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Improving the FTTH business case–A joint telco-utility network rollout model

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ABSTRACT

Fiber to the home networks are seen as the most future proof technology to offer increasing bandwidth to customers. The publication of the Digital Agenda has put forward challenging goals for the broadband connectivity in Europe, but the rollout of next generation fixed access networks is still lagging. One of the reasons is the high initial investment cost associated with the rollout of these networks. To decrease this cost, a cooperation model between utility operators during the deployment phase is proposed in this paper. A model has been developed, in order to optimize the position of the different infrastructures in the trench and to allow for a fair allocation of the different costs incurred between all cooperating parties. The combination of these models has shown that a synergetic deployment phase of new infrastructures, both in Greenfield and Brownfield installations, can decrease the deployment costs for fiber infrastructure up to 21%.

1. Introduction

The introduction of fiber in the last mile of the telecom access networks will be required in the upcoming years to cope with increasing network demands. Additionally, in light of the Digital Agenda goals, put forward by the European Commission, which include the penetration of access networks offering up to 100 Mbps or higher to 50% of the customers (European Commission, 2010), Fiber To The Home (FTTH) networks are the most future proof solution capable of offering such bandwidth. These FTTH networks offer significantly higher bandwidths than the existing access technologies, and allow offering new services to consumers (Evens et al., 2011). However, this infrastructure solution requires the installation of optical fiber in the last mile, to connect the central office with the end customer. In most parts of Europe, where a fully buried installation is typically obligatory, it can be observed that this installation is postponed by telecom operators. Research has indicated that the initial installation cost for the outside plant of underground networks represent between 55% and 70% of the initial investment (Casier et al., 2008). Deploying an FTTH network costs between €500 per home passed in dense urban regions, up to €2000 in rural areas (Casier, 2009; Corning, 2009; Fournier, 2007). This high upfront investment is one of the main reasons private players have not started the rollout of FTTH networks on a large scale in Europe. This lag in FTTH installation is clearly reflected in the current penetration rates of FTTH in Europe.

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Compared with the penetration rate of fiber to the building/home in Asia Pacific (46.15%), South-East Asia (19.259%) and North America (7.12%), Western Europe is clearly behind with only 2.56% (Point Topic, 2013).

In recent years, a shift in perception can be noticed towards telecom networks, where they are seen as just another utility network, like gas or electricity networks. Several similarities can be identified between these infrastructures. The passive infrastructure of all these networks typically can be found in the same location in the public domain, and the operations in rollout and maintenance of this infrastructure show several similarities over all networks. The initial rights of way, trenching and rollout of the cable or duct is alike for all infrastructures, although differences in the technical limitations exist. Important economies of scope can be gained by combining these operations (Gillett, Lehr, & Osorio, 2006; Kittl, Ruhle, & Schuster, 2008). Regulatory practices of one infrastructure can also set the example for other infrastructures. The unbundling of the electricity market, with a structural separation between the infrastructure operations and the electricity production and supply can been successfully transferred to telecom networks (European Parliament, 2009; Verbrugge et al., 2011). In the electricity sector, distribution grid operators roll out and maintain the network and sell access to this grid to suppliers and producers on equal terms. In telecom, Swedish municipalities have rolled out and own the passive fiber infrastructure (Forzati, Larsen, & Mattson, 2010). Other telecom operators are given access to this network on fair terms to offer services to end users, which is an open access model for telecom (Banerjee & Sirbu, 2003; Ehrler, Brusic, Reichl, & Ruhle, 2008).

These two factors, the similarities in the passive network rollout and operations and the comparable regulatory issues, have resulted in recent policy and recommendations towards the joint rollout of infrastructures (European Commission, 2012; US Congress Broadband Conduit Deployment Act of 2009, 2009). By stimulating the cooperation between different infrastructure owners, policy makers aim at reducing the nuisance for inhabitants and small and medium enterprises (SMEs) by reducing the total work time. The economic impact of road works cannot be neglected. Time losses and extra fuel consumption due to congestion is only one aspect. In addition, especially for infrastructure works in cities, SMEs can be (partially) cut off and are harder to reach for their suppliers and customers, resulting in lost turnover.

In this paper a cost sharing model is introduced to indicate that a joint rollout of different types of infrastructures not only results in reduced nuisance and economic losses for the society, but also offers cost saving possibilities for the utility owners compared to an independent rollout. Additionally, it is shown that this joint rollout drastically improves the business case for an FTTH infrastructure rollout. Reducing the initial investment costs can persuade actors to start with the rollout of the infrastructure, raising the penetration of FTTH networks in Europe and helps at reaching the goals of the Digital Agenda.

Section 2 gives an overview of the typical network characteristics, together with the (ideal) trench model. Next, the cost and allocation model is discussed in Section 3. The paper continues with two example case studies, highlighting the impact of a joint network infrastructure rollout on the total initial rollout cost in different areas. Section 5 concludes, together with some topics for future work.

2. Underground network infrastructures model

To decrease the existing gap between the Digital Agenda goals and the existing cost issues for infrastructure providers to rollout the network offering the higher access speeds, a joint utility network rollout is proposed in this paper. In Greenfield situations, the opportunities for cooperation during rollout are straightforward. In Brownfield situations, existing utility networks typically require regular pre-emptive maintenance, which can be an opportunity for telecom operators to deploy a network. Also, the large upgrades needed to the electricity networks to move towards smart metering offer opportunities for other actors to coordinate road works. A last example where cooperation in Brownfield installations can occur is the upgrade of existing sewage systems. While these are currently single pipe systems, they need to be upgraded towards split systems for sewage and rain. Several advantages can be expected from such a joint rollout. Reducing the rollout cost for FTTH/FTTB networks could improve their respective business cases, speeding up the introduction of these high bandwidth networks in Europe. Additionally, other utility providers could profit from such cost synergies. An important advantage for policy makers could be the reduced nuisance for inhabitants and SMEs when all infrastructure works are carried out together, thereby reducing the total work time. However, such a joint rollout can also be expected to result in extra overhead costs. Deploying the infrastructures together will require extra coordination costs. Additionally, existing safety regulation concerning underground infrastructures could result in only marginal cost savings, making the extra overhead costs outweigh the possible cost gains. It is therefore important to identify the level of cooperation between the different utility operators.

Fig. 1 shows an overview of the different network parts (access, in the building, within the home or apartment) when considering a utility. Every network part consists of up to six layers: right of way (ROW)/trenching, duct/fiber, WDM/MAC, IP, service and content. In the model presented here, a fully open access network is shown (Forzati et al., 2010). The network is opened at different levels to different actors. The focus in this paper is on the physical infrastructure access provider (PIP) who deploys and operates the infrastructure and opens it for all network and service providers on top. More in detail, the PIP actor contains the ROW/trenching and duct/fiber role. Since previous research indicated that cooperation offers synergy opportunities in these layers, focus is on the PIP (Gillett et al., 2006; Kittl et al., 2008).

In every network part, four network lifecycle phases can be identified on the horizontal axis: deployment, initial and later-on connection provisioning to the customer and network operations (Verbrugge et al., 2011). Previous research has