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Stratix

Brief

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Bringing Fibre to Business

A viable business model for optical fibre-based access to small & medium enterprises and corporate branch offices

Fibre to the Home services not yet tailored to business users

The emerging deployment of Fibre to the Home (FTTH) networks shows that it is difficult to serve both the consumer market and the small and medium enterprise (SME) market simultaneously, and to offer adequate solutions for their different demands.

For the existing copper and cable-based access technologies the situation seems simple: the consumer market is served with asymmetric overbooked ADSL and cable subscriptions while small and medium enterprises are served using SDSL connections or high end cable subscriptions offering sufficient bandwidth and service guarantees. The model enables dedicated ISPs or Competitive Local Exchange Operators (CLECS) targeting business users to provide their services on top of these infrastructures.

In the FTTH case this is different. Today's FTTH services are very consumer market oriented and do not always provide business grade quality. Furthermore, economies of scale in number of users per FTTH area are difficult to achieve for CLECs and ISPs dedicated to SMEs.
Corporate users, in particular those with branch offices in residential areas, are however better served by dedicated and understandable services, with a clear development roadmap, instead of brushed up consumer grade products with a 'business flavour'. They require symmetric services and minimal overbooking. Even more important are high reliability and dedicated management with short response times. Multinational enterprises have an additional requirement: a need for a uniform technology and service level over Europe.

Wholesale fibre loop: an opportunity

Stratix Consulting has developed a new technical and architecture approach that not only addresses those specific business market needs, but also creates a feasible business case for competition in the FTTH era. This Brief explains the case.

Wholesale fibre loop offerings and back-haul from Optical Distribution Frames to regional carrier hotels provide an opportunity for dedicated business service providers to bring a new set of services to small businesses and branch offices that were until recently too expensive to serve.
The approach is based on the currently emerging standardised fibre ring architecture for serving in residential as well as mixed residential and business areas (see figure 1).

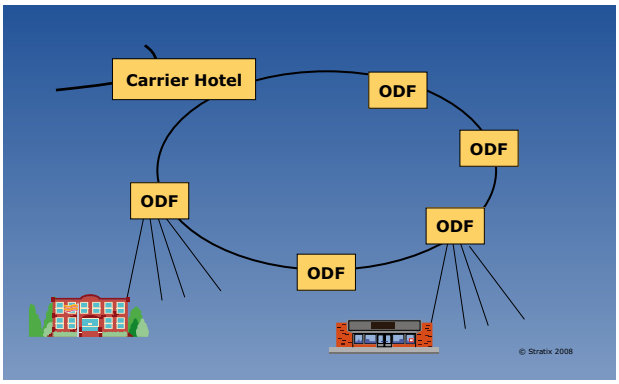

Figure 1: Fibre loop network infrastructure: the back-haul ring

In Europe point-to-point fibre pairs from homes and businesses run to Optical Distribution Frames (ODFs). Even those operators that plan to install PON splitters in the outside plant, tend to add several fibre pairs for serving businesses in their designs. Traffic from those ODF locations is back-hauled using optical back-haul rings to metropolitan or regional carrier hotels.

Where the average local-loop length is a few kilometres, the back-haul rings have a typical circumference up to 40 km. Today's commercial off-the-shelf lasers for Ethernet, not only those for 100 Mbit/s, but also 1 GbE and 10 GbE varieties, easily span that fibre length. A length of 40 km is also one of the design targets for the 40 and 100 Gbit/s Ethernet standards under development by the working group for IEEE 802.3ba.

These high span lengths allow CLECs, ISPs and corporate users with many branch offices to replace current SDSL lines with business grade service levels at an affordable price by acquiring wholesale access to fibre optic local loops.

Stratix Consulting has developed a new network architecture that enables a protected CWDM channel offering based on the ITU G.694.2 channel grid. As a service this extends current dark fibre offerings and allows CLECs, ISPs and corporate users to reach economies of scale and improves reliability by concentrating active equipment in regional and metropolitan carrier hotels.

