

SANOG-32

South Asian Network Operators Group

A non-profit forum for Data Network Operators in South Asia

SANOG



Presentation On Overview Of FTTx deployment in Bangladesh

Mohammad Javed
Lead FTTx & triple play Planning Team And
Project Manager of FTTx (Triple play)
Cell: 01847102159, 01989904993
Fiber@Home Ltd



FTTx?

Difference Between Conventional Vs Micro FTTh Infrastructure

Pros & Cons

PON Growth Rate

Possible Distance Target & Budget

Splitter Type & Loss

1x4 Lambda in a single core

Coverage Possibility GPON Network

Link budget Details: GPON with RF overlay

Exist(Achieved) of Traditional Network at Dhaka Metro

Dream Topology for Bangladesh

FTTx Project Coverage Area

Requirement ,Material's Use, Deployment Challenge

Cost Difference ,Conclusion.

Defination of FTTx : Fiber to the x (FTTx) is a collective term for various optical fiber delivery topologies that are categorized according to where the fiber terminates.

Example:

FTTn => Fiber to the node or fiber to the neighborhood

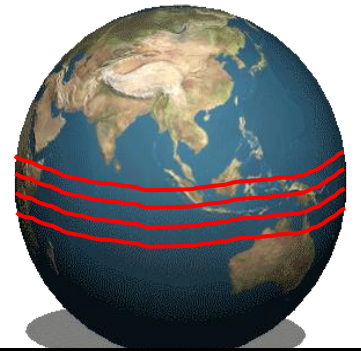
FTTc => Fiber to the curb or fiber to the cabinet

FTTb => Fiber to the building or fiber to the basement

FTTh => Fiber to the home

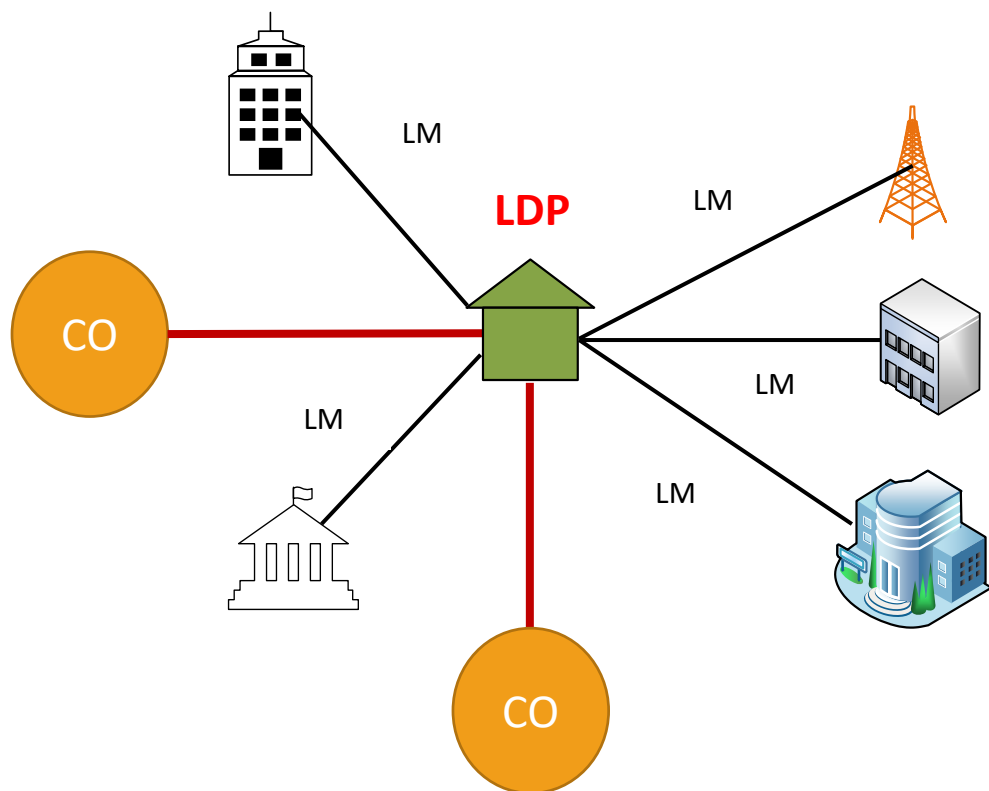
FTTp => Fiber to the premises

FTTd => Fiber to the desk

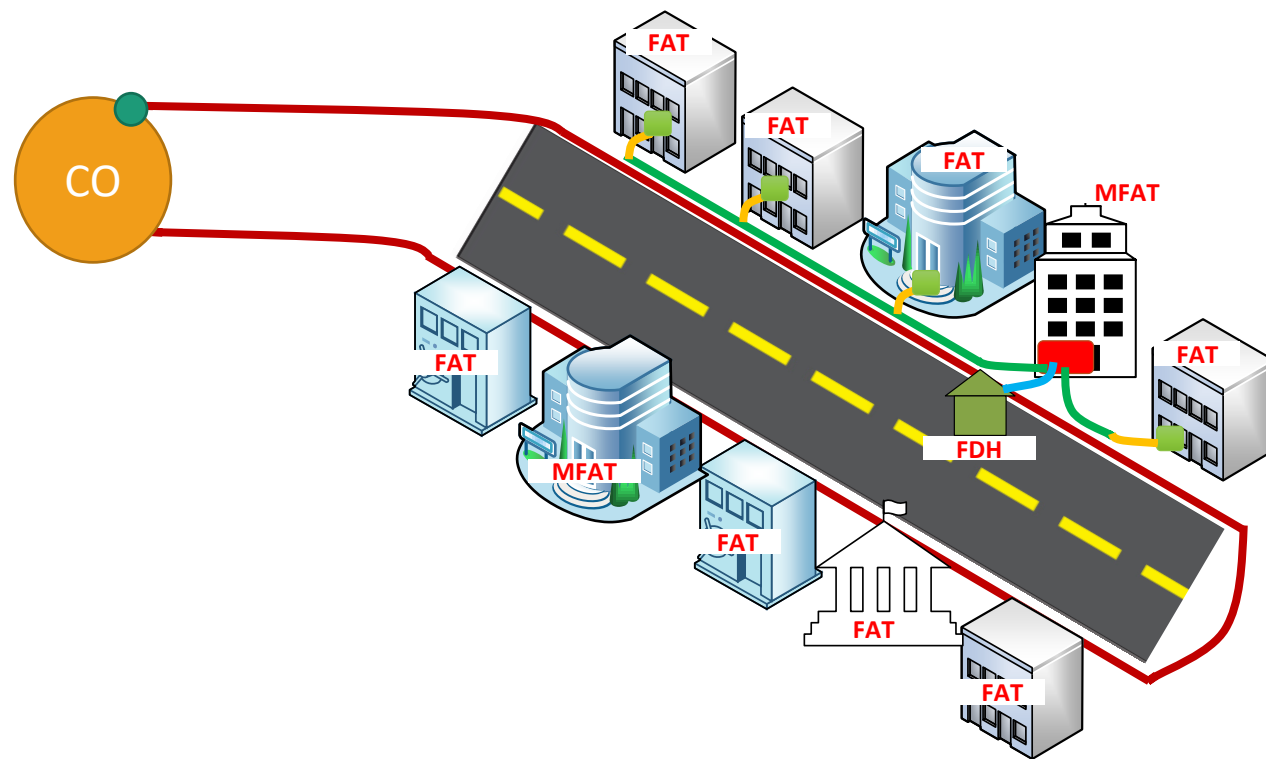


Topographical Difference Between Conventional Infrastructure and FTTh Infrastructure

