Ways to Solve the MDU Challenge of Deploying Fiber to the Subscriber

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Introduction

The business case of today's fiber-to-the-home (FTTH) deployments is often greatly influenced by the ability to deploy fiber effectively to the end user living in multidwelling units (MDUs). Reaching several customers by installing a single-fiber network for the whole building is surely attractive to obtain a quick ROI. However, there are some critical considerations to be made before the deployment starts and various challenges to overcome once the build-out has started.

This paper will review the main factors influencing the decision to choose the right MDU architectures. It will describe key lessons learned from recent global deployments and provide tools that have been developed to make key decisions correctly from the beginning. These tools have proven to be successful in improving the MDU business case.

The MDU Application Space

FTTH continues to emerge as the leading choice of network infrastructure to offer the bandwidth our society requires. While the financial case of building fiber to the end user has proven difficult in the early years, many breakthrough developments leading to key product enablers, together with gained rollout experience, have led to significant progress in confidently installing fiber optic access networks.

While installing the fiber and reaching end users living in single family units (SFUs) is straight-forward, the case for MDUs is different. With multiple tenants living in a centralized space, more complex ownership structure of the building, various aesthetic approaches or different service requirements, just to name a few differences. However, due to the close proximity of potential end users and the potential revenue income stream, the MDU space has some cost advantages and is the natural strategy on which to focus an FTTH network.

So, what is making the MDU so complex? There are various influencing factors, which will drive the decision on where, how and in what timeframe to deploy an MDU area. Figure 1 shows some of the main criteria.

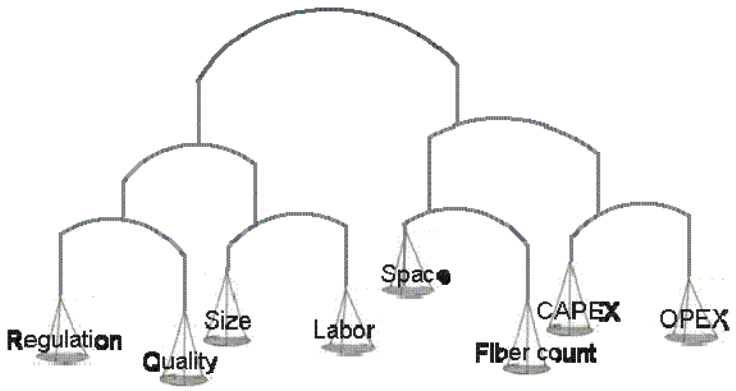

Figure 1: Main criteria influencing the decision for an economic MDU solution

Hence, some people still consider the MDU area a challenging space to deploy fiber. None of these factors stands alone; they are linked and dependent on each other, and the importance of each will differ between continents, regions and even operators in the same country. Balancing these needs will make an MDU deployment successful. As an example, the influence of regulatory decisions is still a stumbling block for some operators in Europe, while the North American region is not really concerned with this anymore.

Additionally, the MDU offers another dimension with the need for true indoor solutions. This situation is different from SFUs, where the majority of installations are in the outside plant. Being able to install a fiber network inside a building, while maintaining the speed of construction, achieving the approvals from the house owners and satisfying the aesthetic needs of the end users makes those solution sets rather unique.

