eelnet®

Access Network Infrastructure Solutions

ACOME

Contents

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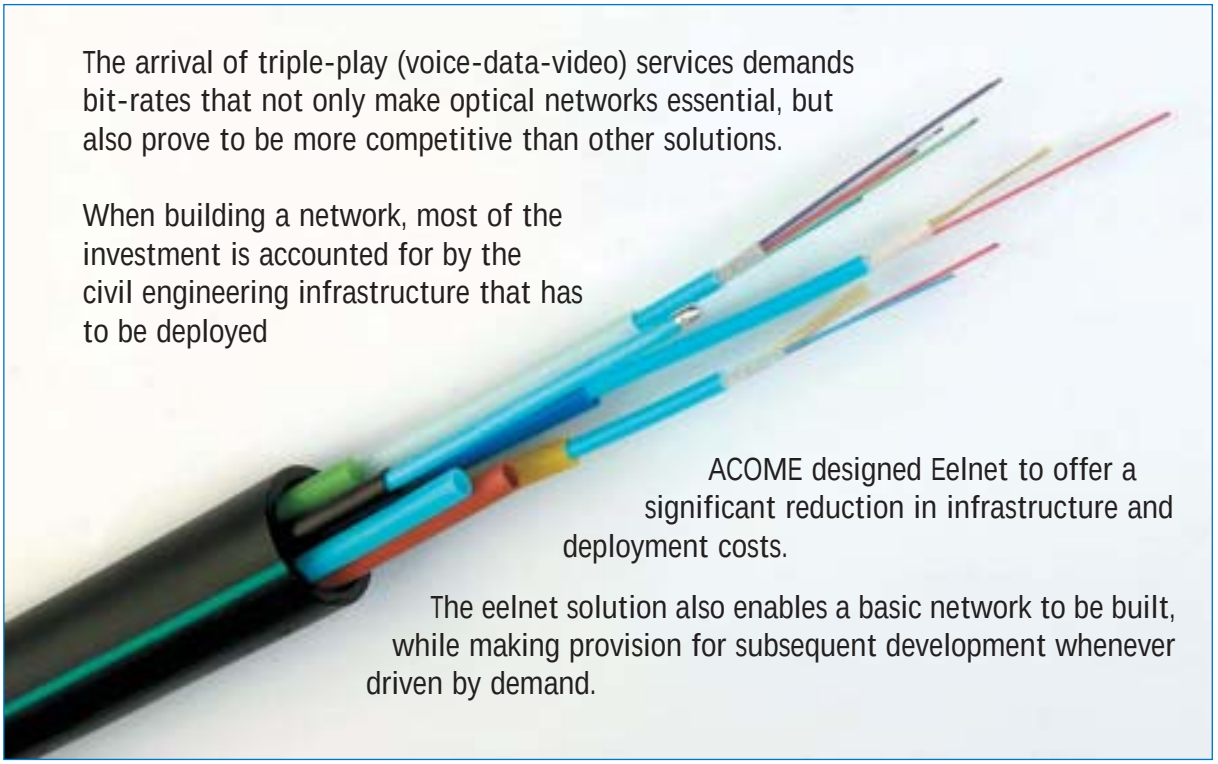
"invest as you deploy".



The arrival of triple-play (voice-data-video) services demands bit-rates that not only make optical networks essential, but also prove to be more competitive than other solutions.

When building a network, most of the investment is accounted for by the civil engineering infrastructure that has to be deployed

ACOME designed Eelnet to offer a significant reduction in infrastructure and deployment costs.

The eelnet solution also enables a basic network to be built, while making provision for subsequent development whenever driven by demand.

Eelnet means

-Optimising the existing infrastructure

-Minimising civil engineering

-Deploying as and when needed

-Protecting your investment

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eelnet: a real advantage for your access networks

Eelnet was designed to meet the needs of operators and local authorities deploying "broadband" infrastructures that are either completely or partially made up of optical fibres.