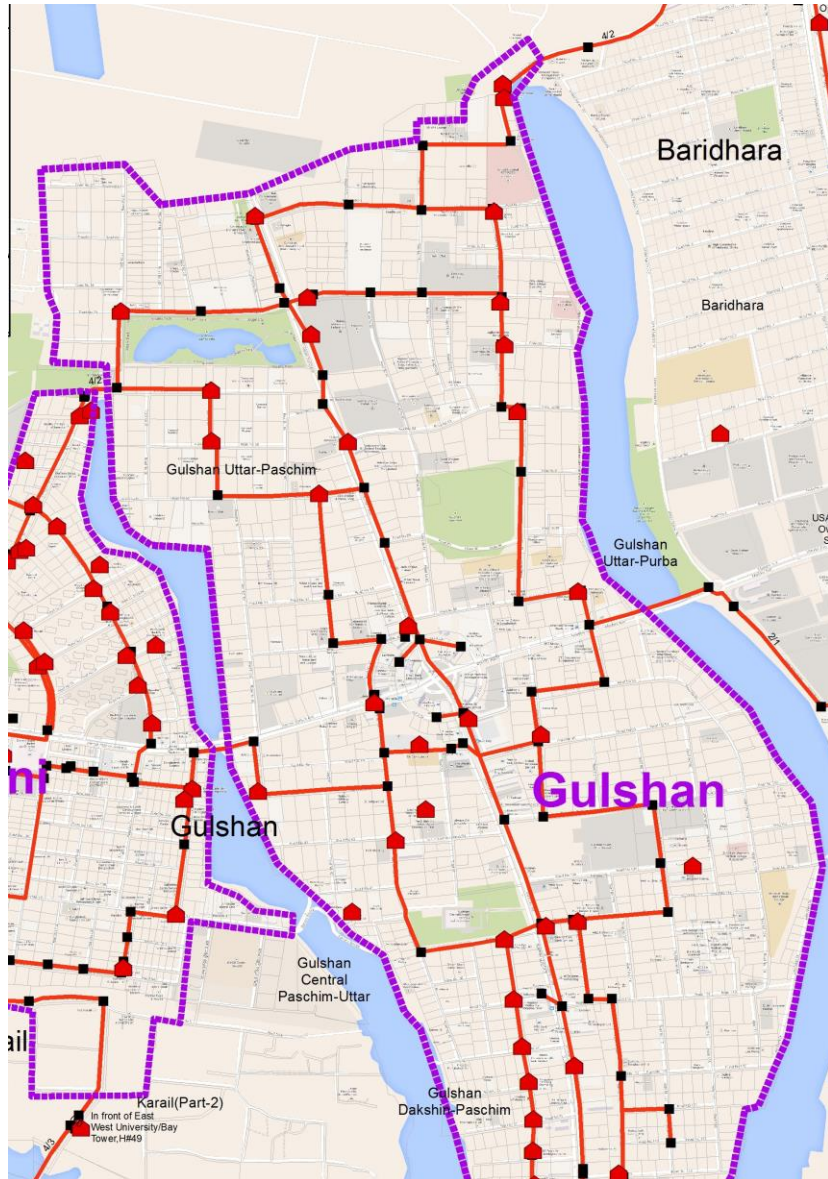
Conventional Network



FTTh Network

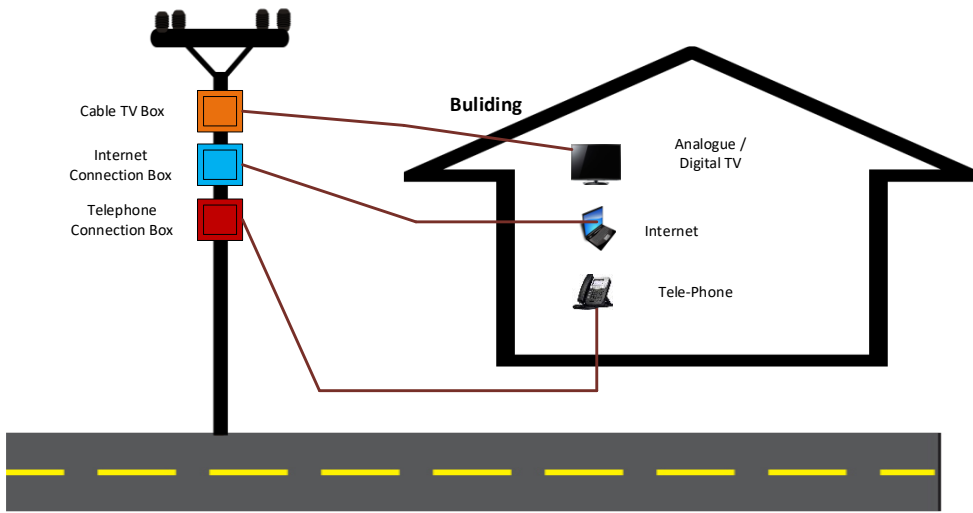


Geographical Difference Between Conventional Infrastructure and FTTH Infrastructure



Pros & Cons (Difference between Conventional ODN & FTTx ODN Networks)

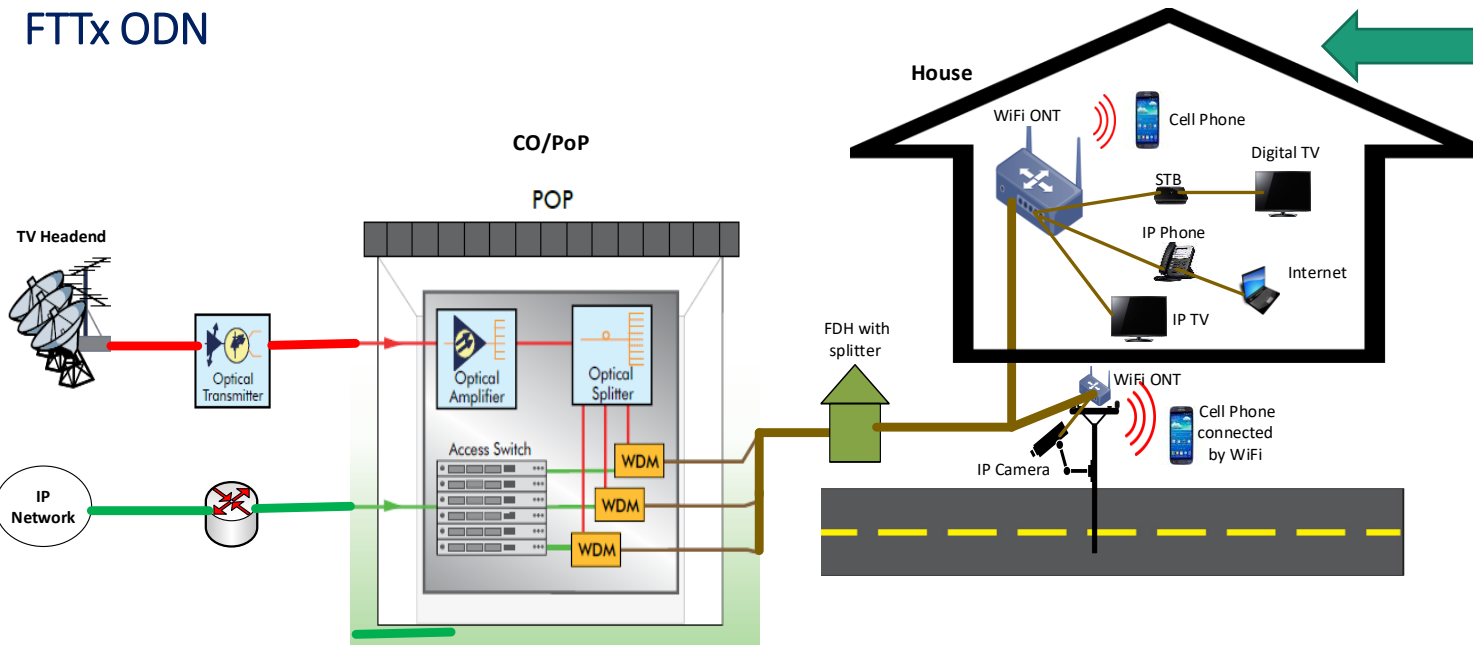
Conventional ODN



← limitation of conventional ODN System :

1. Insecure Last mile , due to multiple cable access in same premises.
2. Scattered cable management system
3. Separate access required for multiple entity for multiple service issues .
4. Expensive for users, due to multiple connectivity taken from different provider.
5. 1: 1 Service .
6. Unstable Network .

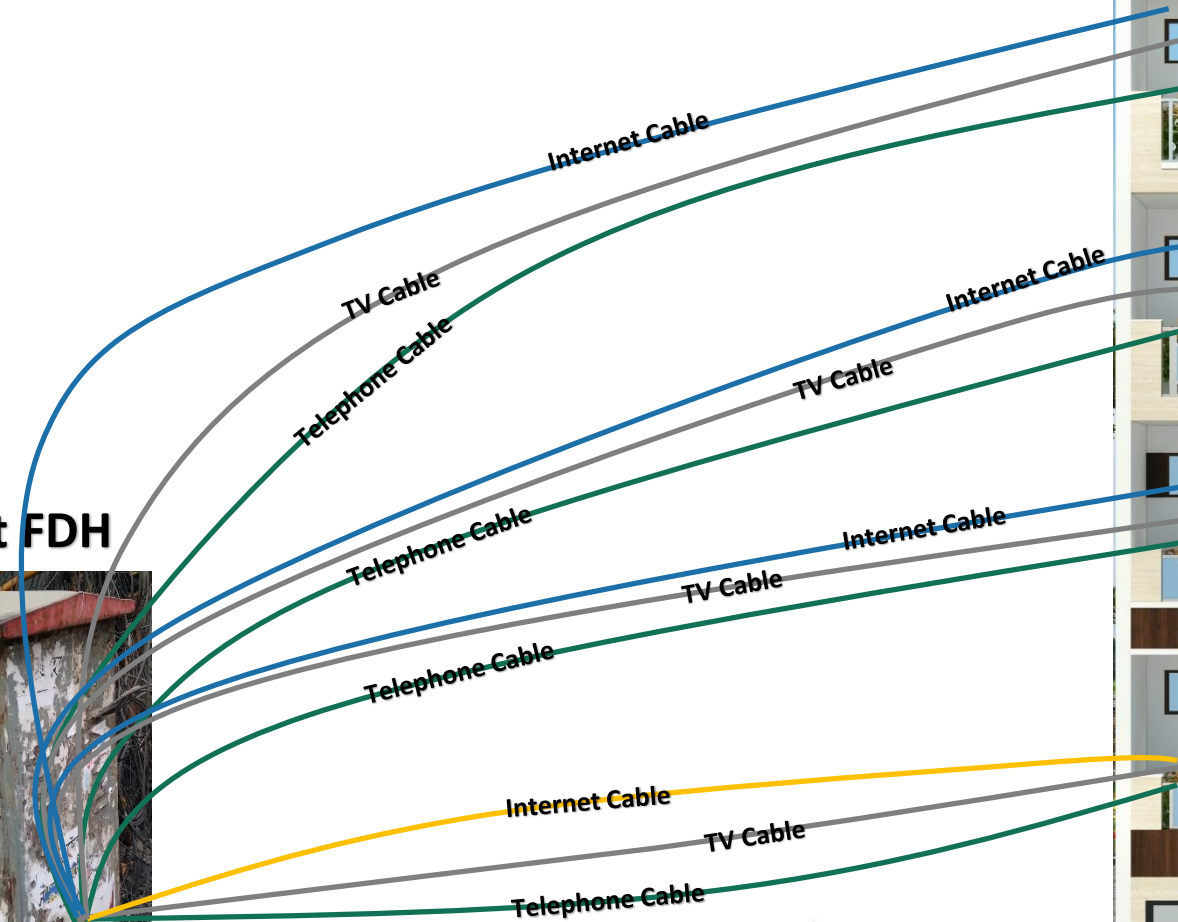
FTTx ODN



← Facilities of FTTx ODN System:

1. Fully secured, due to entrance single entity up to the home.
2. Simplified network, Without multiple cable gathering .
3. Uninterrupted service.
4. Economic for user.
5. Green Technology
6. Possible to provide 1: all Services over FTTh.
7. Clean city from the cable hazardous

Pros & Cons (Insecure access network & access multiple entity by using conventional network)



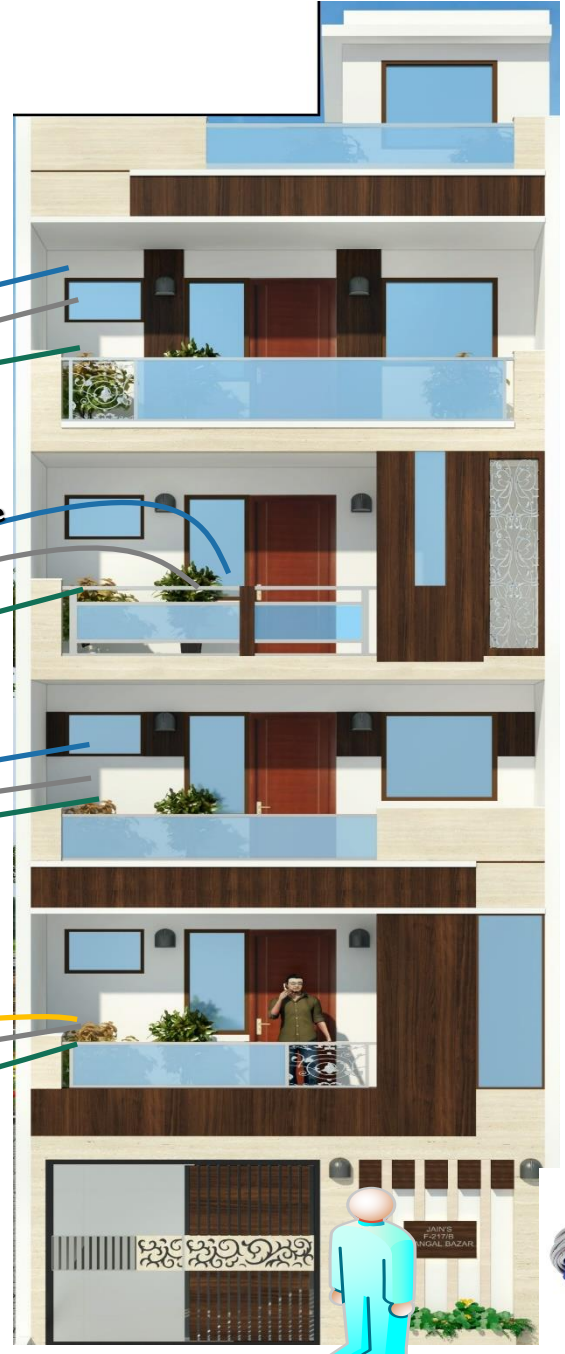
Maintenance Engineer coming from TV company



Maintenance Engineer coming from Internet company

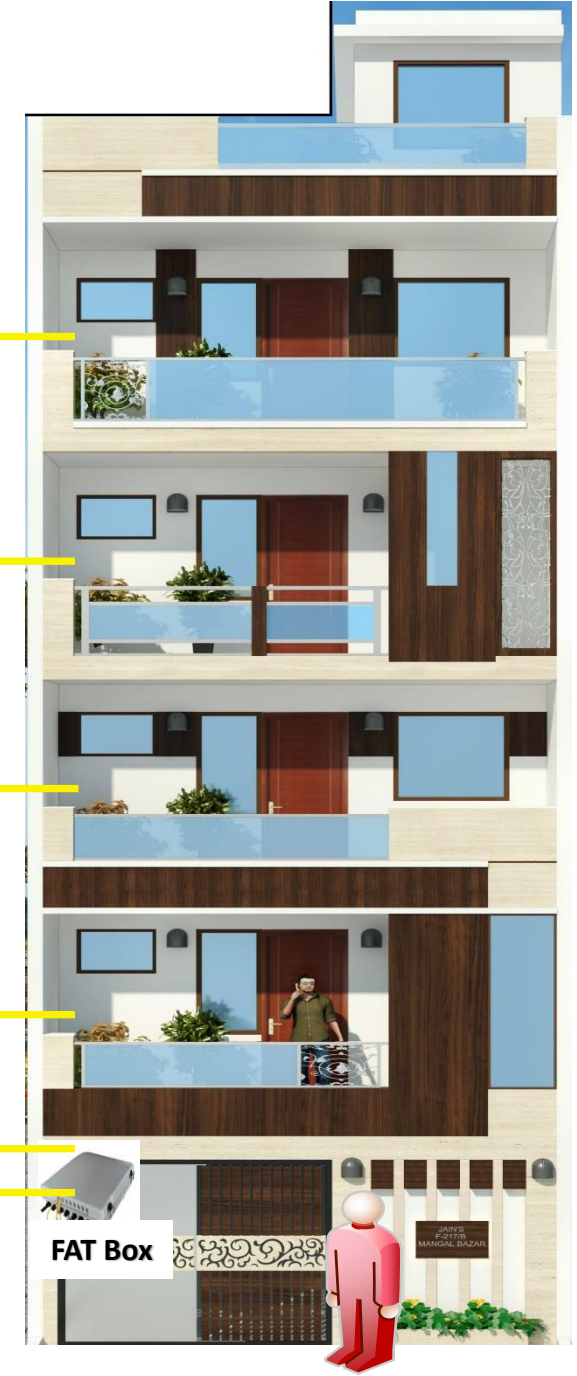


Maintenance Engineer coming from Telephone company



Pros & Cons (Secure access network & access single entity by using FTTx Network)

Single entity can't provide together all service. Because of they will use individual license of individual company for each service.
So, If any company can take license all together want to provide all service from the single point of view ,there is also have limitation. Such as they have obligation to do underground cabling work.



Only one license can do FTTH network by using underground cabling. Others entities can provide their service by the single transmission.

Nearest FDH



Optical Fiber

Only one maintenance Engineer coming from "F" company



Pros & Cons (Difference of cost)

Conventional

Service over Conventional Network System									
Links	Inetnet	Internet cost	Analog/CATV TV (85-90 ch)	PSTN line rent each month	PSTN (Average use)	Digital TV (150-ch)	Digital TV (260-ch)	Total without Digital TV	Total with Digital TV
Line-1	2 Mbps	800	300	180	250	300	0	1,530	1,530
Line-2	4 Mbps	1,499	300	180	350	0	600	2,329	2,629
Line-3	9 Mbps	3,499	300	180	500	0	600	4,479	4,779

Vs

FTTx

Service over FTTx Network System							
Packages	Inetnet	HD-Channel	CATV TV	Total Channel	IP-Phone Free Talk time (Minute)	IP-Phone (Minute) after free talk time	Total BDT
Package-1	2 Mbps	15	SD+2HD	175	200	0.25	895
Package-2	5 Mbps	25	HD-1	225	300	0.25	1,590
Package-3	10 Mbps	40	HD-2	275	500	0.25	2,390

Cost Saving in FTTx system for each packages and for each Month
41.5%
39.5%
49.9%

All the data are approximated, which is based on local market scenario.

