Whitepaper

The world is gravitating towards FTTx

"The needs for FTTx networks have arrived earlier than our forecasting models have predicted. Consequently, the deployment of FTTH and FTTB networks have increased significantly. Setting up a fibre based broadband network, once considered a luxury affordable to the developed world, is poised to become mainstream all over the world. FTTx is evolving on multiple fronts, be it business models, execution methodologies, operating efficiency and strategic partnerships & alliances. Technological developments sit in the middle of it all, playing the role of the enabler."

This is the 1st in a series of 3 papers on trends on FTTx, the need for their rapid adoption as well as the role of automation in hastening the deployment of FTTx networks.

Abstract

Today,the situation of FTTH across the globe is very inhomogeneous, and the status of deployment of fibre to the home and usage of standards in any country depends on the history of broadband internet access in a particular country, regional inconsistencies, local telecommunication firms, and technical issues of individuals.

Some of the main trends in the past couple of years include:

A decrease of nearly 7% in new connections on copper lines

FTTH connections increasing Y-o-Y by atleast 15%

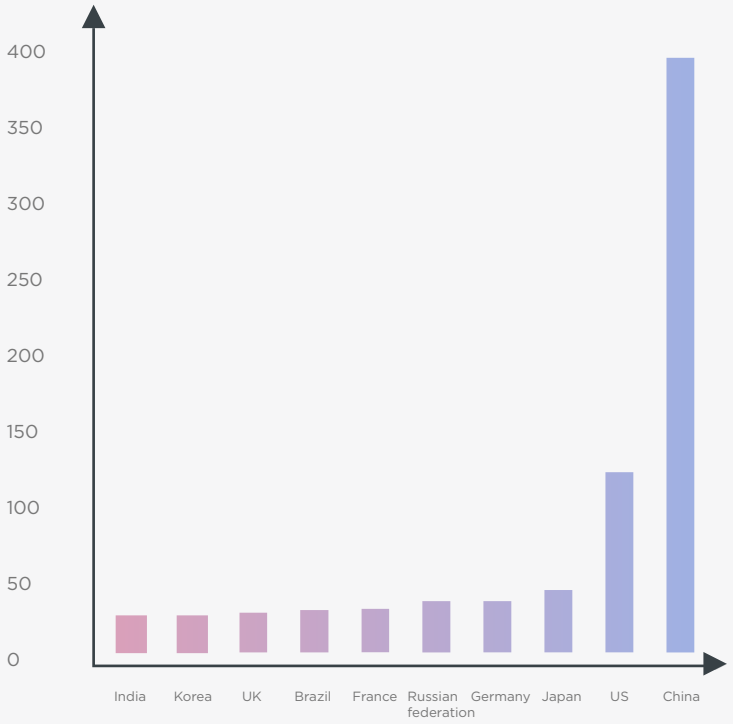
China's record setting fibre market growth at 66% of global FTTH net additions

Belgium, Thailand, Argentina, Philippines, Chile and South Africa among others saw significant FTTH growth rates Q-o-Q

1. Rise of broadband age

Today's internet-savvy consumers are demanding increased bandwidth, and triple play services are now widely accepted for a majority of people across the world. Uses of basic client bandwidth, such as peer-to-peer file sharing and e-mail, are consuming more bandwidth than most contemporary genera -tion networks can provide. The demand for more bandwidth continues to grow at an average of 70 % compound annual growth rate (CAGR), with video-on-demand (VoD) being the biggest driving factor. Existing broadband networks are unable to uniformly cope with this surging demand. Consequently, there has been a proliferation of broadband networks across the world.