The offer is built around components allowing simple, rapid and scalable optical fibre deployment based on a network of microducts.

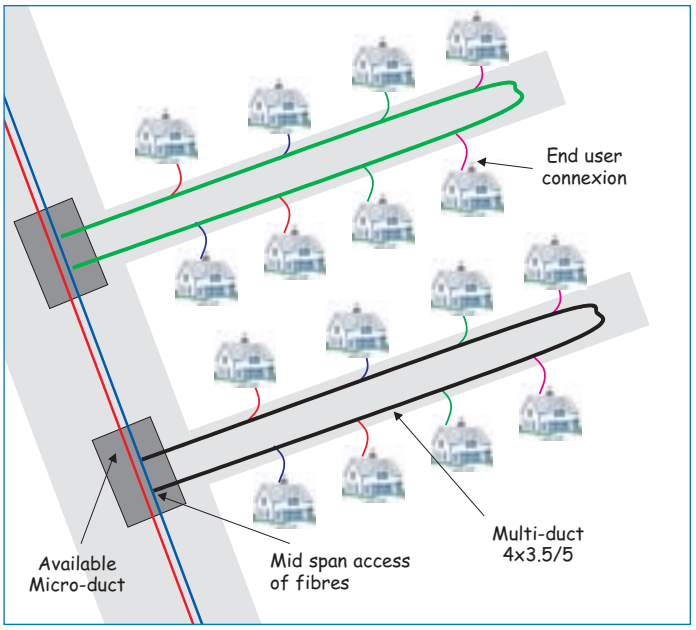
The first step is to deploy a network comprising an arrangement of microducts, which will be used to create the future links by organising the splits and connections between tubes as required, up to the end-user. The cable will then follow this link through the network of microducts.

Another specific feature of Eelnet is that it can be used to create partial optical fibre splitting on request, anywhere on the network.

This infrastructure means that the optical fibre laying and connection points can be centralised. Subsequent network development is therefore flexible as it is based on the microtubes infrastructure.

When compared with a traditional technique, this method has the following advantages:

-Limits the number of points from which the cables are to be installed.
-Better grouping of the connection points.
-Creation of new points as and when required, either for installing or for splitting off fibres.
-Connection of new customers without disrupting the existing networks.
These economical and scalable networks are made possible by the use of a network of microducts and cables ideally suited to mid-span access techniques.



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Network engineering

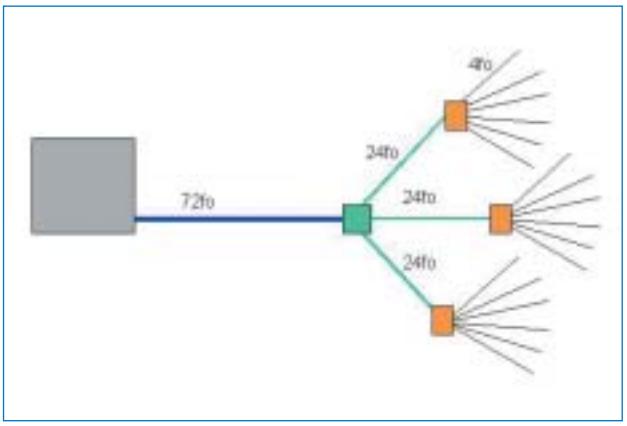
Eelnet enables new network architectures to be created and improves productivity through the use of innovative deployment methods.

1-Network architecture: "Only with Eelnet"

Networks are usually built using a tree structure, with cable size decreasing the closer one gets to the end-user. This type of architecture has the drawback of dedicating cables and fibres to a specific use or zone, right from the outset. Using the ACOME eelnet solution, based on compact-tube technology and a complete range of specially designed components, it is now possible to create networks in a way that is far more economical and scalable than traditional solutions, using a Bus-tree or Ring-tree architecture. This solution can be easily implemented by means of mid-span access.