Note: All Values are in BDT

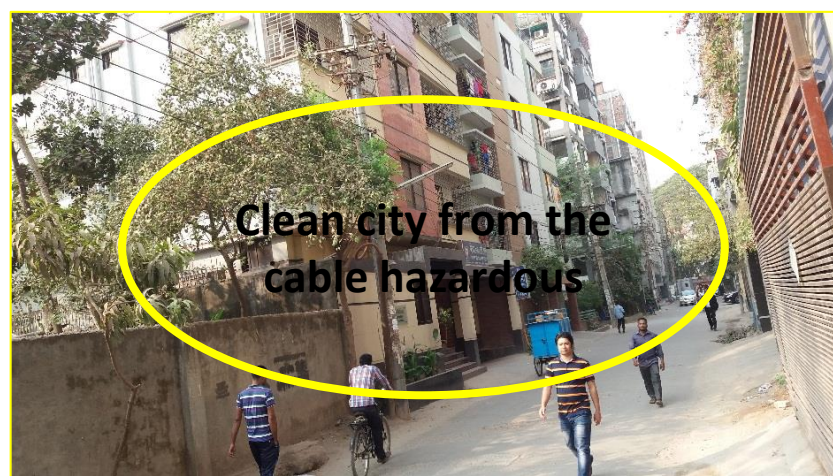
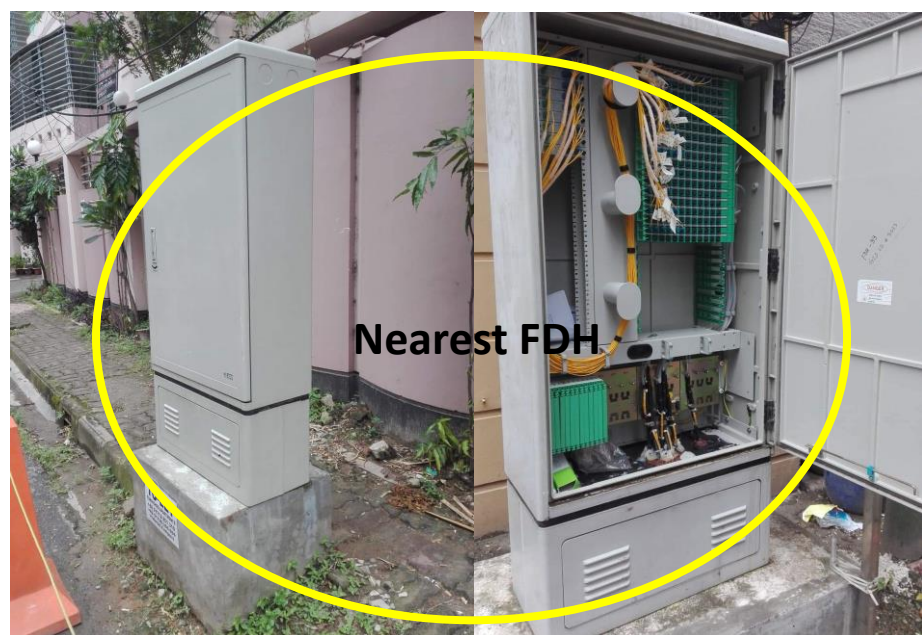


