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FTTH Network Sharing:

Comparison of Passive and Active Approaches

A comparative study leading to recommendations for the MENA region

A Report by FTTH Council MENA Regulation and Policy Comm. Members
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FORWARD AND INTRODUCTION BY FTTH COUNCIL MENA

Given the highly capital-intensive nature of FTTH, it is inevitable that competitive duplication of infrastructure will be limited around the MENA region and therefore policy with respect to the best means of sharing an open network comes to the fore.

The Regulatory and Policy Committee have been examining active and passive sharing, particularly regarding the socio-economic impact, stimulating competition and promoting new, innovative services. These two approaches to sharing are quite different:

- With passive sharing, the service providers use their own electronics and software to deliver their services and simply rent dark fibre from the fibre network owner (FNO). It is usually necessary to integrate the OSS systems so that order data can flow freely, and customers can be kept informed in real time.
- With active sharing, the FNO builds and owns the fibre of course and will usually build the active layer itself although it may grant a concession to a specialised wholesale operator.

The authors have been involved as executives, advisors or suppliers in more than a dozen open fibre networks across three continents. Based on this experience, after first re-capping what an open access fibre network is, we compare active verses passive layer sharing and offer our views regarding the merit of each.

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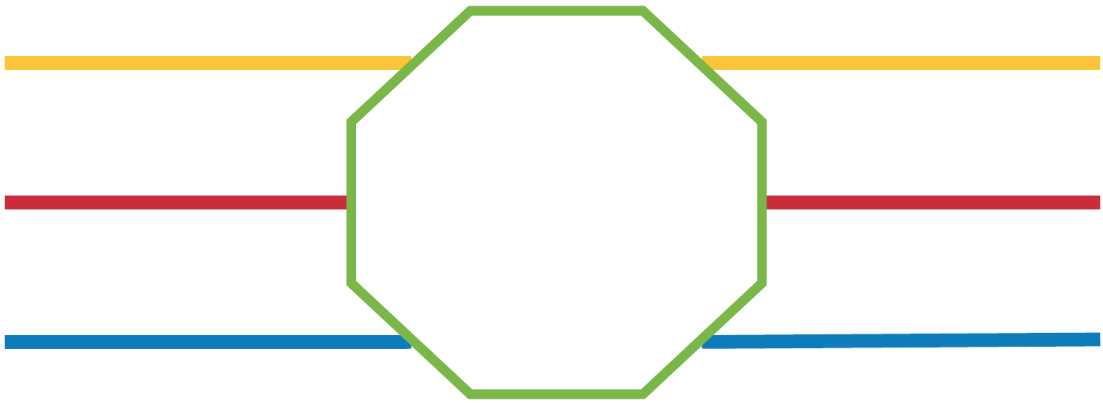


1.1 Introduction to open access fibre infrastructures

While most new fibre operators build vertically integrated closed networks, there is a substantial minority that build wholesale open networks. In fact, recently a European association of open networks was established in response to the growth of this business model[i].

In a vertically integrated closed network, the end-user has no choice of service provider – they only have whatever the single integrated operator decides to offer. In contrast, an open network operator does not provide any service to the end-user but rather enables different broadband TV, phone, security and other service providers to use a shared open network and compete.

The key service, of course, is broadband and having a choice of ISP is important to some customers and others simply fear lock-in after bad experiences in the past. In the age of OTT, having a choice of other add-on services on the network is less of an issue than in the very early days of Scandinavian fibre, but in all markets that we have seen consumers generally resent paying for forced bundles of services they do not use. Choice is popular and reassuring. For the vertically integrated operator, this legacy cable TV style of business model creates unnecessary competitive and regulatory risk.

An open network architecture separates the service layer from the network and technology layer and encourages competition in the customer domain.

For the FNO and its investors, there are a several obvious long-term benefits from an open network approach when compared to vertical integration:

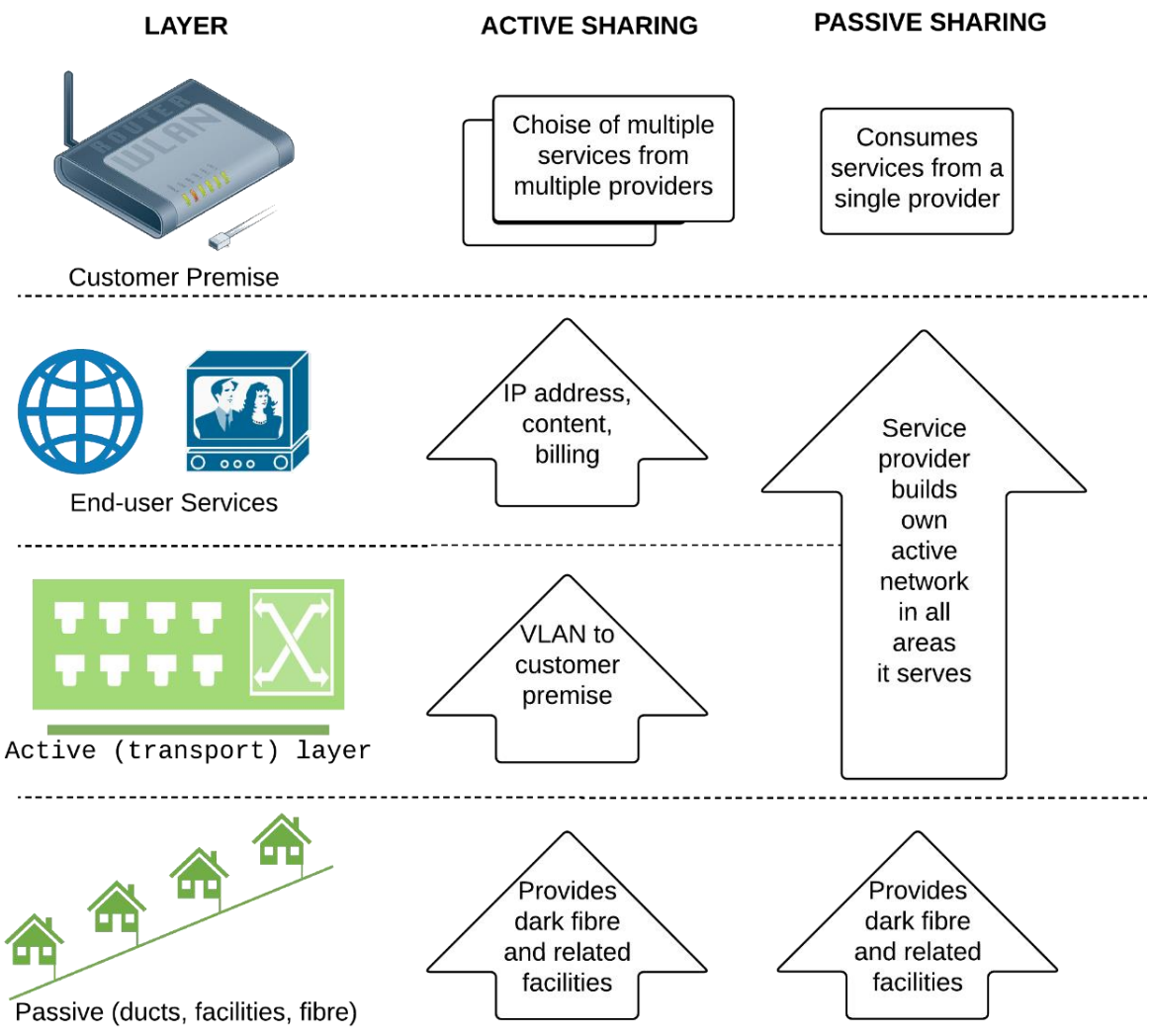
- Customer have more choice and can vote with their feet if customer service is poor – so the open network has a lower market risk than a closed network.
- For new operators, it is particularly clear that the risks of vertical integration are higher as any management team is inevitably stretched by the construction process so complicate matters by re-inventing the wheel with yet another “me too” (in-house) ISP?
- There is a general efficiency gain from specialisation.
- Open networks have, by their nature, extremely clear organisational interfaces as well as clear and evolving technical interfaces. This improves the focus of different parts of an organisation, particularly that of service providers.
- Overall execution and strategic risks faced by the FNO are reduced through diversity and competition in the services. In our experience though the fibre owner must always directly manage or heavily support sales and marketing in newly fibered areas.
- The open access business model is ideally suited to infrastructure finance – which is the ideal form of private sector patient capital for new FTTH build at major scale.

1.2 Active verses passive sharing

The concept of open access developed 15 years or more ago in Europe and followed the realisation in the early days of FTTH that provision of fibre broadband is fundamentally the result of orchestrating three quite different and separate activities:

1. Construction and asset management of physical layer fibre assets and ducts. This is fundamentally a specialised type of real estate business.
2. Design, installation and operation of switches, a network termination and supporting software systems that enable individual access paths to be set-up and torn down.
3. Sale and provision of a service with global Internet traffic, customer care, end-user technical support and billing (and collection of course).