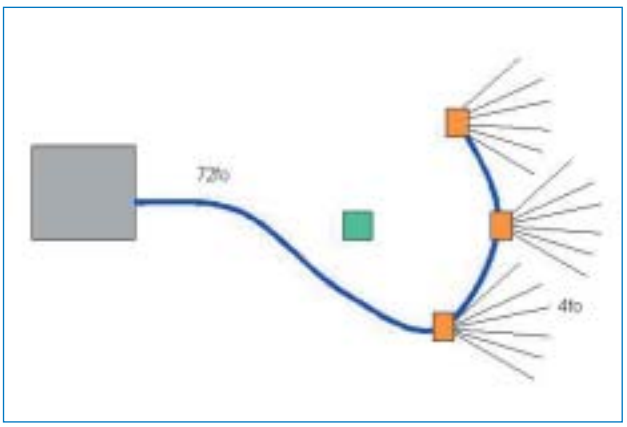
Advantages of a Bus-tree architecture over a tree architecture

Tree architecture



3 cable models
4 access points
at least (4 access chambers)
144 splices in total
Reserve fibres: dedicated

Bus-tree architecture



2 cable models
3 access points (3 access chambers)
72 splices in total
Reserve fibres: accessible anywhere, anytime

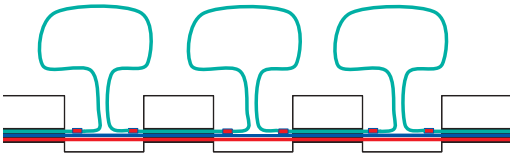
2-Construction of a Bus/tree type network

If there is an existing infrastructure, the first operation is to lay a bundle of micro-ducts in the existing duct:

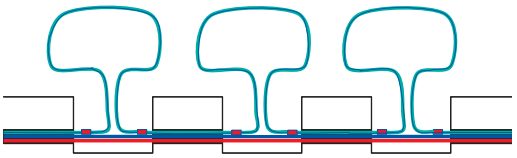
The microduct to be used will be cut in the access chambers in which splits are eventually to be made.

A coil of microduct specific to this application is then connected in each access chamber, such as to provide the extra length needed for future splitting.

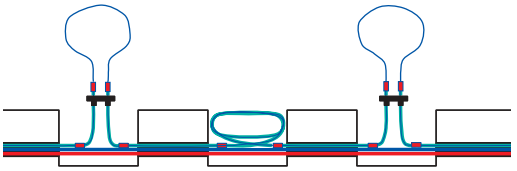
When the cable is installed, the micro-duct will be uncoiled in each access chamber.



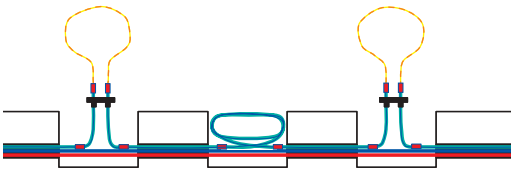
The cable will then be installed inside the microduct using the air-blowing or floating technique, with the cable running through the coils positioned in each access chamber.



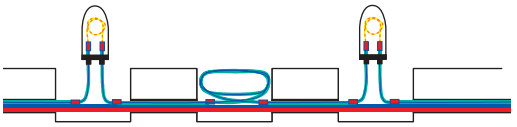
Once the cable has been installed, it will be necessary to install the splitting enclosures. In those access chambers which do not initially require creation of splitting points, the extra tube length will be coiled and will therefore be readily available for the creation of a future splitting.



Using the ACOME tool, the microtube and the cable jacket can be removed at the connection boxes, without any risk of damage to the fibres.



The fibre modules will then be easily coiled in the boxes, without having to cut a single fibre. The boxes can then be closed. The transport side of the work is now completed.



The customer connection part will consist in connecting multi-microducts up to the end-user from the access points previously.