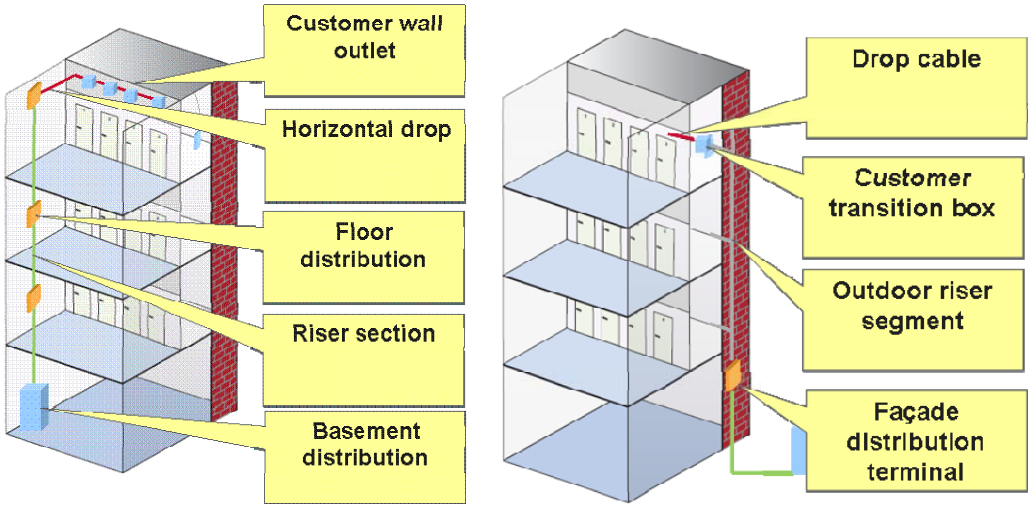

Figure 2: Typical scenarios of today's indoor or outdoor MDU networks and key components used in each

Solving the MDU Challenge

So, how can this be approached to provide the most economical way of connecting the fiber to the end customer? First of all, it is important to understand the overall project boundaries and their potential influence on choosing the right MDU architecture. While a small project with a couple hundred MDUs over a year may not stress an available pool of labor, a project of thousands of MDUs may well stress resources, leading to delays, higher total cost, etc. Understanding the most important factors will rule out some potential architectures available in the marketplace.

Probably one of the most relevant aspects is to understand the size of the buildings to be cabled. There is an established way of segmenting in small, medium and large buildings. The exact definition is dependent on the deployment region. In general, small buildings cover up to 12 customers, where medium and large cover up to 72 or higher. For these building types, there are established ways of providing an

infrastructure that has proven to be economic in various rollouts. Figure 3 shows some of the main architectures used worldwide.

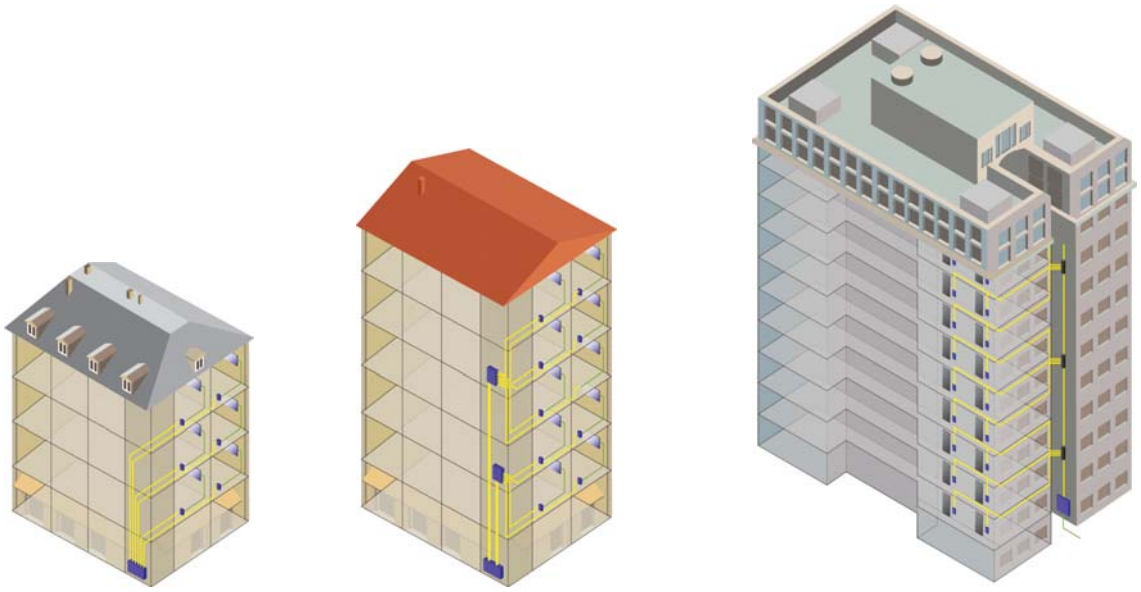

Figure 3: Small, Medium and High-rise MDUs cabled by a direct drop, multi-riser or façade solution