How these activities are split between different organisations varies and this issue of who builds and operates the active later determines where a particular network has active or passive sharing. This value chain is shown graphically below comparing the different roles between active and passive sharing.



In the graphic above, the customer is shown in the top layer in the diagram. Below there are three separate layers in the case of active sharing and just two layers with passive sharing.

- With passive sharing, the service providers use their own electronics and software to deliver their services and simply rent dark fibre from the fibre network owner (FNO). It is usually necessary to integrate the OSS systems so that order data can flow freely, and customers can be kept informed in real time.
- With active sharing, the FNO builds and owns the fibre of course and will usually build the active layer itself although it may grant a concession to a specialised wholesale operator.

Table 1: Comparison of active and passive sharing in terms of investment and operational activities.

	Retail Services	Active Layer Wholesale Services	Passive Layer Facilities
Output	Services consumed by the end-users, mainly broadband.	Transport at layer 2 or layer 3 from customer premise to point(s).	The physical "first mile" of fibre and colocation facilities to house electronics.
Key Input(s)	Access as a service from the Active layer.	Use of dark fibre. Hardware & software.	Builds physical fibre asset.
Skills needed	ISP focussed on sales, marketing and good customer service.	Operate very efficient multi-provider network.	Fibre construction and real estate like financing attracting patient capital. Network should also be built to support multiple providers
Who?	Internet service providers & VoIP providers. OTT TV & CCTV also.	May be part of fibre owner or outsourced to a specialised operator.	Fibre owner - could be a National Broadband Operator, specialised operator, a utility, real estate etc.
Technical Design	Passive: SP gateway Active: usually FNO CPE.	Usually based on GPON technology; products are VLANs.	Flexible dark fibre topology supporting multiple operators.
Asset life	2-4 years	5-10 years	40-80 years
CAPEX	Very low	Moderate	Very high
EBITDA / sales	5%-15%	15%-25%	95%+
Financial characteristics	Service business: equity + modest debt	Equity, leasing, medium term debt	Infrastructure funding (patient capital)

1.3 There are different approaches to active sharing

Although we do not discuss the pros and cons here, please note that there are at least two variants of active sharing:

- The fibre network owner (FNO) builds the active layer and provides services either as the only form of access or as an alternative to rental of dark fibre. This is best achieved using a specialised open access software system but could also be supported with in-house development, particularly if the number of service providers is low and always will be low as happens in some markets;
- The fibre network owner gives a long-term concession to a specialised active layer operator that will provide and own all equipment and software and decides on the technical solution to be used. Such an operator is often made responsible for marketing the fibre as well care of service providers, maintenance etc.

1.4 Should open network sharing be at the active or the passive layer?

If there is to be an open network, then the question immediately becomes whether sharing is best done at the dark fibre layer (passive layer aka layer 1) or by means of wholesale services (i.e. at the active layer aka layer 2).

To examine this, we created the tabular analysis shown on the next page which sets out the different factors at play and their potential impacts as we have observed them in numerous open access FTTP businesses. In our view, sharing by means of open access provides the best model for new fibre networks and the optimal form of sharing depends on market conditions:

Where there are few active service providers, and this will not change (perhaps because of limited market size or regulation).	In this type of market, the level of competition is limited, and the bargaining power of the market leaders is great. The open network needs to work closely with each of typically two or three providers perhaps even tailoring technical solutions to discourage self-build. In this situation, active sharing is unlikely to be accepted by all so will work for none. Furthermore, if the market is limited then larger operators may prefer to operate to their standard technical model rather than support a local active layer platform, even if highly sophisticated.
Where there is a wider range of service providers, brands and wireless and / or copper networks already available.	Active sharing in this context makes a great deal of sense. It lowers the cost of broadening the product range and number of providers. Also, there is an economy of scale and opportunity to standardise customer installation processes to the benefit of all parties (lower cost, less truck roll, one step go live for the customer, earlier billing for the SP & FNO).