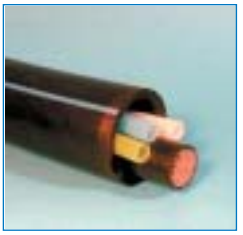
3-Construction of the infrastructure (civil-engineering)

Existing networks

The existing networks generally use an infrastructure comprising PeHD or PVC ducts. Whether the duct is empty or partially occupied by a previously installed cable, one or more microducts can be installed inside it.
Deployment will use pulling, air-blowing or floating techniques.

Installation in an empty duct:
-over short distances (a few hundred metres)
cable pulling is perfectly suitable
-for greater distances (1000m),
the air-blowing method will be preferred
-for the longest distances,
the floating method will be used.
The microducts may be installed in several sections, as connection using pneumatic couplings is extremely simple.

Installation in a duct already containing a cable
Microducts can be installed in a duct which already contains a cable, with the number of microducts and the distance depending on a certain number of parameters: diameter of installed cable/duct, how the cable was installed, whether or not old lubricant is still present, and so on.
In this case, even if the air-blowing method is usable, the safest method will be floating.



New networks

Where there is no existing infrastructure, several different solutions can be considered, including direct burial in conventional trenches or micro-trenches and cable laying in micro-grooves.
Infrastructure can be deployed quickly using efficient, economical new civil engineering techniques.

Burial in trenches or micro-trenches
With this approach, one or more reinforced multitubes, each containing a bundle of microtubes, are laid in a trench.

Cable-laying in micro-grooves
This technique, which is particularly suitable for connecting end customers over distances of a few tens of metres, involves laying a reinforced microtube along the bottom of a groove.

Other solutions can also be used. These are in particular based on drilling techniques, either directional drilling or boring, ideally suited to routing up to the customer.

COMPONENTS

1-Microducts

1-1 3.5x5mm microducts

3.5x5mm LSOH microduct:
These microducts are used for the transition between the outdoor network and the interior of buildings. They are made of materials which give off no toxic or corrosive fumes.

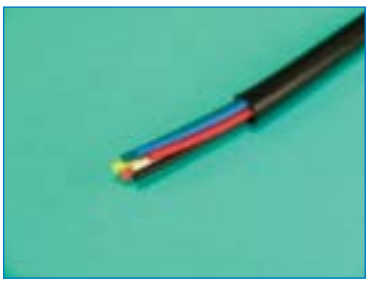
Delivery length: 600 or 1200m

3.5x5mm individual sheathed microduct: tube made of translucent coloured polyethylene covered with a polyethylene sheath. A sliding coating on the inner wall of the tube makes it easier to slip in the cable during the air-blowing operation.
These sheathed microducts are particularly well suited to customer connection with installation in a micro-trench, groove or borehole in a new infrastructure.

Delivery length: 600 or 1200m

3.5x5mm sheathed multi-microduct: 4 Tubes made of coloured polyethylene covered with aluminium tape and a polyethylene sheath. A sliding coating on the inner wall of the tube makes it easier to slip in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.

Delivery length: 600 or 1200m



3.5x5mm sheathed multi-microducts: 7 Tubes of coloured polyethylene, covered with an aluminium tape and a polyethylene sheath. A sliding coating on the inner wall of the tube makes it easier to slip in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.

Delivery length: 600 or 1200m

3.5x5mm sheathed multi-microducts: 12 Tubes of coloured polyethylene, covered with aluminium tape and a polyethylene sheath. A sliding coating on the inner wall of the tube makes it easier to slip in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.

Delivery length: 300, 600 or 1200m

3.5x5mm sheathed multi-microducts: 19 Tubes of coloured polyethylene, covered with aluminium tape trip and a polyethylene sheath. A sliding coating on the inner wall of the tube makes it easier to slip in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.