The following represents the top ten countries of the world in terms of number (million) of FTTx connections by Q2 2019



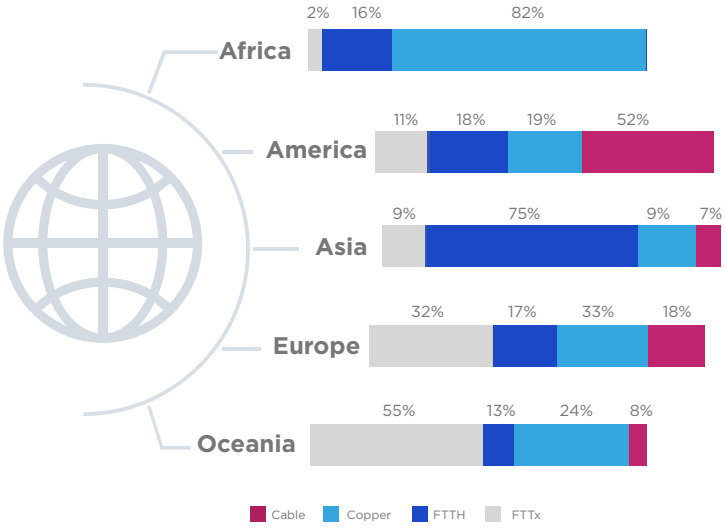
Source: Point topic

Figure 1: Top 10 FTTx countries

Internet has been growing at an incredible rate; many countries – including India, Bangladesh, Cote d'Ivoire, Ghana and Malawi have more than doubled the uptake of broadband users since 2013.

2. Technologies for the broadband age

The means of broadband connection include cable modem, DSL, fibre-to-the-home, other fixed (wired) -broadband, satellite broadband and terrestrial fixed wireless broadband. The following graph shows us the intensity of broadband technology adoption across the globe:



Source: Point topic

Figure 2: Technology market share by region

In the realm of wired broadband, two underlying technologies lead the way for data transfer over a network – copper and optical fibre. Technical developments for data transmission via copper over the past 15 years has increased bandwidth significantly. But improvement in speeds over copper wire has come at a cost: the ever -decreasing lengths of copper along which it is feasible to transmit data at that speed. Therefore, the huge copper stock in the ground can only be used for future high bandwidth connections by laying fibre closer and closer to customers and thereby decreasing the length of the copper lines employed.

Line technologies such as Fibre-to-the-Curb (FTTC) and Fibre-to-the-distribution-point (FTTdp) and transmission technologies such as VDSL, Vectoring, Super-Vectoring, G.fast do exactly this. Nevertheless, these are clearly intermediary solutions, designed to buy time to recover high investment costs in line technology (mainly digging), before finally rolling out Fibre-to-the-Building or even Fibre-to-the-Home (FTTB/FTTH). Another more recent development in the FTTx realm is PON or Passive Optical Network which implements a point to multipoint architecture, and it can serve multiple endpoints from a single optical fibre, through the use of unpowered splitters. PON uses passive splitters and couplers to divide up the bandwidth among the end users–typically 32 over a maximum distance of 10–20km. A fibre-based PON access network connects a large number of end users to an Access Node (AN). The main service points are:

- Mobile network base stations
- Subscribers in SDUs (Single Dwelling Units) or MDUs (Multi Dwelling Units)
- Larger buildings such as schools, hospitals, businesses and government

Many internet consumers view optical fibre as the one service that is unlimited in bandwidth, and delivers the low latencies that are required for the digitally transformed services of today as well as the future.

There are increased efforts to ensure that affordable FTTH services are available for many customers, and this will positively foster global economic growth. Analysts foresee that fibre optic wires will eventually replace the infrastructure based on copper wire. The following table is a peak at the advantages of OF over Copper:

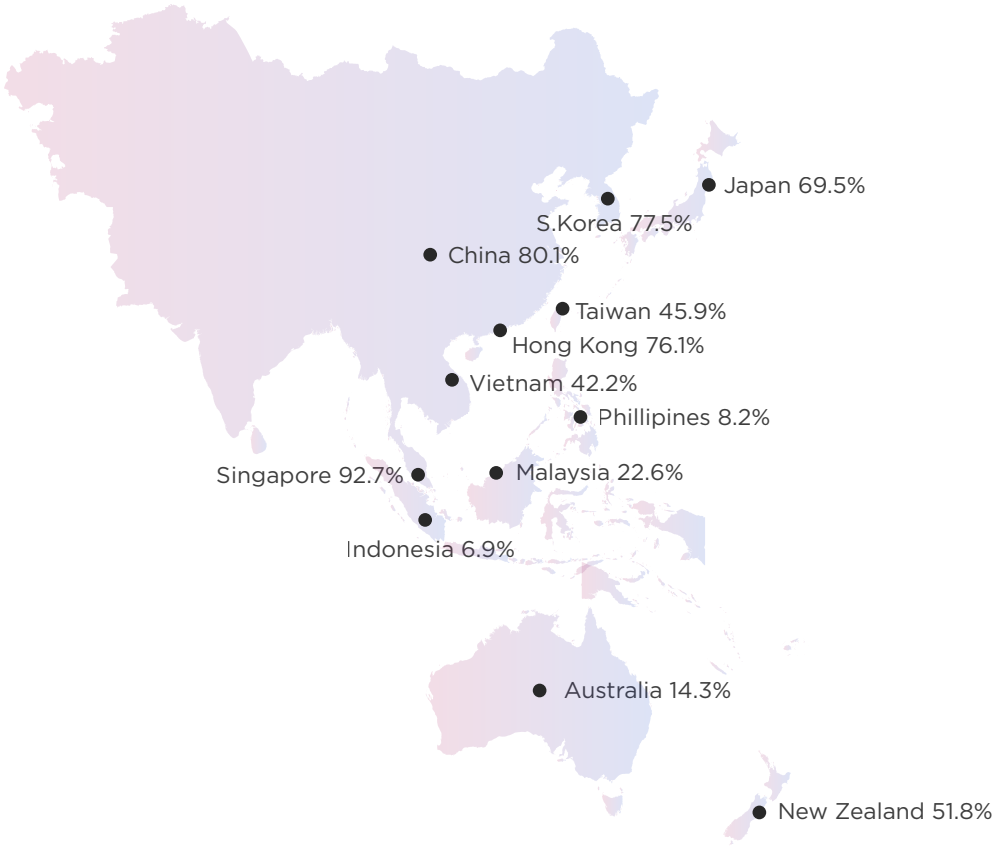
Parameter	Optical Fibre	Copper
Bandwidth	60 Tbps and beyond	10 Gbps
Future-Proof	Evolving towards the desktop	CAT7 in development
Distance	12 Miles+ @ 10,000Mbps	300 Ft. @ 1,000Mbps
Noise	Immune	Susceptible to EM/RFI interference, crosstalk and voltage surges
Security	Nearly impossible to tap	Susceptible to tapping
Handling	Lightweight, thin diameter, strong pulling strength	Heavy, thicker diameter, strict pulling specifications
Lifecycle	30-50 years	5 years
Weight/1,000 ft	4 Lbs.	39 lbs
Energy Consumed	2W per User	>10W per User

Table1: Optical Fibre vs Copper Cable

3. FTTX AND ITS JOURNEY

Fibre to the home is a popular integrated communication technology that uses fibre optic technology to enable faster and more effective communication. It is a passive network with no active components, and thus, it requires minimal network maintenance costs. FTTH also eliminates the need for a DC power network and provides revenue -generating services such as voice, high-speed data, video on demand, etc. It has the capability to provide enough bandwidth reliability at a low cost.

China has already established itself as a global leader in terms of countrywide FTTH uptake. Singapore has 92+ percent FTTH penetration, South Korea 77.5 percent, Hong Kong 76 percent and Malaysia nearly 23 percent.



Source: Statista

Figure 3: Ranking top APAC countries by FTTx penetration

FTTx has many different applications and use cases Fibre optic architectures are equipped with optical fibre throughout long-distance segments of the network. Depending on how close the fibre comes to the end user, the corresponding acronym is used to denote the FTTx type viz. Fibre to the Node (FTTN), Fibre to the curb (FTTC), Fibre to the Building (FTTB), Fibre to the Home (FTTH)

- **FTTN:** Also known as Fibre-Deep, Fibre to the Node deployments feature optical fibre that terminates at a node that lies only a few miles from the customer.
- **FTTB:** In a Fibre to the Building/Fibre to the Basement deployment, optical cabling ends directly at the building. FTTB is as close as network operators can get to FTTH while still using a node architecture
- **FTTH:** Fibre to the Home, also known as Fibre-to -the- Premises (FTTP), deployment occurs when optical cabling ends directly at the individual home or business.
- **FTTH Home Run:** The Fibre to the Home: Home Run deployment is structured with a dedicated fibre from the central office to each home. Therefore, the data on it is exclusive to the customer. This deployment type is commonly used for small developments and rural areas.
- **FTTH Active Star:** The Active Star deployment contains a multifibre cable leading from the central office to a local switch. Essentially, the Active Star deployment is FTTC without copper cabling at the end portion of the deployment.