Introducing a new business grade service: Coarse WDM channels

Dense Wave Division Multiplexing (DWDM) equipment has been used on long-distance backbones for over a decade. On the other hand, Coarse Wave Division Multiplexing (CWDM) technology is widely used by the business community on acquired dark fibre networks. CWDM offers less wavelength channels per fibre than DWDM, but has the advantage of simpler, cheaper and more robust equipment. Deploying CWDM reduces the need for advanced optical engineering, which is costly to manage. This lowers operating cost.
A back-haul ring is designed to protect against the risk of cable breaks. The architecture in figure 2 achieves this goal without the usual deployment of active equipment in ODF buildings.

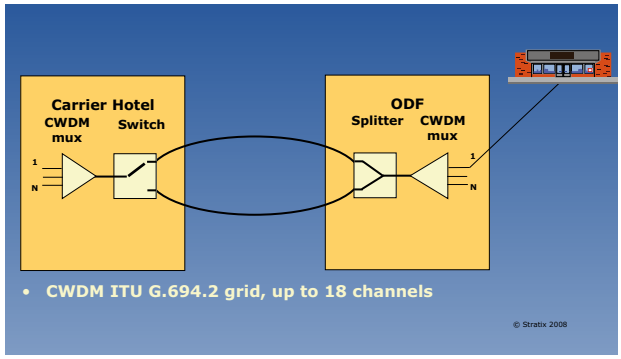

Figure 2: Architecture for CWDM spectrum to small offices

The entirely optical protective switch used in this configuration contains monitoring functions to switch to the back-up channel in ca. 10 milliseconds in response to a back-haul cable break. By mounting only passive CWDM and splitter modules in the unmanned ODF buildings, maintenance costs are reduced significantly. Instead it puts the far more failure prone active equipment in a much smaller number of high-grade 24x7 accessible carrier hotels.

Besides the advantage of providing business users bandwidths far exceeding what is now achievable with SDSL, this approach also provides service providers a way to differentiate their business services, as more versatile than selling only Metro-Ethernet service in competition with consumer

Ethernet service. CWDM channels can be used to carry SDH, fibre channel, or video technologies that operate with plug-in CWDM-grid transceivers. An end user can even be provided with the option to deploy a few own DWDM channels in the 1530 and 1550 nm window.

The design is also future proof: because it is transparent in the CWDM spectral window, the scheme is able to support a range of bit rates up to 100 Gbit/s for Ethernet now on the table at standards bodies. Thus enhancing the economic life of the installed optical devices far beyond the upgrade cycle of current electronic switches.

Lowering entry barriers in the business market segment

One of the major concerns for government policy makers is that the deployment of Next Generation Access networks will result in re-established operator monopolies. The architecture to provide CWDM spectrum as sketched above effectively establishes the opposite: CLECs and ISPs can install their systems in metropolitan or regional carrier hotels and enter the market with a high-grade service for SMEs. This is already economically feasible when there are only a handful of business users in an ODF area. Service providers with a high number of customers in an ODF area can make efficient decisions whether to install their own equipment in ODF buildings or lease the back-haul fibres to central sites. CLECs and ISPs are not restricted to Wholesale Ethernet Access with service levels and features determined by mass market oriented operators.

The regional carrier hotels, in particular those in major metropolitan areas, are often provided by specialised, neutral third parties, not tied to the FTTH networks. This design therefore also reduces the regular discussions on collocation conditions and rack-space lease rates with incumbents.

In a typical ODF site, several thousands of fibre pairs are installed. In large cities sometimes even more than 10 thousand per site. This level of aggregation allows for easier competition between dark fibre operators than competitive back-haul to street cabinets. The need for access to ducts for back-haul suppliers is less necessary, as the fibre back-haul operators can address also those special business sites that need a premium service like diverse-routed fibres.

This way the proposed architecture lowers the entry barrier to the business market, with a dedicated offer at even low penetration levels. It also fits well in the ladder of investment as observed by most CLECs and ISPs.