Delivery length: 300, 600 or 1200m

3.5x5mm reinforced microducts: For applications in harsher environments, 3.5 x 5 mm reinforced microducts are also available on request:
-Addition of a second PeHD sheath, to offer higher crush resistance.
-Addition of peripheral stiffeners between the two sheaths, for greater tensile strength (cable pulling)
-Addition of a metal armour between the two sheaths, for greater compression and impact resistance (direct burial)

1-2 8x10 microducts

8x10mm microduct: Translucent coloured polyethylene tube. An internal groove makes it easier to slide in the cable during the air-blowing/floating operation.
These microducts are particularly suited to sub-tubing of PVC or PeHD ducts.

Delivery length: 2500m

8x10mm LSOH microduct:
These microducts provide the transition between the outdoor network and the interior of buildings. They are made of materials giving off no toxic or corrosive fumes.

Delivery length: 600 or 1200m

8x10mm individual sheathed microduct: Translucent coloured polyethylene tube covered with a polyethylene sheath. An internal groove makes it easier to slide in the cable during the air-blowing/floating operation.
These microducts are particularly suited to the customer connection and can be laid in a micro-trench, groove or borehole on a new infrastructure

Delivery length: 600 or 1200m

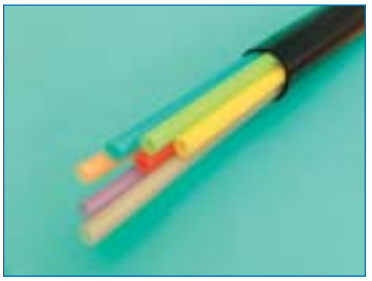
8x10mm sheathed multi-microduct: 2 Tubes of translucent coloured polyethylene tube covered with aluminium tape and a polyethylene sheath. An internal groove on the tube makes it easier to slide in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.

Delivery length: 600 or 1200m

8x10mm sheathed multi-microducts: 4 Tubes of translucent coloured polyethylene tube covered with aluminium tape and a polyethylene sheath. An internal groove on the tube makes it easier to slide in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.

Delivery length: 600 or 1200m

8x10mm sheathed multi-microducts: 7 Tubes of translucent coloured polyethylene tube covered with aluminium tape and a polyethylene sheath. An internal groove on the tube makes it easier to slide in the cable during the air-blowing/floating operation.
These sheathed microducts should be used when the installation distances are short and do not require deployment of dedicated laying equipment, or if the existing ducts are old and cannot withstand the high water or air pressures used in this particular form of cable laying.



Delivery length: 300, 600 or 1200m

8x10mm reinforced microducts: For applications in harsher environments, 8x10 mm reinforced microducts are also available on request:
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-Addition of peripheral stiffeners between the two sheaths, for greater tensile strength (cable pulling)
-Addition of a metal armour between the two sheaths, for greater compression and impact resistance (direct burial)

2-Cables

2.1 Microcables for 3.5x5mm microducts

Microcables with 2 to 12 fibres:

Bundle of fibres encapsulated in a peelable flexible material.
Protective sheath with a very low friction coefficient and a diameter of less than 2mm.
The microcables were designed for customer connection in optimum installation and connection conditions. The installation parameters were optimised to be able to handle the most problematical routing. The structure is designed to offer the necessary mechanical protection, allied with easy deployment.

Delivery length: 600, 1200 or 2100m

2.2 Microcables for 8x10mm microducts

Microcables with 12 to 72 fibres:

-Bundles of 12 fibres in flexible compact-tube modules
-Watertight
-Composite sheath with an extremely low friction coefficient. Can be easily opened for mid-span access. Nominal diameter 6mm.

The eelnet range of cables is designed for all installation situations, owing to their ideal weight, diameter, stiffness and friction coefficient. The best installation performance will be obtained in conjunction with ACOME ducts.
The cable jacket offers easy access to the modules, while the Compact-tube technology enables the modules to be easily coiled, giving particularly simple and safe access to the module fibre. The entire system is ideal for the mid-span access technique.

Delivery length: 600, 1200 or 2100m

3-Connection equipment and accessories

3.1 Pneumatic connection

10mm microduct air-blowing end-piece:
Tube sealing cap for pressurisation. The hemispherical end makes it easier to guide the microduct through the duct at installation.