Visual Difference Between Conventional Infrastructure and FTTh Infrastructure

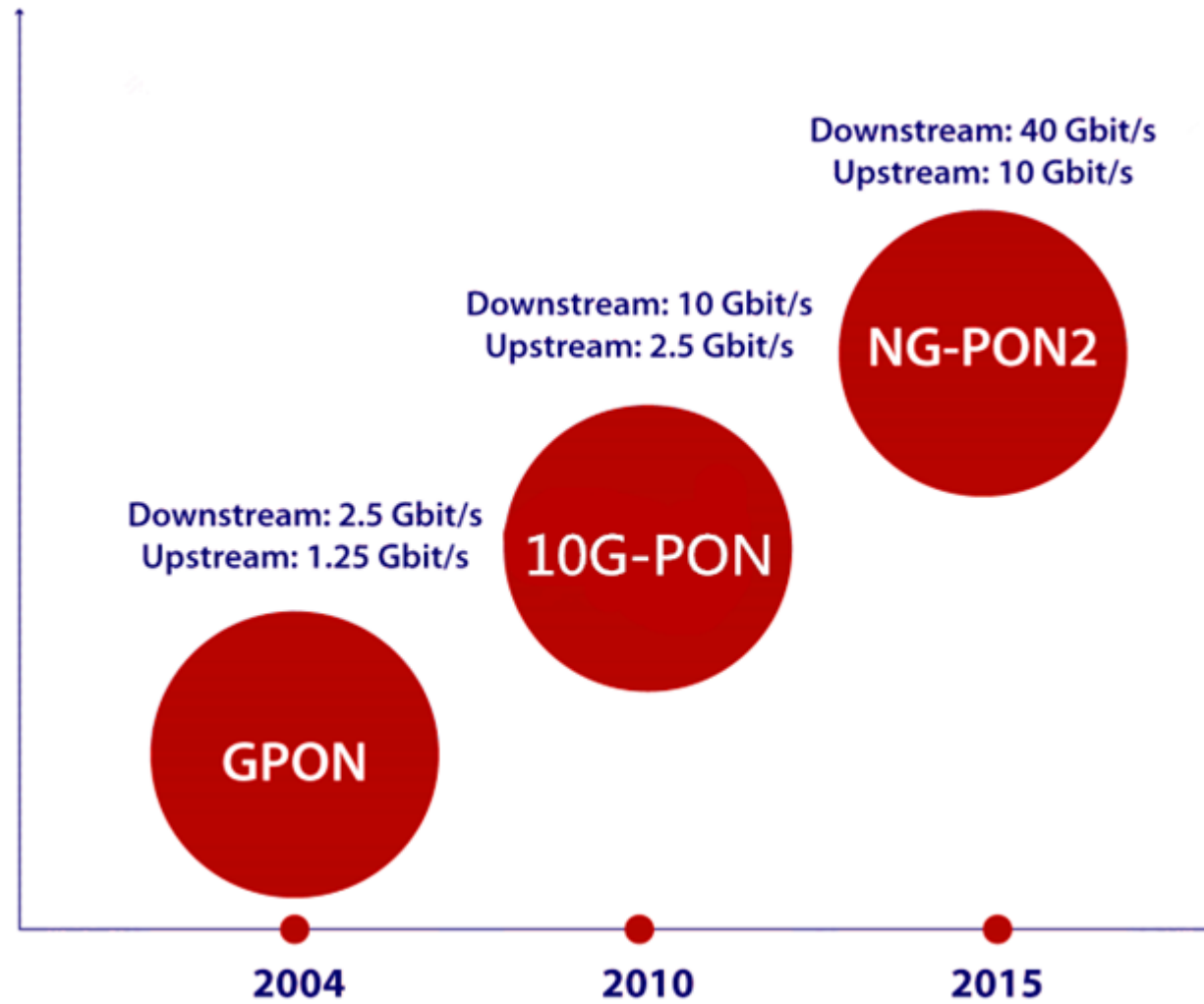
Before FTTh



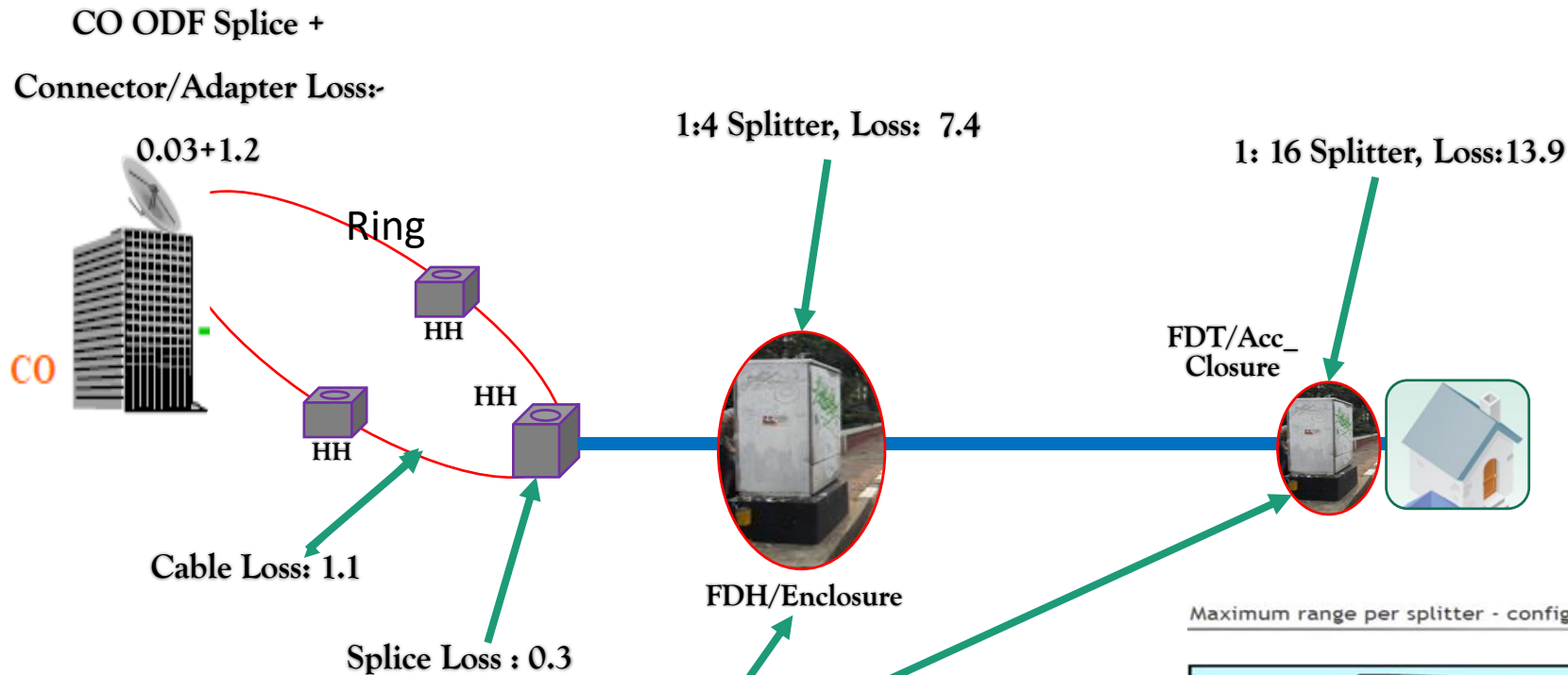
After FTTh



PON Growth Rate



Possible Distance Target with Budget



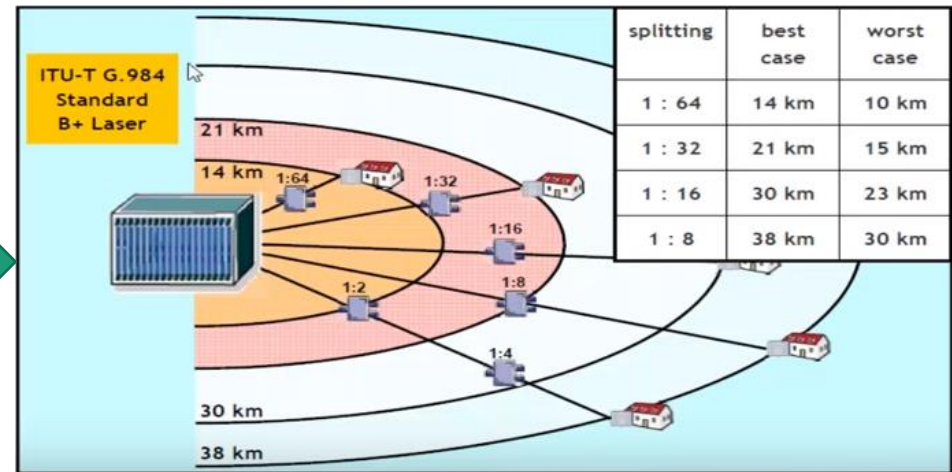
Loss Parameter

- ODF
- ADAPTER
- CONNETOR
- WDM COUPLER
- FDH-SPLT-SP
- SP-CABLE
- FDT-SPLT-SP

Hard patch or splice losses will be include



Maximum range per splitter - configuration



=> $(0.03+1.2)+(1.1+0.3)+(7.4+1.03)+ (13.9+0.3)=?$

CO-ODF+WDM

OSC

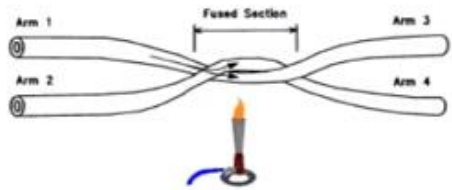
FDH-SPLT/Closure

FDT-SPLT/Closure

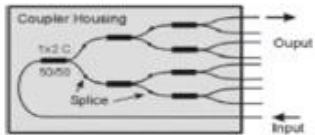
Splitter Type & Loss

Splitter - Types

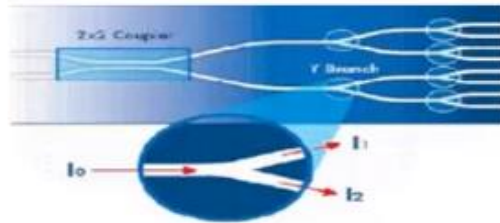
Type 1: FBT



- FBT – Fused Biconic Taper**
- Two fibers fused to create a split
 - Typical fusion of 2, 3 or 4 fibres
 - Splits in cascade



Type 2: PLC

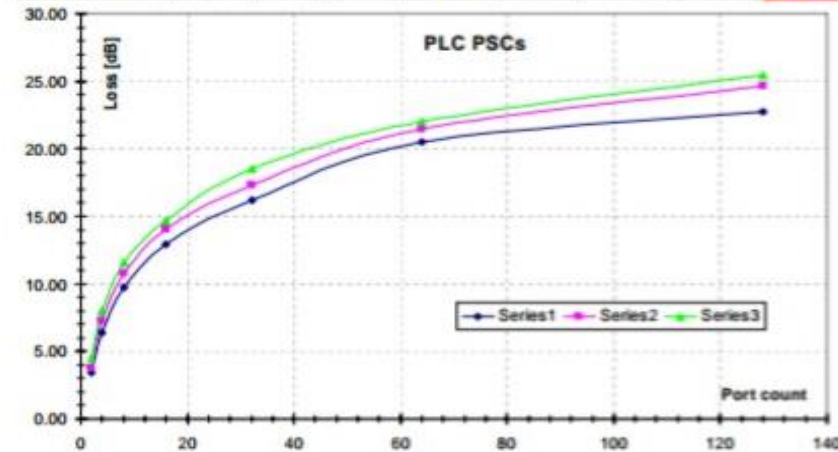


- PLC – Planar Lightwave Circuit**
- Built into glass waveguides
 - Solid state
 - No mechanical parts
 - Compact
 - Splits: 1x4, 1x8, 1x16, 1x32
 - Splits: 2x4, 2x8, etc

PLC PSCs

Port count	2	4	8	16	32	64	128
Min loss [dB]	3.40	6.40	9.70	12.90	16.20	20.50	22.77
Average loss [dB]	3.78	7.30	10.75	14.03	17.33	21.50	24.65
Max loss [dB]	4.50	8.00	11.60	14.70	18.50	22.00	25.43

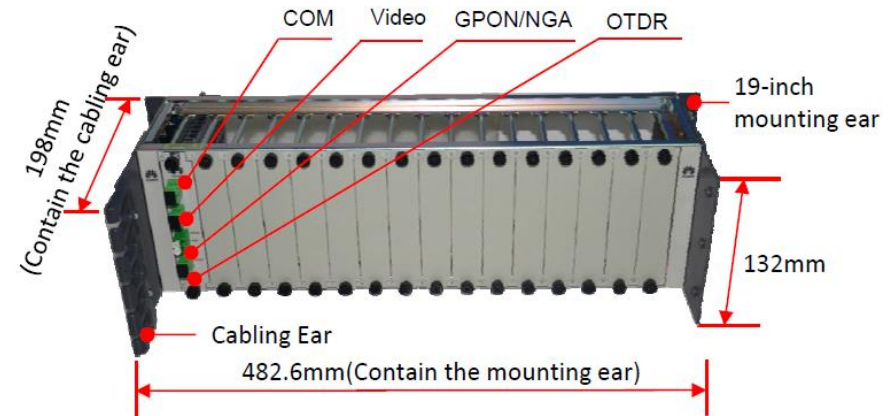
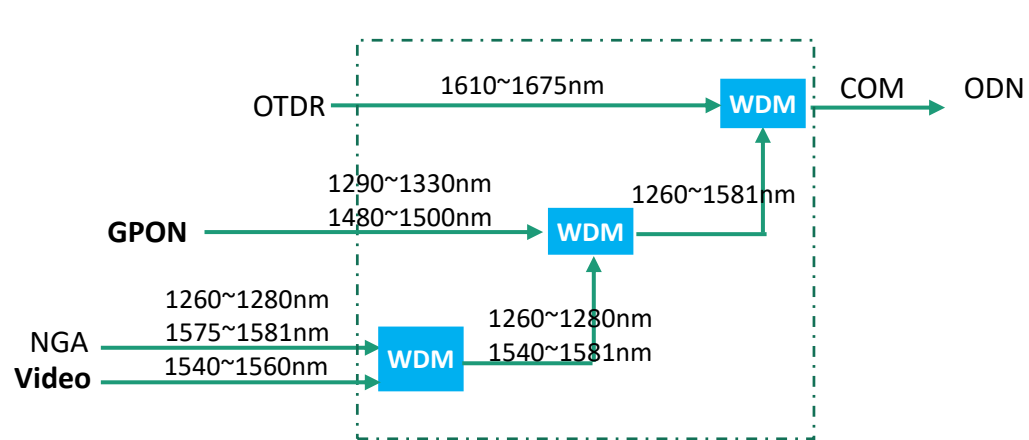
Estimated values



	FBT splitter	PLC splitter
Operating wavelengths	850 nm	1260 nm ~ 1650 nm
	1310 nm	
	1550 nm	
Number of inputs	One or two	One or two
Splitter ratio	Customisable	Equal for all branches
Reliable splits	1:8 (can be larger with higher failure rate)	1:64
Maximum splits	1:32	1:64
Other	High failure rate	Low failure rate
	Lower price	Higher price

Item	Unit	GPON	1:8 EDFA	1:16 EDFA
Transmitter power	dB		7	7
EDFA Receive level	dB		5	5
Amplifier (EDFA)	dbm	+5	+20	+20