Uniformity for operators serving multinational enterprises

The passive nature of the CWDM spectrum made available as shown above allows European operators to create a uniform international service: offering multinational enterprises a single platform that reach even to their branch offices in residential areas and small business parks. Direct access at the optical level to the protected passive layer allows European operators to avoid the need to write a different service level agreement per country due to the differences that exist between countries in Wholesale (bitstream) Ethernet services.

Many multinational enterprises are already used to contract with dark fibre operators for links between main business locations, but still need to buy Ethernet and SDSL-based bitstream services to smaller branch offices from public network operators.

Because in the described approach active equipment only has to be installed in third-party regional carrier hotels and at the user premises, large corporate users can easily decide in what case to buy the service externally, and when to rent rack-space dark fibres for self-provisioning. This decision can also be based on the level of availability and security that is required for a network.

A business user with typically one or two branch offices per ODF area can contract for a dark fibre

ring and install a passive drop-insert scheme as sketched in figure 3.

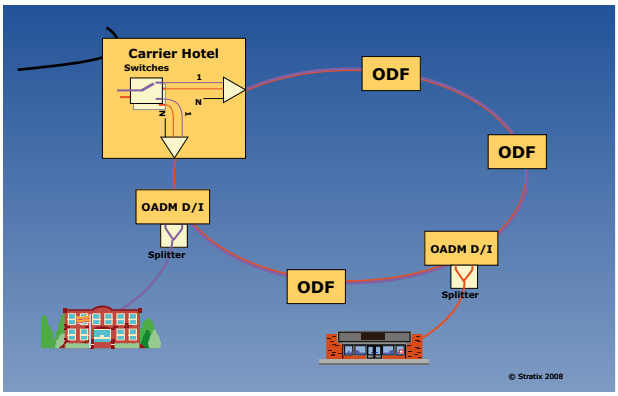

Figure 3: Drop/Insert ring for very low granularity per ODF

Business benefits

Stratix Consulting is currently finishing the finer details for the approach sketched in this brief with industry partners in FTTH and equipment suppliers.

The main beneficiaries of the creation of this new approach (besides of course the business oriented CLECs and ISPs) are the business users themselves. They currently face the end of the economic lifecycle of SDSL, while their demand supersedes that of consumer oriented residential products. The most overlooked aspect of the design trade-off between higher fibre ring usage, but less active equipment in a network is a strong reduction in operating complexity, management and power cost.

Implemented at European scale, the approach provides a roadmap for international operators to establish uniform services and service levels to all branches of large corporations. The voluntary development in the Dutch FTTH market of a wholesale fibre local loop offer, without any regulatory strong-arming and therefore at a free market determined price, enabled the affordability of the approach described in this publication. A competitive back-haul ring market from the regional and metropolitan carrier hotels to ODFs with many thousands of local loops terminating there, makes competition over open local loops viable.

The approach described here highlights that quite a set of current policy discussions on how to ensure fair market opportunities for competitive service providers in fibre access networks is best solved by thinking about innovation first and regulatory intervention second. The initial outlay in CWDM modules, splitters and switches for providing 8 protected CWDM channels into an ODF area for less than € 4,000 is in the range of annual fibre loop leases at business service level.

The effective transmission span of 40 km (CWDM-based off-the-shelf equipment) enables a strategic rethinking "outside the DSL box". More advanced Laser modules are available that can even span further distances, allowing the configuration sketched in this Brief to be feasible even in areas with low population density.

Stratix Consulting

Stratix is a multidisciplinary consultancy with a focus on electronic communications, new (infrastructure) technologies and multimedia applications. We advise on strategy and business planning and aid clients with operational issues with respect to electronic communications. Our work is a combination of in-depth research and consulting, combined with extensive experience in facilitating processes. In this way we aid customers with the design and purchasing of new networks, systems for data storage, VoIP and multimedia applications. We also have a broad knowledge of the telecommunications industry, ranging from law and regulatory affairs, market developments to technology.

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