Table 2: Comparing differences between active sharing and passive sharing

FNO Issue	Type	Active verses Passive Only	Impact	Caveat
Time to market	Commercial	Active solution implemented in parallel to passive planning and construction.	No impact.	Design and construction could take longer if the FNO is beholden to a single anchor tenant (or a duopoly).
Range of service providers	Commercial	Assuming they exist in the country, more service providers will be viable on the network as their barrier to entry to the footprint is greatly reduced.	5%-15% greater take-up due to better choice and segmentation and reduced infrastructure competition from WISPs or ISPs forced to stay on copper. Lower market risk reduces cost of capital by 200-500 basis points.	This positive impact **only arises** where there is a wide range of service providers and some wireless / copper-based competition. In areas with few viable SPs and little viable wireless, the impact is very low.
Co-operation of Incumbent	Commercial	Incumbent would prefer to provide active services and simply consume passives.	An independent company may have more success providing passive fibre services to incumbent.	Strong regulation is required.
Sales effectiveness	Commercial	Customer engagement should be driven by the service providers, all competing for revenues.	Enables and secures gains in higher take-up as set out immediately above.	Delivery lead times are more directly under FNO control with active sharing.
Pricing power	Commercial	Wider range of SPs gives the FNO more pricing power, within reason.	Active results in lower market risk and a better position for the FNO.	Only viable where there is a range of comparable SPs.
Capital investment	Financial	Active entails $200-$400 higher unit capex and puts take-up risk on the FNO.	Higher cost with lower margin but higher absolute return per customer.	Adds to peak funding requirement.
Management team	Execution	More complex business with wider span of control needed.	Active adds a high degree of technical complexity which small FNOs may struggle to support.	-

FNO Issue	Type	Active verses Passive Only	Impact	Caveat
Start-up costs & risks	Financial, Execution	Smaller service providers are much more likely to join a new fibre network at the active layer – it is basically zero capex for them although they will lose return on any of their own infra.	If the area that already has wireless or copper-based ISPs, bringing these service providers on and migrating their existing customer will significantly reduce risk for the fibre owner.	A locally strong provider will be tempted to invest in their own fibre. the new FNO gets there first and the area is not strategic then in time the rational provider should join the FNO.
Operating costs	Financial	Ongoing labour costs are clearly higher with active.	Manageable with sensible outsourcing.	More points of organisational failure in active sharing.
FNO margins	Financial	Passive only margin / revenue is necessarily very high to obtain a return on capital intensive assets. Active sharing will reduce this margin as a proportion of revenue but increases absolute gross profit as it adds a second revenue stream and improves take-up.	As a percentage of revenue passive only margins should be more than 95% compared to around 70% overall with active.	Active sharing is only of benefit in the appropriate market conditions as discussed above.
End-user satisfaction	Commercial	In the days before OTT services it was clear that active sharing tended to be superior in terms of satisfaction. That may no longer be true provided broadband over passive is uncapped, unrestricted and neutral.	There is less customer lock-in for the SP with active sharing but greater probability over the long term of *sustained* customer satisfaction as a result for the FNO.	-
Regulatory risk	Financial	It is unclear if there is much difference in regulatory risk. Where an FNO comes to dominate a substantial area then regulatory action cannot be ruled out if FNO pricing power is abused.	The larger the FNO the more likely that regulators will at least want to see passive offered as an option and the costs benchmarked against comparable regulated entities.	-

1.5 Is it practical for an infrastructure company to operate both models at the same time in the same infrastructure?

Running active and passive sharing in parallel might suit certain market conditions for example where it is advantageous to support both fibre and DOCSIS technologies or where some major brands insist on passive sharing but there are enough smaller players in favour of active sharing that it is viable.

Having acknowledged that the two can co-exist, we are not familiar with any examples except where imposed on an incumbent by regulation.

1.6 Regulatory and Policy Issues

Open networks are favoured by regulators. Institutionalising an open competitive environment for services – free of the conflicts of interest that have bedevilled regulation of incumbents – is very attractive to regulators. In fact, according to UK operator CityFibre:

> *"The new European Electronic Communications Code (EECC) expressly encourages wholesale only operators by providing them with a specific, light regulatory regime as they naturally provide access to multiple telecom service providers without discrimination or abuses."*

In the table on the next page we set out the main regulatory and policy benefits of open network sharing and compare the differences between active and passive approaches.

However, while the principles are widely supported, there is no standard definition of what open access means and there is always the issue of market power at the wholesale level (whether at the passive layer or at the active layer). There has already been litigation in Sweden relating to alleged abuse of local monopoly power by an open fibre network owner (FNO).