a) For small MDUs, usually a direct drop scenario is applied where customer connections are made by individual interconnects between a fiber distribution box sitting either in the basement or on the lower part of the façade and the end user. Very often, the individual drop cable is preconnectorized to save installation cost and allow a quicker customer connection.

b) In larger buildings, this solution is often not economical since space becomes a constraint and pulling many drop cables requires too much time and effort. In this case, multiple central riser segments are often installed and serve a certain area of floors around the floor termination point. The major advantage is the space savings achieved in the riser. Usually those individual riser segments come as splice options or have preconnectorized basement ends to avoid time and cost increases when connecting to a basement terminal.

c) If space inside the MDU is too constrained, a useful alternative is the installation on the façade, the outside wall of an MDU. Here, a central riser segment is mounted on parts of the façade before entering individual drop cables into the MDU on the floor level. The key is to lessen the visual impact in those deployments by using adequate façade areas, for example in the back yard. Deploying riser segments that are as small as possible is important. Preconnectorization plays an important role in this scenario too, in order to limit the time needed to dwell in certain heights during installation, and therefore minimize the safety risk associated with this installation technique.

To determine the best MDU solution, put the major driving factors of an installation into a model, and let the model compare the various deployment alternatives. This can be achieved by comparing the material and installation costs for different

alternatives, as well as looking at the estimated deployment time for a typical MDU area. This will reveal major advantages and drawbacks of one solution vs. another and allows you to focus on the leading options right away.

Let's look at one case study from a recent deployment, where approximately one million end customers received a fiber connection over the past several years. The solution of choice at the beginning of the project was a direct drop solution installed inside the buildings. However, as it turned out after initial installation of the first MDUs, this method was too costly and did not meet the deployment speed that was required to support the objective for this project. The above modeling exercise helped to clearly differentiate alternative solutions for this customer and optimized the overall MDU rollout.

As an example, Figure 4 shows a total cost and time analysis for two building types of 18 and 54 floors. The solutions considered here are a direct drop solution, a central riser solution with a mid-span technique at the floor level and a multi-riser solution set.