10mm microduct Valve Stop:
Enables the microduct pressure to be increased for pulling or air-blowing installation

Microduct straight connector:
Used to connect two Microducts. Transparent to enable the connection to be checked.

Available dimensions: -For 3.5x5mm microduct
-For 8x10mm microduct

Microduct sealing plugs:
Provide a watertight Microduct seal.

Available dimensions: -For 3.5x5mm microduct
-For 8x10mm microduct

Watertight Microduct/Microcable transition:
Provides a watertight seal between the end of the micro-duct and the cable.

Available dimensions: -For 3.5x5mm microduct
-For 8x10mm microduct

Gas-tight Microduct/Microcable transition:
Provides a gas-tight seal between the end of the microduct and the cable. Comes with a clamping ring to secure the connector to tube connection.

Available dimensions: -For 3.5x5mm microduct
-For 8x10mm microduct

Flexible sealing sleeve for 5 mm Microduct:
Provides a watertight seal between the end of the microduct (5 mm diameter) and the microcable (diameter approx. 2 mm).

Bulkhead connector for Microduct:
Used to connect two wall bulkhead Microducts. Comes with a wall-mounting device (for connection boxes)

Available dimensions: -For 3.5x5mm microduct
-For 8x10mm microduct

Multi-Microducts sealing plug:
Used to seal the microducts on leaving the duct. Also ensures that the microducts are securely held and maintains the seal between the microducts and the inner wall of the duct. Eliminates all tube expansion/shrinkage in the connection access chambers.

Dimensions available for the following ducts:
- Diameter 27x33mm
- Diameter 33x40m
- Diameter 41x50mm

Tube-cutting tool:
Cutting tool for microducts allowing twist-free cutting by rotating the tool.

8x10mm multi-Microducts pulling head:
Provides watertight attachment for simultaneous pulling of several microducts through a duct.

Designed for pulling from 1 to 7 microducts.

Microduct inspection gauge:
Used to check the inside diameter of the duct over its entire length. To be used before the microcable air-blowing installation operation.

Available dimensions: -For 3.5x5mm microduct
-For 8x10mm microduct

Microcable end-piece for Microduct:
Eelnet cable watertight end-cap. Its conical form allows optimum microcable guidance through the 8 x 10 mm microduct.
For eelnet 6mm microcable.

Microduct lubricant
Liquid used to lubricate the microduct to make it easier to slide in the microcable during the air-blowing installation operation.

Pneumatic splitting enclosures
The range of pneumatic splitting enclosures enables a set of multi-microducts to be split off into individual microducts for the end-customers.

Fibre splitting enclosure.

This range of fibre splitting enclosures is used to split off the required number of fibres.

Customer access box.

This range of boxes is used to distribute the optical fibres to the subscribers.

IB 3000 cable and tube opening tool.

ACOME has designed a tool for opening the cables and tubes lengthwise, for mid-span access operations (diameters 5 to 20mm)

4.3-Installation

The ducts and cables must be installed using appropriate methods and equipment.

4.3.1-Microduct installation

Microducts can be installed in a variety of ways, depending on the topology encountered:

Retubing of PeHD or PVC ducts with individual microducts:

Short distances (access chamber to access chamber) .....Traditional pulling
Medium distances 500 to 1500m. .....Air-blowing
Long distances or difficult route.....Floating

Retubing of PeHD or PVC ducts with multi-microducts:

Installation using traditional pulling

4.3.2-Installation of microcables

Microcables are installed using appropriate, qualified equipment. The configuration of these machines has to be adapted to the type of cable being deployed. ACOME is ready to assist and advise the installer concerning all aspects of cable installation:

On-site assistance
Training on the ACOME-Mortain site

ACOME can assist you with the architecture and engineering of your networks.
ACOME can also advise you in choosing the components you need and help with their deployment.

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