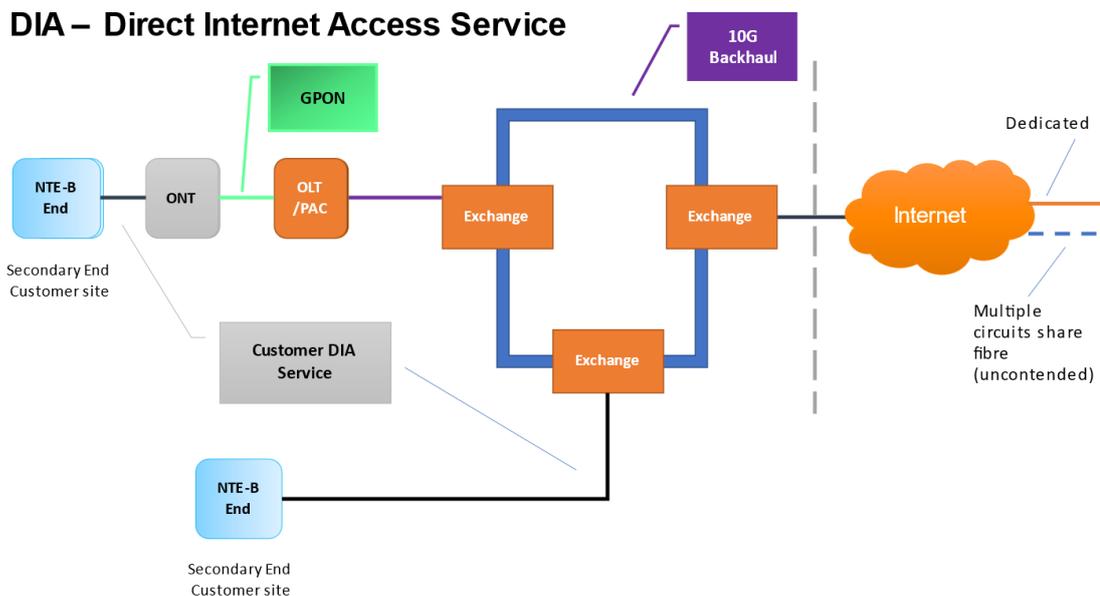
Client interfaces offered are full duplex only.

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.

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 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.

DIA 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.

2.2 Service Availability

KCOM Direct Internet Access (DIA) is available within the Hull Original Licensed Area (OLA) as defined by OFCOM as 'Kingston upon Hull'. It is also available in the Expansion Area of the KCOM Group Ltd network but is subject to survey and availability.

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.

The maximum radial distance between any endpoints is 40 km. 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' internet over ethernet service to Wholesale 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 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 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 Layer 2 ethernet product transmits IEEE 802.3 Ethernet frames with a maximum size of 1500 Bytes 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. This are blocked at ingress.

3.4 Link Loss Forwarding

The service is not offered. 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

Half duplex is not supported in any configuration.

It shall be noted that **medium dependent interface** (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 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.

3.7 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.



3.8 Maximum frame size

The maximum frame size is 1500 bytes.

3.9 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.

3.10 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 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 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.

3.11 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.

3.12 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 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 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 our 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.

3.13 IP Addressing

The DIA service supports both IPv4 and IPv6 addressing. By default, IPv4 addressing will be the only type provided following the completion of a KCOM RIPE form. IPv6 addressing can be requested in addition. As a service provider it is important for KCOM to justify its allocation of IPv4/IPv6 addressing; as such KCOM will only furnish the minimum amount of addressing required by the customer. A typical DIA service will be allocated a /30 of IPv4 addressing and a /64 of IPv6 addressing. A DIA may be allocated multiple prefixes on the same service. KCOM limits the number of prefixes on a DIA service to four separate prefixes.

3.14 IP Packet Size

The maximum supported packet size is 1500 bytes in line with international standards. This is the same for IPv4 and IPv6 packets. This will allow for unfragmented communications between the customer and services provided on the internet.

3.15 Policing

The DIA service will be policed to the purchased access rate in both ingress and egress directions using a single rate two colour policer incorporating the token bucket algorithm.

3.16 IP Spoofing Mitigation

To mitigate against spoofing attacks from the DIA service KCOM will implement uRPF in line with BCP84 and RFC8704. This helps protect the network from compromised devices in the customer environment.