4. Factors driving the global FTTx agenda

The following represents the top ten countries of the world in terms of number (million) of FTTx connections by Q2 2019.

4.1 Customers' bandwidth requirements

Bandwidth hungry use cases such as HD streaming, videogaming, etc. call for higher downlink and uplink bandwidths. These higher speeds in the neighbourhood of a few hundred Mbps to even Gbps are necessary to cope with simultaneous use of multiple devices (HDTVs, tablets, smartphones, games consoles, etc.). Lower latency is generally considered essential for real-time and cloud services. Fibre-based technolo -gies are called "future proof" because they enable easy upgrades - an easy (and affordable) path for future technology upgrades, ensuring products remain competitive.

4.2 Cost per FTTx customer

One of the major deterrents to FTTx adoption at scale has been the initial cost per customer with activities such as trenching and in-building or in -community costs accounting for upto 70% of the total costs. However, recent developments in technology have enabled the use of aerial fibre, sharing of existing ducts, pre-connectorised FTTH kits which significantly reduce costs of installation as well as maintenance.

4.3 The regulatory environment

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5. EXECUTION IS KEY

FTTH/B is now deployed in all major regions in the world, at different levels: FTTH/B represents a great opportunity for emerging countries where broadband is not yet widespread.

Given the high investment in terms of resources & their mobilisation combined with the complexity of quickly deploying an FTTx network, a corresponding commercial offer and its supporting enablers/operations, a robust model must be developed to drive and coordinate the venture into fibre. Success stories of the same from across the world highlight the need to rapidly adopt newer execution models and techniques over traditional practices. Some of the key initiatives across the world to have taken up the FTTx challenge are:

Openreach program in the UK: Ultrafast full-fibre broadband to 227 rural communities across the UK, connecting 15 Mn premises by 2020.

National Ultra-Broadband Plan, Italy: Develop infrastructure to guarantee services of 100 Mbps for at least 85% of households by 2020.

National Broadband Scheme, Finland: Digital Infrastructure Strategy specifies the technology -neutral countrywide broadband objectives for 2025.

Digital India, India: To transform India into a digitally empowered society and knowledge economy with the use of Fibre broadband under Digital India and AtmaNirbhar Bharat schemes.

6. Looking ahead

As a parting thought, FTTx is here to it is imperative that FTTH/B be rolled out at scale and speed, despite the uncertain stand alone business case and competitive environment.

The following challenges must be confronted and addressed in the course:

1) Developing a strong service offering/ecosystem beyond connectivity.

2) Determining the extent of network investment versus rollout to pass and connect homes.

3) Defining the sales approach to drive rapid take-up.

4) Right-sizing the network (technology, sites and operations)

5) Identifying and implementing best practices through an organisation resourced with top talent and, critically driven by an entrepreneurial mind-set.

Look out for our next paper where we will discuss the imperatives demanding rapid deployment of FTTH/B as well as some key solutions to help achieve uniform FTTx across the globe.

We integrate digital networks for our customers

STL is an industry-leading integrator of digital networks.

We design and integrate these digital networks for our customers. With core capabilities in Optical Interconnect, Virtualised Access Solution Network Software and System Integration, we are the industry's leading end-to-end solutions provider for global digital networks. We partne with global telecom companies, cloud companies, citizen networks and large enterprises to deliver solutions for their fixed and wireless netw for current and future needs.

We believe in harnessing technology to create a world with next generation connected experiences that transform everyday living. With inte focus on end-to-end network solutions development, we conduct fundamental research in next-generation network applications at our Cent Excellence. STL has a strong global presence with next-gen optical preform, fibre and cable manufacturing facilities in India, Italy, China and Brazil, along with two software-development centers across India and one data Centre design facility in the UK.

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