1x4 Lambda in a single core



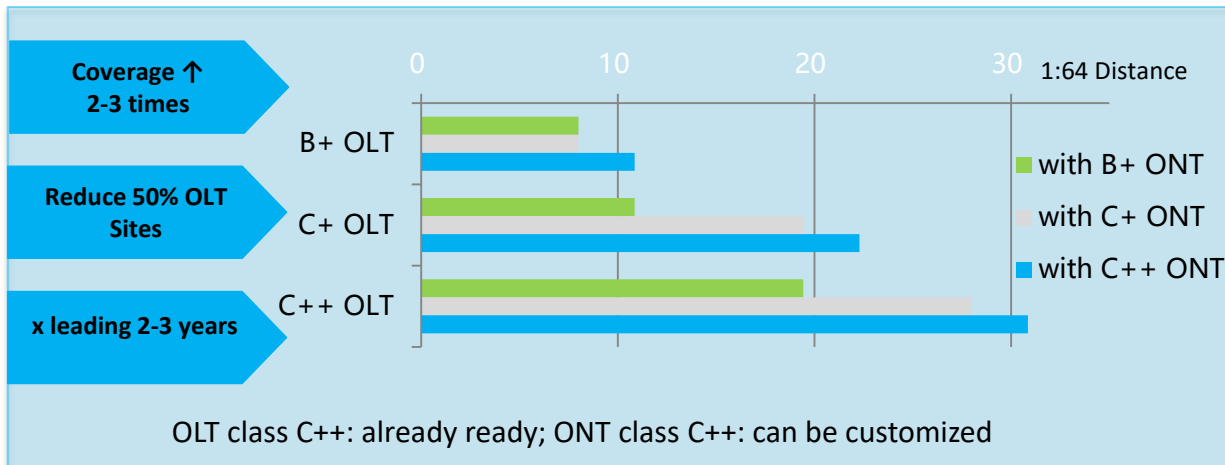
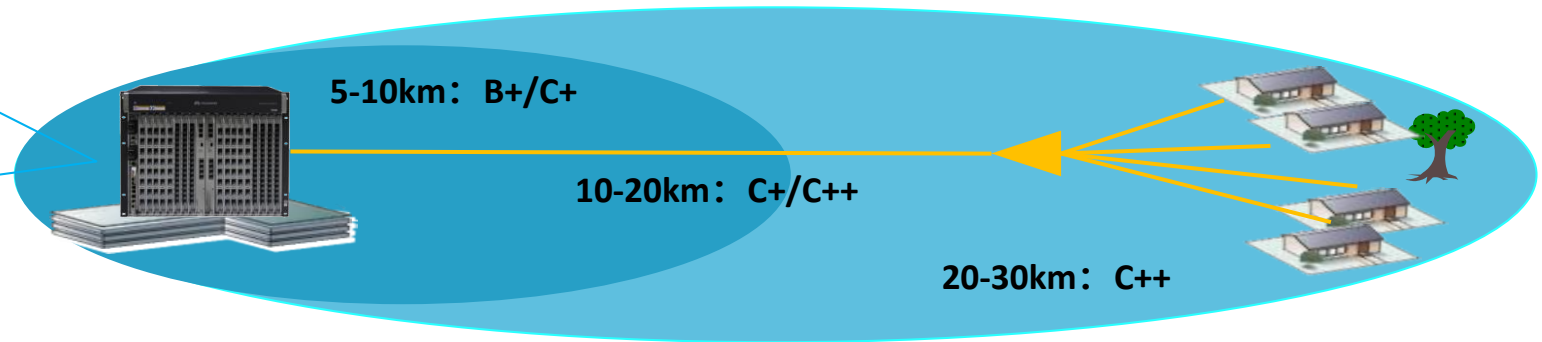
- Support to multiplex CATV/GPON/10GPON/OTDR signal into 1 output to ODN.
- Modular design, 19'' installation, max16 pcs in each subrack with 3U height.

Con: One card require to manage/PON Port

Coverage Possibility GPON Network

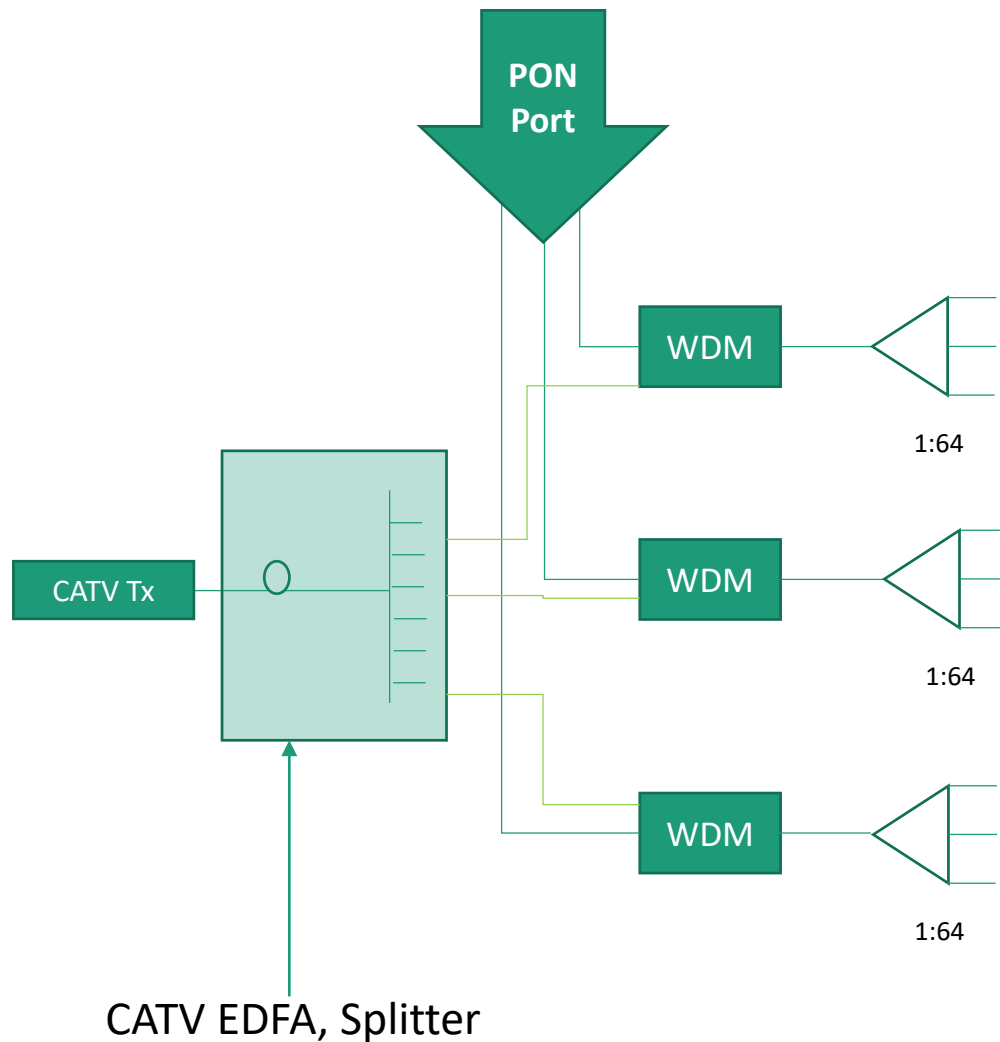


Long Reach Optical Module: Class C++



Optical power level of OLT	Optical loss budget		
	With Class B+ ONT	With Class C+ ONT	With Class C++ ONT
Class B+	28dB	28dB(Enable FEC)	29dB(Enable FEC)
Class C+	29dB	32dB(Enable FEC)	33dB(Enable FEC)
Class C++	32dB	35dB(Enable FEC)	36dB(Enable FEC)

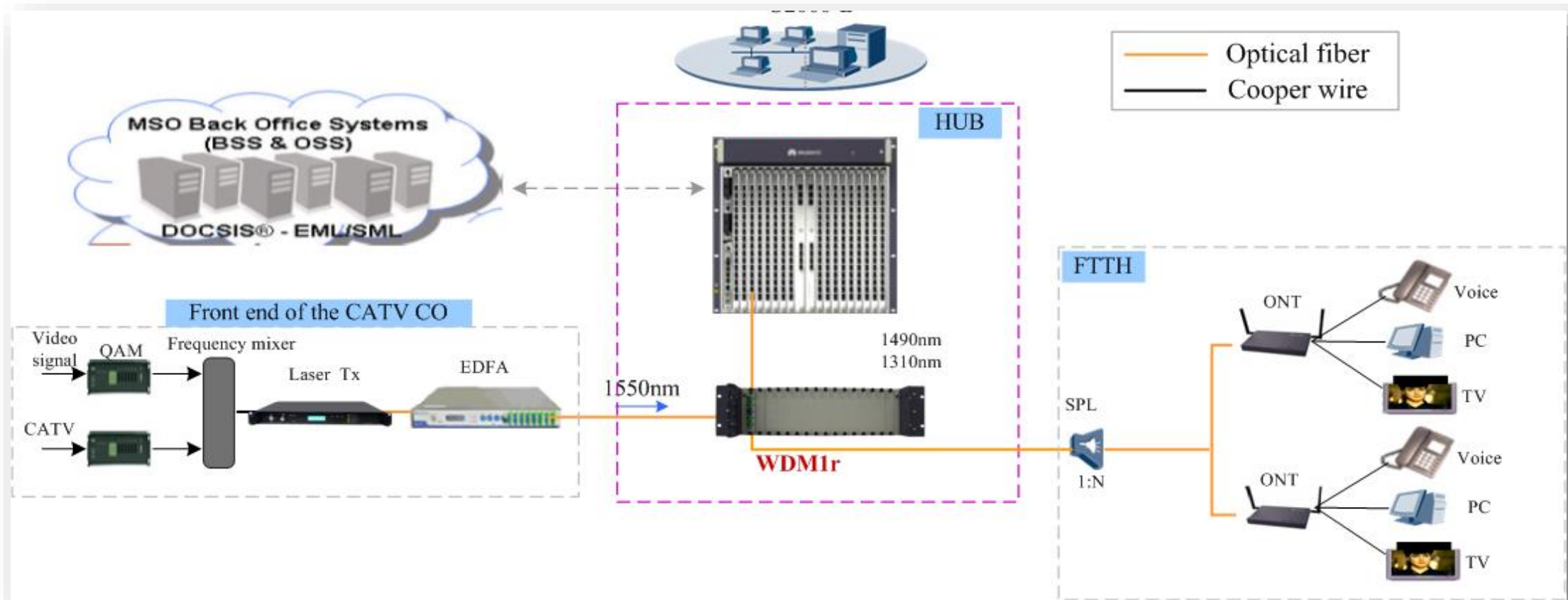
Link budget Details: GPON with RF overlay