3.17 Filtering

The DIA service will implement the filtering of traffic destined to addressing identified in BCP153 and RFC6890.

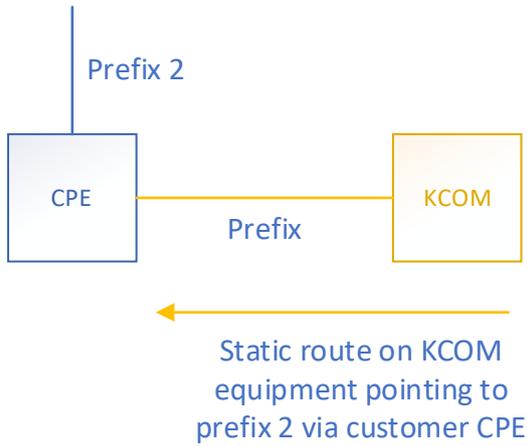
3.18 IP Service Delivery Options

A typical service delivery will consist of the allocated addressing being input directly onto the circuit as shown in the figure below.



KCOM will use the lowest usable address within the allocated addressing on their side of the circuit.

When a customer has multiple prefixes allocated to them the additional prefixes can be assigned directly onto the circuit or the additional prefixes can be pointed at the customer CPE as shown below.

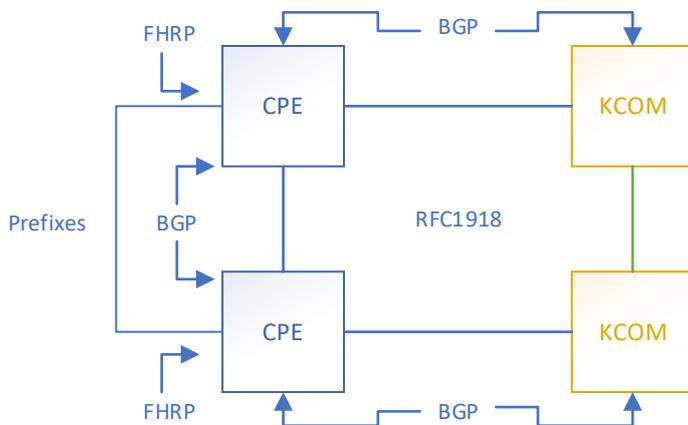


Both above solutions have the customer CPE being managed by the customer as opposed to a managed service by KCOM.

For a resilient DIA service, two separate pieces of customer premise equipment are required to present the customer prefix to the internet. Each CPE will have its own circuit back to the KCOM core network and will run Border Gateway Protocol between CPE and the KCOM core.

The BGP session will utilise a private autonomous system number which will be assigned by KCOM. The point-to-point circuits between each piece of CPE equipment and the core will utilise RFC1918 private addressing. This addressing will be allocated by KCOM. The CPE equipment will advertise the KCOM allocated prefixes to the KCOM core which will provide reachability to the internet. The CPE can utilise the Multi-Exit Delimiter BGP path attribute to manipulate which circuit is used to pass traffic. If multiple prefixes are advertised, the best path to each can be load balanced between the circuits. The KCOM core will advertise a default route over both circuits.

It is up to the CPE equipment to determine which circuit it will use preferentially for outbound traffic, KCOM recommends that the same circuit is preferred for outbound and inbound traffic. The CPE equipment should present the KCOM allocated prefixes to the customer in a resilient manner using a first hop redundancy protocol. This will take up three addresses from within the allocated prefix meaning that at minimum a /29 is required. The customers own equipment can utilise any remaining usable addressing.



4 CP Interface Equipment

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

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.

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

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.

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, 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.

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 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 should it be need.

4.2.4 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.

4.3 Power consumption

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

4.4 Heat output

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

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

4.5 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.

5 SAFETY & EMC INFORMATION

5.1 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 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 RFC handover pack documentation.

Please see section 4.2.2 Power supply for further safety information.

5.2 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., industrial.

6 GLOSSARY

Definitions of Terms Used:	
Term (e.g. abbreviation or technical term)	Explanation
AC	Alternating Current. Electrical supply type.
BGP	Border Gateway Protocol
CP	Communications Provider. (Providers of Electronic Communication Services) and customer contracting the service from KCOM
CPE	Customer Premise Equipment
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 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
20/09/2023	1.0	New document	Andrew Machin
01/12/2023	2.0	Addition of IP Service Delivery Options	Andrew Machin