Table 3: Regulatory Benefits of Active and Passive Sharing verses an Integrated Operator Market

Impact	Integrated	Passive Sharing	Active Sharing
Stimulating competition	Only overbuild (i.e. duplicative investment) might provide meaningful competition, albeit exclusively in urban areas. Regulation of incumbent bitstream has proven problematic given severe structural conflicts of interest.	All service layers are open to competition but minimum viable scale in any area can be quite high, limiting options. Passive layer is provided locally as a form of real estate, unhindered by the conflicts of interest inherent in the integrated model.	This maximises competition in services by optimised sharing of assets. No issue of minimum viable scale as active layer and transport may be shared. Active layer partly competitive using time limited concessions.
Promoting innovation in services	Historically this model has been very poor at promoting successful service innovation.	Positive for service innovation, providing the price and volume can justify the capital investment needed to reach customers renting dark fibre.	Optimal model for service innovation as cost effective for low priced and/or low volume services while being free of structural conflicts.
Enabling 5G	Creates complex regulatory situation and conflicts. Generally, monopoly leads to higher costs and less effective delivery.	Positive for 5G as creates open market for passive layer fibre and physical assets.	Slightly more positive for 5G as offers incremental cost transport in addition to passive layer assets.
Attracting infrastructure investment	Possible either by means of special purpose vehicles or all-new integrated operator.	Depending on market structure, can reduce market risk so positive.	In most cases highly effective at reducing market and execution risk.

1.7 Unbundling and Regulation

Unbundling, the regulatory process of allowing alternative operators to use a physical connection, is widely regarded as an important path to opening access to fibre and giving competitive providers direct access. In the event of unbundling, it is vital that a balance is found between compensating incumbents whilst retaining realistic pricing models.

This process becomes more complicated during the migration to fibre where it is difficult to strike a balance between the very high rate of return on the old and fully depreciated legacy copper versus the new and capital-intensive fibre, despite lower operating costs on fibre. It is important that use of obsolete copper is not favoured or rewarded by the regulatory system but also that the regulatory price floor is high enough to support investment in new fibre access networks.

1.8 Attracting Private Finance to Fibre Investment

How best to enable the migration to fibre is a key question for Governments and regulators. Many regulators have a duty to ensure suitable levels of investment in national telecom networks and to encourage the provision of modern services. Unless a country is already fibered, this means ensuring healthy and rising investment in FTTH.

One simple approach is for Government simply to pay for everything, but this does not build a vibrant nor innovative telecom sector. Better, in our view, is to work with the private sector to encourage major infrastructure investment. This requires an appropriate policy and regulatory environment and that is problematic often requiring significant reform.

Infrastructure funds, which provide investors with an opportunity to invest in essential public assets against predictable returns, are increasingly moving into funding FTTH. Their patient capital and long-term approach is ideal for FTTH and the stable inflation-proof cashflows possible with FTTH are ideal for such funds. It seems likely that at least in Europe it will not be long before the great majority of new independent fibre is funded this way.

Although such funds do back closed networks all such financiers that I have interviewed make it clear that this is an artefact of what project promotors believe and that in fact the funds much prefer the open access wholesale model. In fact, the open business model fits their infrastructure investment approach perfectly.

In the MENA region, this form of investment would be new but has been used for development of ports, roads and so on. In theory this approach could open up major pools of long-term capital for investment in fibre, which would not be possible using traditional corporate finance techniques. However, this approach does require stable long term and appropriate policy and regulatory environment, and these can be politically complex to create.

1.9 Supporting 5G and wireless

There is a great deal of mobile industry and Government interest in new 5G mobile technology. There are already early examples of equipment deployed and some initial experience of 5G in the USA. That experience is that 5G is positioned as a lower tier product than fibre delivering (much) less than a Gig. The technology has had some success but like previous generations of radio, its performance is not consistent, and its reach is unreliable. Operators face many problems in delivering a consistent service and coverage. Meshing from house to house might help improve things but it is very early days. In short, 5G is a technology that is useful at the margins of broadband but will not compete with fibre except for the most price sensitive and least demanding customers. This type of customer might always choose to be mobile only regardless of the technology on offer.

Nonetheless, it seems likely there will be much investment in 5G drive by mobile market dynamics and so mobile operators are going to need a large amount of fibre and access to an extensive fibre footprint. Mobile operators are major firms and less dependent on active services than other type of service provider. Nonetheless, as shown in the table above, our view is that the provision of cost-effective wholesale active transport services by a neutral operator free of conflicts of interest (i.e. active sharing) probably best meets this need. Open fibre networks, whether active or passive shared, will go a long way to minimising the cost and maximising the speed of their deployments.

1.10 Conclusion

This analysis shows that in general the best business model for new build fibre depends on local conditions both in terms of demand density, competition and the plurality of service providers.

In cases with an unrestricted number of service providers, and with a strong incumbent, then an open network offering active layer wholesale services may be preferred.

However, where there is a strong independent operator, or the range of service providers is structurally limited, then there are often clear advantages in a passive sharing strategy.

Both approaches are positive for 5G (backhaul) with probably a slight advantage for active (as it is more suited to the economics of supporting many small sites).

[i] http://www.broadbandworldnews.com/document.asp?doc_id=744822