



## H-OPTO

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### Partners:

BT, United Kingdom

Enovas, Turkey

Lund University, Sweden

MIC Nordic AB, Sweden

Nexans Sweden AB, Sweden

STOKAB AB, Sweden

Swedish Transport Administration, Sweden

Telenor Sverige AB, Sweden

TeliaSonera Skanova Access AB, Sweden

Transtema Network Services AB, Sweden

Turkcell Teknoloji, Turkey

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### Project Website

[www.celticplus.eu/project-h-opto](http://www.celticplus.eu/project-h-opto)

<http://h-opto.eu>

## Maintenance and deployment of optical and in-home networks

**H-OPTO's ambition was to become the world's finest knowledge and innovation platform for fibre-optical broadband network management and add value to wireless in-home networks. The project made very good progress on its goals to transform the operation and maintenance of optical networks from a low-tech industry to a high-tech one and, thus, to accelerate the deployment of high-speed networks throughout Europe.**

### Main focus

H-OPTO focused on the industrial requirements for and costs of deploying and maintaining optical broadband networks. Although these types of networks are yet far from being ubiquitous, they are increasing rapidly in both size and numbers. As the networks grow and start to age, cost and quality issues also become more important. Our aim has been to create an innovation and know-how platform for optical networks and stay ahead of industry's need for practical knowledge in this field.

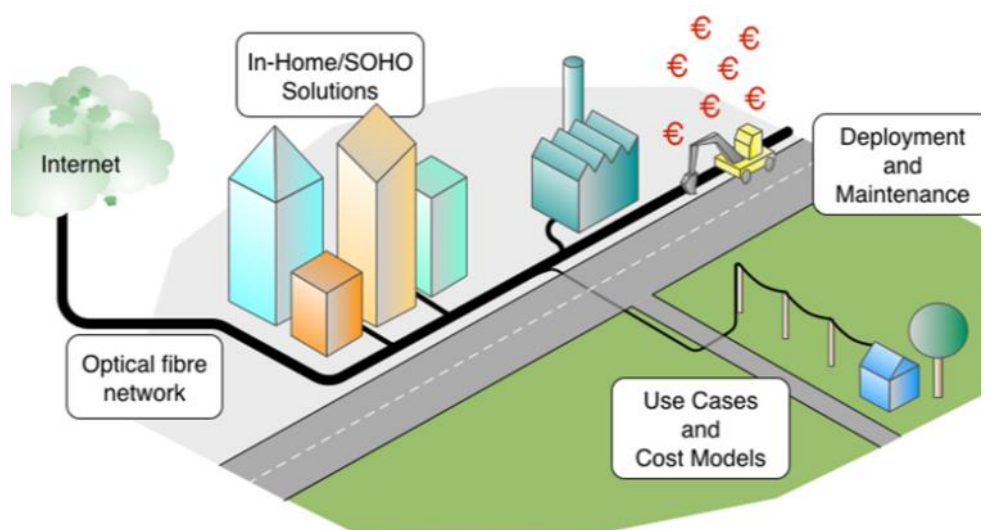
Compared with legacy copper access networks, the operation and maintenance of optical networks is, in many ways, low-

tech and labour-intensive. So far, this has worked well as the number of faults in optical networks is relatively low. As the networks expand and the number of faults increases, however, costs increase significantly. H-OPTO addressed this problem, with a strong focus on aging and maintenance.

The deployment of optical access networks has also been a political focus for some time. Through ambitious expansions in Europe, networks have grown, and a considerable amount of experience has been gained. However, the arrival of 5G mobile networks necessitates a further wave of fibre infrastructure to be added to the already accelerating "regular" deployment of optical access networks. Cost and efficiency will thus become increasingly crucial, now also for the success of 5G. The project stayed ahead of this curve and had a work package dedicated to indoor wireless access and the associated maintenance challenges.

### Approach

The project gathered experts from various European companies, organizations and universities, all frontrunners in the field of optical networks or indoor communication.



*Use cases and cost models for deployment and maintenance of optical fibre networks and in-home access.*

Our goal was twofold: (i) Vertical integration, bringing networks owners, maintenance/installation companies and academia together. (ii) Geographical spread, collecting expertise and experience from a number of national markets in different phases of deployment. The project worked as an innovation platform driven foremost by the exchange of ideas and development of industrial expertise.

The partners joined the project with clear plans of what they wanted to achieve and the questions they needed answering. We established a high level of trust among the partners, leading to generosity in sharing knowledge, experience and data, as well as support for each other's plans. As a result, the consortium achieved its goal, stated above, and answered even new questions arising during the project. Throughout the project, we also allowed new significant developments in the field to augment the list of project-topics, ensuring that the project remained up-to-date and always relevant to the partners' innovation efforts.

## Achieved results

The project focused mainly on networking services and infrastructure and produced knowledge and innovation in the following areas. (see figure)

*Best practices of fibre-optical network deployment.* Although a substantial amount of access fibre had already been laid in Europe at the

start of the project, there was still much debate about the advantages and disadvantages of various deployment methods, e.g. trenching, micro-trenching and the hanging of fibre. We have gathered significant knowledge about these deployment techniques and their long-term effects on fibre.

*Best practices of operating and maintaining fibre-optical and in-home networks.* Today, optical networks are run in a considerably more manual way than e.g. copper networks, as the routines and support tools have not yet had enough time to develop. The project has produced knowledge which will lead to "industrializing" the maintenance of optical networks, just as it had previously been done for copper networks.

*More precise knowledge of the OPEX of fibre-optical and in-home networks.* We have developed a cost model to identify major cost items, overall network cost and trends in costs together with the impact these will have on future overall costs. The model also enables the comparison of different fibre access topologies and allows these comparisons to be made over different geo-types, thus providing insight into what technology is suited best to a particular location/customer density.

The combination of expertise in optics and wireless has even led to unforeseen results, including a new business model for one of our partners, reducing both cost and

environmental impact significantly. Cost savings in network maintenance have thus been achieved both on the optics and the indoor wireless side. The project also had two forward-looking innovation tracks looking at the techno-economics of massive scale optical deployment and securing a disturbance-free radio environment, respectively, both with good progress.

## Impact

This project improves European competitiveness in the following ways:

1. *We contribute to the acceleration of the deployment of high-speed networks in Europe.* The project answers concrete questions like "how do optical networks age," and "how do we transform network maintenance into a data-driven industry." The impact of answering these questions is an increased confidence in optical networks and an increased incentive to invest.
2. *We increase the competitiveness of the European telecommunications industry.* By enabling high-speed fixed broadband access, we contribute to the future of 5G mobile networks.
3. *We increase the overall competitiveness of Europe.* There is no doubt that the competitiveness of Europe in many ways depends on European citizens and organizations having ubiquitous access to high-speed, high-quality, affordable broadband. Access to high-speed broadband boosts the IT abilities of the European population and encourages entrepreneurship.

## About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World“ paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies

or universities and research organizations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

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