Item	Unit	Average loss/gain	GPON	CATV	1:16 EDFA
Transmitter power	dB			7	7
EDFA rcv level	dB			5	5
Amplifer (EDFA Amplify)	dbm		5	18	24
Cable loss, G 652, km	0.35	5	-1.75	-1.1	-0.35
Adapter, pcs	0.2	4	-0.8	-0.8	-0.8
Connector/Splicing loss,pcs	0.3	4	-1.2	-1.2	-1.2
Splitter	1;64	21.5			
	1:32	17.2			
	1:16	13.9	-13.9	-13.9	-13.9
	1:08	10.7			
	1:04	7.4	-7.4	-7.4	-7.4
	1:02	4.4			
Splice Loss	0.06	5	-0.3	-0.3	-0.3
Other loss	2	2		-2	
Margin	2	2		-2	-2
Total Loss			-25.35	-28.7	-26.0
Received Power			-19.1	-9.4	-2.1
Receiver sensitivity	dbm		-27	-27	-27

Link budget confirm feasibility with 1:64 and B+ SFP

GPON with RF Overlay



- There are existing head end devices, only needed to add a WDM1r, which combines the PON and CATV together and output the mixed signal in to the ODN network.
- All optical network, saves the ODN fibers, reduces more than 50% installation space, and saves the whole power consumption in the HUB office.

Exist (Achieved) of Traditional Network at Dhaka Metro

Metro Coverage by Conventional Infrastructure

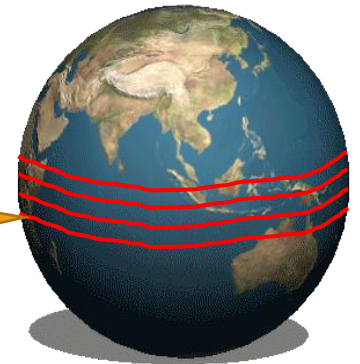
Total UG Cable Length (km) 1906.2

Present no. of active DP 693

Total CO 18

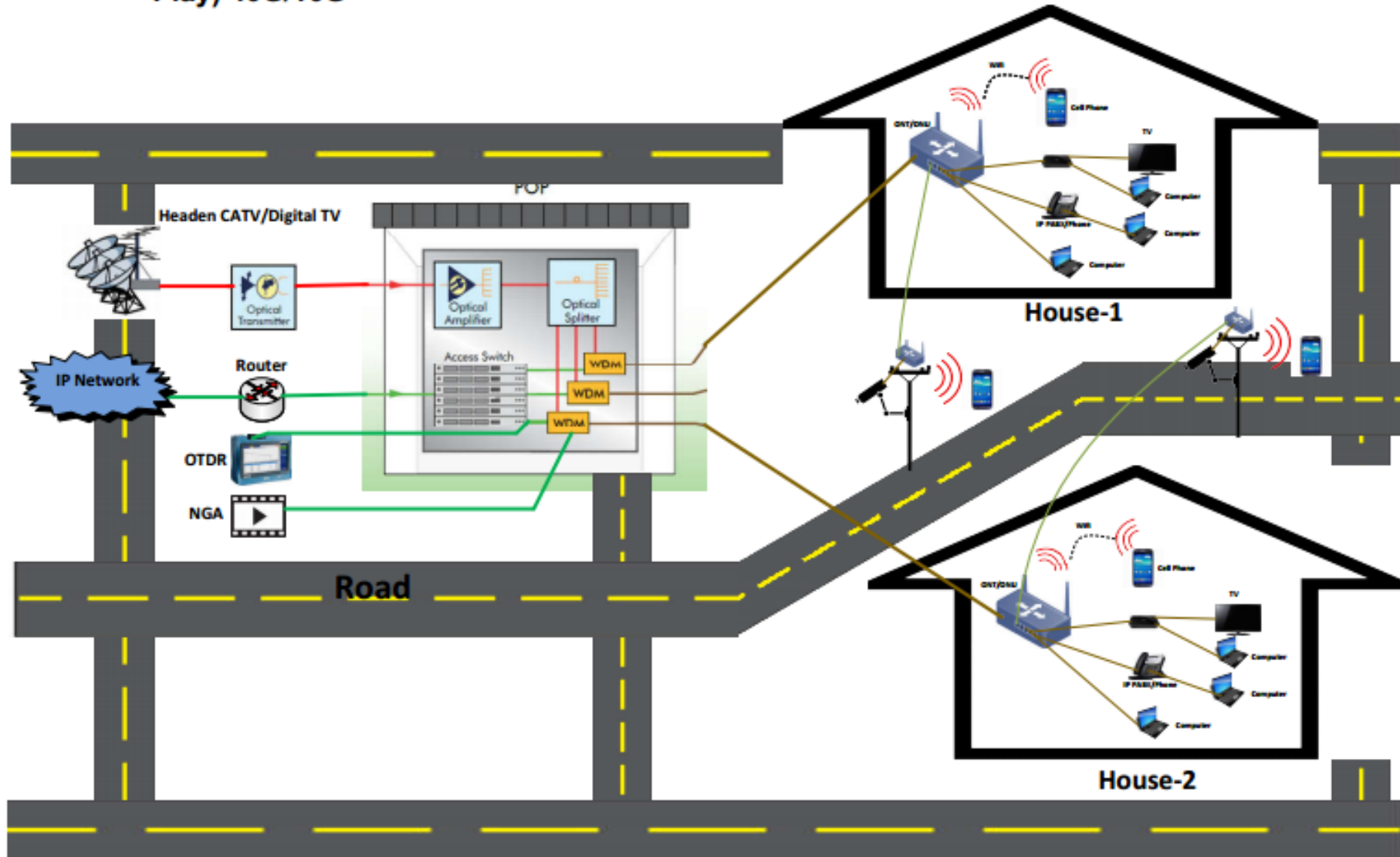
Current FTTx Zone Gulshan-1, Pallabi, MogBazar, Mohakhali-DOHS, Niketan, Motijheel.

Fiber@Home Core distance = 4 times of Earths Diameter (12752 Km)



Dream Topology for Bangladesh

NG-PON2 (Triple/Quadrant Play) 40G/10G



FTTx Project Coverage Area

Planned

Banani N&S

Baridhara

Banani DOHS

Nikunja-2

Dhanmondi

Banassree

Uttara-12 sectors.

