Cost Comparison of the FTTO Concept versus a Structured Cabling System with Floor Distribution Units

Advanced Management Summary

Expertise for MICROSENS GmbH & Co. KG

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Bad Honnef, April 2012
- not authorised translation -

1 Background and Aims of the Study

Despite fiber optic technology being the most future-proof cabling technology currently available, its economic benefits however are still often questioned, particularly in generic office environments, such as commercially-used buildings.

Fiber optic solutions are well-known for its superiority concerning all other media with regard to the maximum achievable bandwidth, the fact that for a large number of applications copper cables cannot be implemented due to either physical restrictions (e.g. airports with extremely long cable routes) and electro-magnetic considerations (e.g. industrial, hospitals).

The Fiber To The Office concept developed by MICROSENS (hereinafter referred to as the FTTO Concept) provides an alternative to the classic copper-based[1] structured in-house cabling system with floor distribution units and decentrally organised active distribution technology in commercially used buildings (Ethernet switches). Both architectures incorporate fiber optic cables which link the cabling of each floor vertically within the building (also referred to as secondary cabling). In the case of the classic structured cabling system, the horizontal cabling on each floor (so-called tertiary cabling) consists of copper cables linking the data ports in the offices to decentral Ethernet switches located on each floor, whereas the FTTO Concept implements fiber optic cables for the horizontal floor cabling, allowing the end user to connect his/her equipment directly up to copper Ethernet ports via 4-port fiber Micro Switches (Fast Ethernet or 1 Gb) located in the work areas.

In the light of this, this study, compiled for the MICROSENS company, aims to compare the economic benefits of each concept, record all the relevant cost drivers and to simulate, in particular, the cost of initial investment and operating costs by way of a realistic cost model so as to ultimately provide a solid basis for making decisions with regard to putting alternative cabling solutions into practice.

1 Nowadays generally copper category 7 (Cat. 7) cables.

2 Assumptions and Study Design

Apart from which type of building is to be fitted out (old building[2] versus new building), the question of how the LAN structures are distributed and/or the number of users are factors which have a considerable impact on the initial investment and operating costs – which in turn affect the overall investment costs for installing cabling in the building.

MICROSENS' initial hypothesis, therefore, assumed that for LAN structures spread over a large area, respectively with a larger number of users, the FTTO Concept was superior to a structured cabling solution right from the initial acquisition phase (hardware and cabling). It was assumed that in the case of less spread-out LAN networks or those with a lower number of workplaces the acquisition costs of a structured cabling system would be lower – or at least comparable – but that the difference would be balanced out later through the lower operating costs of the FTTO Concept.

In order to achieve a differentiated study of the assumptions, various application scenarios were used to allow for the influencing parameters mentioned above. The distribution, resp. number of users, was modelled using a project scope of 200 workplaces to represent a smaller and 1,000 workplaces to represent a larger number of users. When distinguishing the various application scenarios, differentiations were made to allow for whether the plan involved a new building or the refurbishment of an old building. This resulted in four different application scenarios, respectively study cases:

1. New building with 200 workplaces
2. New building with 1000 workplaces
3. Refurbishment of an old building with 200 workplaces
4. Refurbishment of an old building with 1000 workplaces

The assumptions and parameters used were based on discussions with MICROSENS specialists, external specialised planners and people responsible for IT from the office building industry with comparable application scenarios.

The discounted project costs were calculated over a period of 10 years. This period was selected as it represents a typical period for office building rental and because copper cabling is often replaced with a change of tenant. The costs of the two cabling concepts are either compared as cash values or annualised costs per workplace.

2 Talks with the planners showed quite clearly that copper solutions, with their high space requirements, are often quite out of the question for old buildings due to other prevailing general conditions (protection of historic buildings). This aspect was disregarded in the monetary assessment. It is assumed that renovation and installing copper cabling is possible, but may lead to additional costs (relocating workplaces during installation work).

3 Results of the Study

The examination of the initial investment costs showed that copper cabling requires a higher level of initial investment in all application scenarios (pls. refer to Table 1). This is caused, in particular, by higher passive cabling costs and the costs of technically setting up the required decentralised equipment rooms. This, therefore, provided confirmation of the first part of the initial hypothesis.

Table 1: Initial investment costs t_0

	New bdg 220WS	Old bdg 220WS		New bdg 1040WS	Old bdg 1040WS
Copper	232,216 €	280,824 €		902,024 €	1,135,596 €
FTTO	174,456 €	174,456 €		631,104 €	631,104 €
Difference	**25%**	**38%**		**30%**	**44%**

The examination of the operating costs also showed that a copper architecture is considerably more expensive than FTTO in all four scenarios (pls. refer to Table 2). Being able to forego active access layer units on each floor and air-conditioned equipment rooms at the secondary level means that a decentralised FTTO architecture is much more energy-efficient – and thus cheaper.

Table 2: Cash value of the annual operating costs over 10 years

	New bdg 220WS	Old bdg 220WS		New bdg 1040WS	Old bdg 1040WS
Copper	142,006 €	110,109 €		555,843 €	411,342 €
FTTO	64,264 €	64,264 €		200,852 €	200,852 €
Difference	**55%**	**42%**		**64%**	**51%**

The overall costs (initial installation, operation, scheduled equipment replacement) in a copper architecture are higher than those of a FTTO cabling setup in all four application scenarios (pls. refer to Table 3).

Table 3 Annual costs per workplace (annualised initial installation costs and operation over a 10 year period)

	New bdg 220WS	Old bdg 220WS		New bdg 1040WS	Old bdg 1040WS
Total cash value copper	265 €	270 €		218 €	226 €
Total cash value FTTO	191 €	191 €		145 €	145 €
Difference	**28%**	**29%**		**34%**	**36%**

In order to guarantee the reliability of these results, a series of sensitivity analyses was carried out (increase in the number of workplaces per floor, change in the number of decentrally located equipment rooms in the structured cabling system, number of offices with just one workplace, price of the FTTO Micro Switches). Viewed within the scope of realistic change, none of the individual analyses resulted in a reversal of the (monetary) benefits.

4 Conclusions

Without any doubt, fiber optic technology is the most future-proof cabling technology currently available due to its superiority vis-à-vis all other media with regard to the maximum achievable bandwidth and a range of other obvious advantages. Copper cabling is much less future-proof from a long-term perspective. On the other hand, it can be assumed that a possible future evolutionary leap to a bandwidth of 10 Gbps per workplace can be achieved using (high-performance, i.e. at least Cat. 7) copper cables over short distances. In any event, copper performance has its physical limitations and is clearly inferior to fiber optic networks. This speaks in favour of generally setting up fiber optic rather than copper networks.

This study also proves that MICROSENS' FTTO Concept, based on using a fiber optic infrastructure throughout, not only offers cost benefits for large projects, such as airports or hospitals, but can also achieve obvious cost savings totalling around 30 per cent for smaller projects with around 200 workplaces.