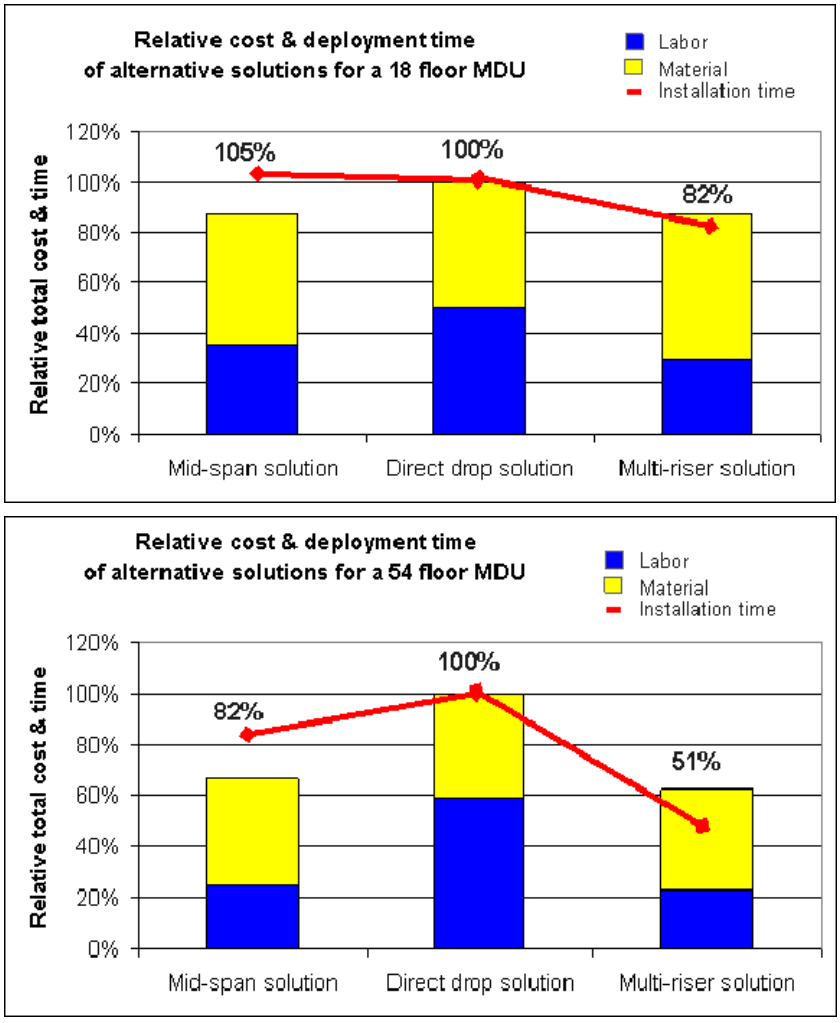

Figure 4: Total cost and time analysis for 18- and 54-floor building types

When comparing the results for both MDU types, it is clear that the direct drop solution is not economical in terms of costs or deployment time. The best choice in this case was made with a multi-riser solution, revealing lowest total cost and significant advantages in deployment time, both of which were critical considerations for this customer. Consequently, this method of installation was the major deployment scheme used for the rollout.

The Deployment Methods Supporting the MDU Case

Having decided on the basic architecture to be deployed, the next key questions are what to consider for the component solution. It is beyond the scope of this white paper to go into large detail on this topic, but there are a few lessons learned from projects around the globe that should be taken into consideration.

a) The focus on FTTH deployments worldwide leads clearly to a bottleneck of skilled workforce to actually perform the installations. The major cost driver is the splicing needed for various deployment steps. This has led over the past years to a significant increase in the usage of factory-preterminated solutions, particularly drop cables, riser segments, splitter modules and interconnecting hardware. Accepting a somewhat higher material price in return for an overall lower installed cost, as well as higher deployment speed, is a decision many have made already in the industry.

b) Based on the same underlying need to reduce the skill level needed to perform certain installation steps, the use of field-installable connectors experienced a breakthrough in MDU network deployments. Specifically, the ability to quickly connect customers in their own private property (fewer disturbances of the tenants) is a major factor for the large success of this key technology.

c) A major enabler for indoor deployments in the MDU was the invention of truly bend-insensitive fiber. Challenging spaces in the riser and drop area of an MDU, and even more in the private environment of an apartment, will always lead to significant numbers of bends and crushes on the fiber optic cable. Without this invention of being able to install fiber cables like copper cables, the cost of installing MDU networks would probably still be prohibitive.

d) For façade solutions, bundled cables or tethered solutions have shown to be the fastest and safest deployment method. Combined with bend-insensitive fibers and preconnectorization, they can be a great “detour” that is actually faster.

Summary

While installing fiber optic networks into the MDU space still seems to be a more complex topic than for SFUs, major progress has been made over the recent years to provide economical solutions.

There is no ‘one size fits all’ solution; simply because different project boundaries require a flexible approach to cover the individual needs best. However, there are common trends and ways to structure the approach of selecting the most economical

solution by understanding, for example, building sizes and by choosing a few relevant solutions for those MDU types. Based on individual needs, analyze these solutions with an experienced partner according to total cost and deployment speed in order to choose the best fit. Together with the right key components already proven in worldwide deployments, installation in MDUs can be easy, reliable and quick.