Innovative Solution for Optical Access Networks

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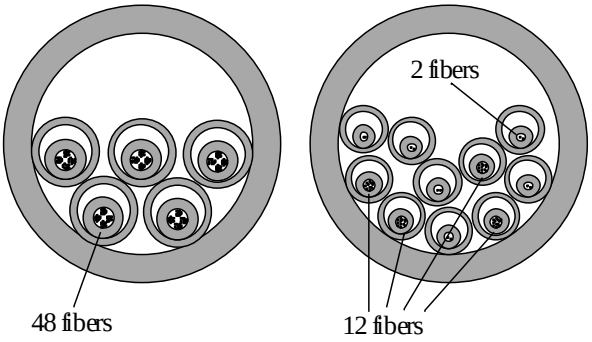
Abstract

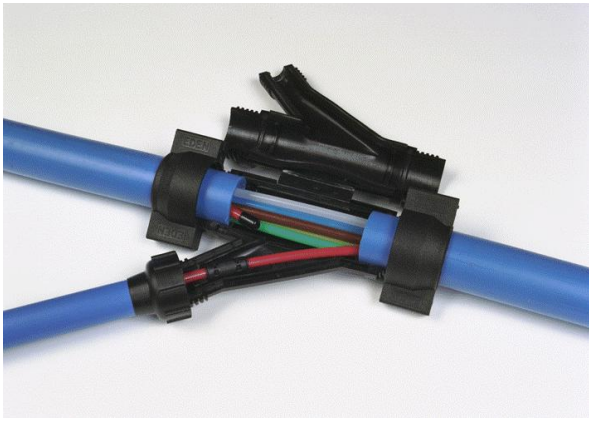
While optical fibre is now widely used in telecom backbones, copper twisted-pair still dominates in the access network. In the backbone the exchange offices are connected by simple point-point links. In the access network, however, the connection from exchange office to customer passes many splices and branches. Splicing and branching in copper twisted-pair has been done for more than a century, but for optical fibre (where a minimum of splices is preferred) the current technology does not suffice. Optical access networks require a high degree of versatility: It is not known when and where connection is asked for, installation shall be fast, new connections shall not disturb existing ones, both business and consumer market may ask for solutions and redundant connection may be required. The architecture for optical networks has to evolve in an environment where techniques for passive optical networks are still in development. Also excessive digging shall be avoided and trench space is limited.

In this paper a unique concept for the optical access network outside plant is presented. Here individual guide tubes run through a telescopic network of protective HDPE ducts. A trunk duct runs through the streets and smaller ducts branch to the subscribers. Low-cost splittable branching connections are used which can be placed at any place and any time. Miniaturised optical cables (2-48 fibres, with or without metal shield, resistant to outside plant conditions) can be installed into the guide tubes, e.g. by simply pushing or using compressed air. The concept comes with optional joint boxes to connect cables from feeder-, distribution- and drop-part of the access network. With the presented modular building blocks anyone can build his own creation. The new concept is less costly than traditional techniques for optical access networks, it is more flexible and the costs grow with demand. It solves today's problems connecting business customers. Typical advantages are:

- Costs grow with market. Parallel (filling tubes) and serial (connecting bundles of tubes; saves digging) upgradeable.
- No (expensive) pre-determined splice boxes with cable-overlength, low-cost branching.
- No extra protective ducts needed along distribution route (avoids digging again from splice-point to branch).
- Much more customers per protective duct, less trench space.
- Mid-span access at any time (living fibres not disturbed) and any place.
- Limited number of splices.
- Less splices at reparation (the less customers, the less fibres).
- Fast installation technology, short response time.
- Spare tubes can be used for localisation wire.
- When a customer moves or ends its subscription the guide-tube is easily used again.
- Matching with commonly used HDPE ducts for optical cables.

The new outside plant concept for optical access networks will be illustrated by results from a several pilot projects, e.g. for KPN Telecom, the largest telecom operator in the Netherlands.





Biography

Willem Griffioen received a MS degree in Physics and Mathematics from Leiden University (The Netherlands) in 1980. He worked there until 1984. Then he joined KPN Research, Leidschendam (The Netherlands) where his responsibilities were R&D of Outside Plant and Installation Techniques. He worked at Ericsson Cables, Hudiksvall (Sweden) and Telia Research, Haninge (Sweden) in the scope of joint projects with KPN Research. He received Ph.D. (Reliability of Optical Fibres) in 1995 from the Technical University of Eindhoven (The Netherlands). In 1998 he joined NKF Kabel as a product manager for new optical network concepts.