Project Closing

Gulshan 1

Gulshan 2

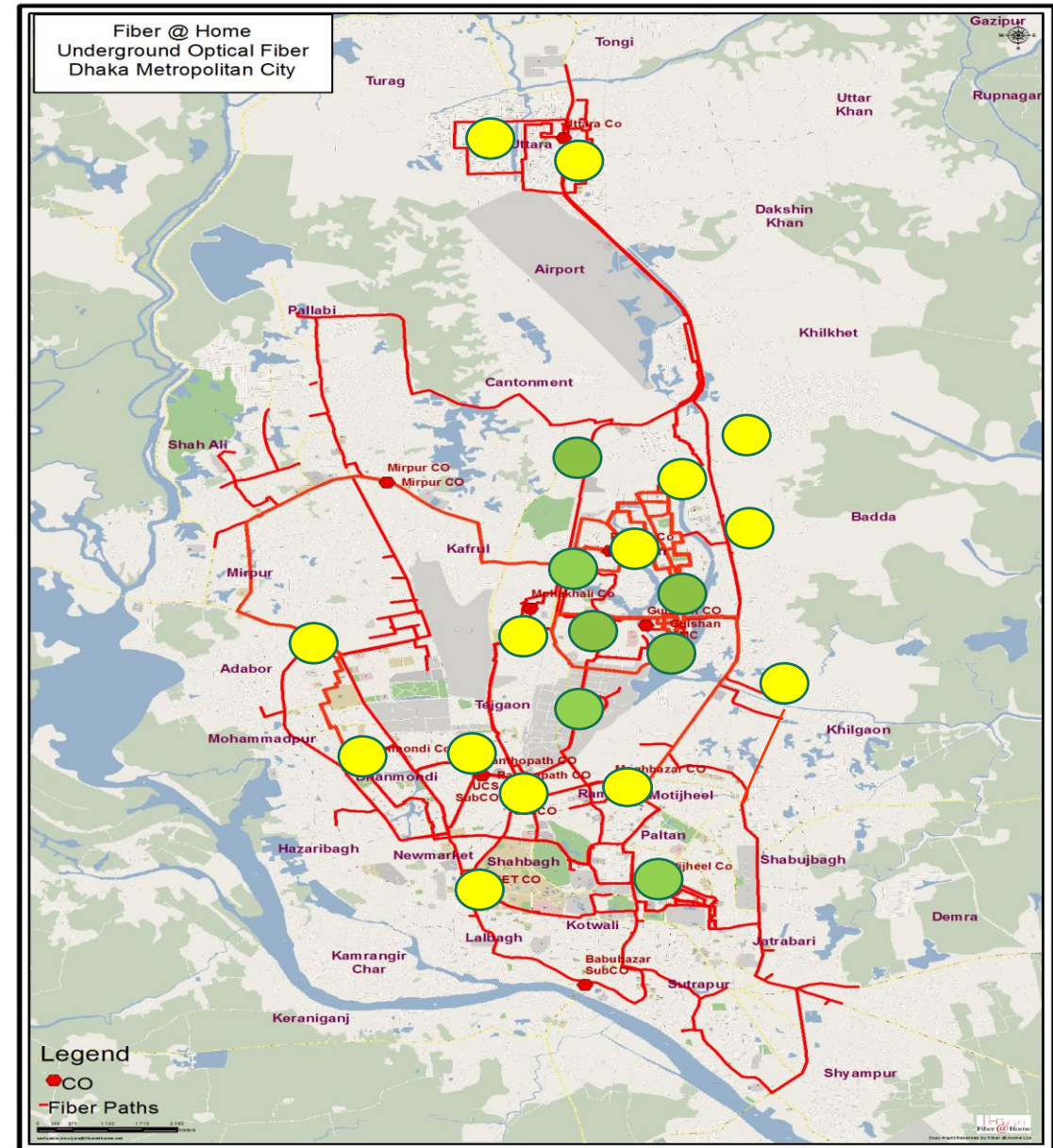
Pallabi

Paltan

Segunbagicha

MogBazar
(Siddeshory)

Uttara-4 sectors.





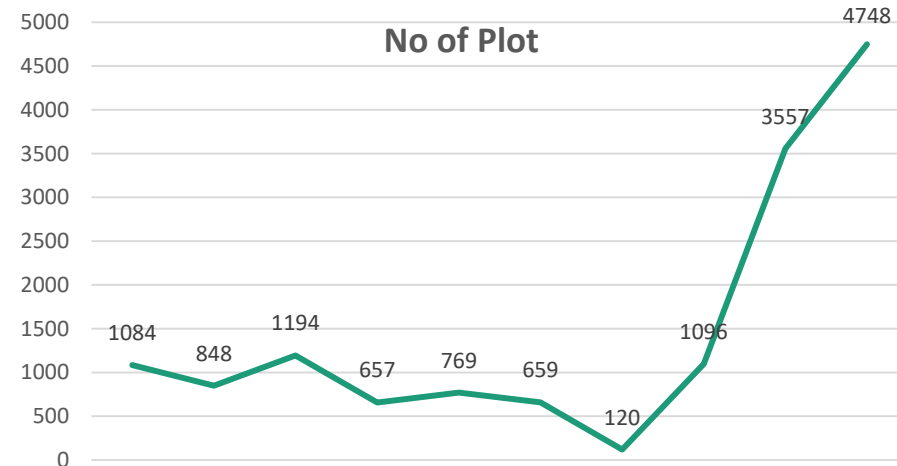
FTTx

Target
Client
>181000

House/Plot
>18797

Current
>6800+ 😞

• **Plot Growth :**



• **Process for network planning:**

- Calculation / setting the project objective for the network planning
- Analysis of the existing (or new) infrastructure
- Site survey & planning concept Detailed network planning (CO head-end, amplifiers points, distribution points, connectors etc)
- Device list and construction planning (equipment, rack mounting, cluster, equipping of the amplifiers and distribution points etc) .
- Time schedule, installation, commissioning.
- Certification & Acceptance.

Requirement

Ambition	<ul style="list-style-type: none">• FTTh/Access to each door
Planning	<ul style="list-style-type: none">• Architecture, Plan, Design and Dimensioning, Budgeting, Resource.
Technology for Passive Network	<ul style="list-style-type: none">• HDD/Micro-Trenching ,Duct, Fiber, FDH, FAT, WDM Machine and Tools
Active Network	<ul style="list-style-type: none">• GEAPON (OLT,ONT)• Transport Network (IP and DWDM)
Operational	<ul style="list-style-type: none">• Monitoring & Billing – Active and Passive (OSS, Server)
Project	<ul style="list-style-type: none">• PM-Plan, RoW, Rollout, Acceptance.• Business Achieving Plan

What Material are using for ODN/OSP.

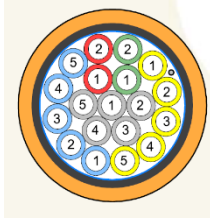
FD(Folding duct) & LD(Linked duct)



DB(Direct burial)



Micro Fiber



FDH Box



MFAT Box



FAT Box



Micro Trenching Machine



Dimensioning of Micro Duct & Fiber

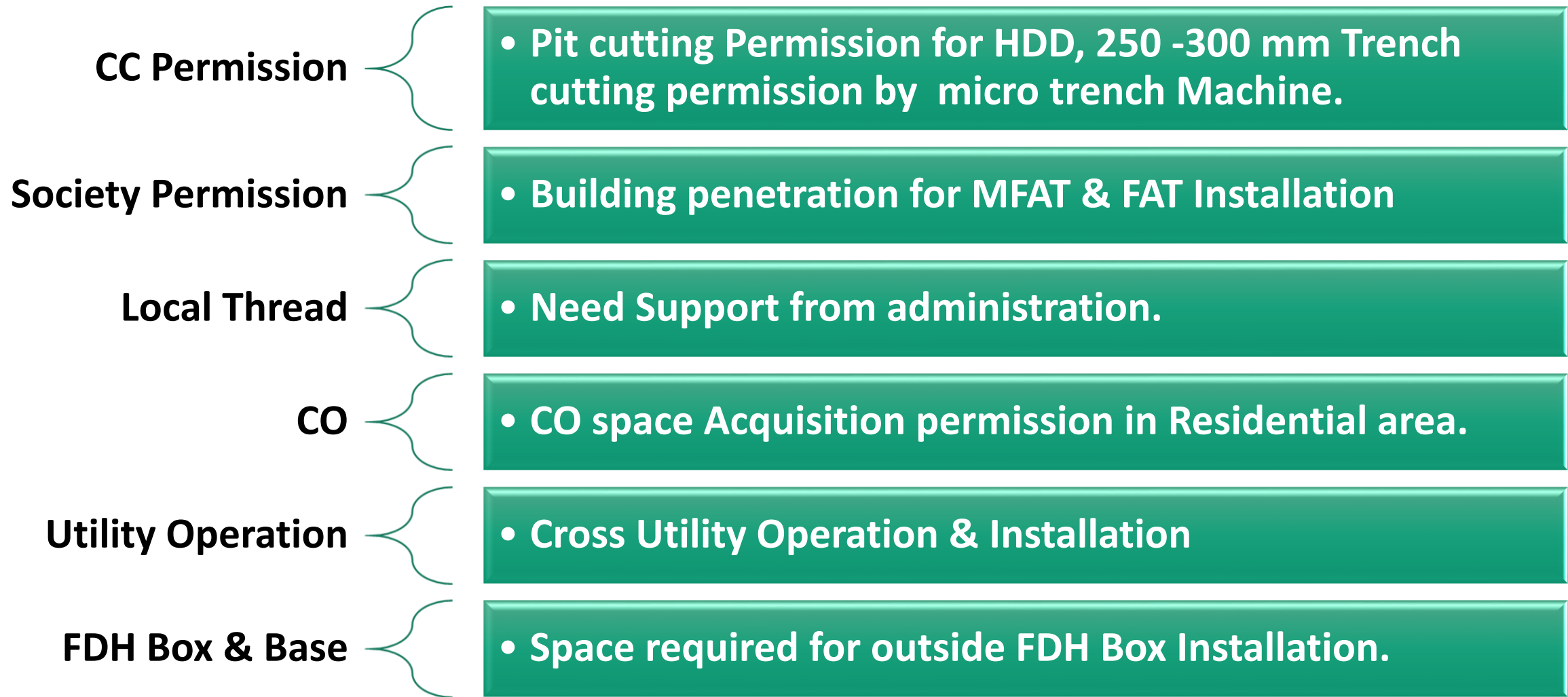
Existing

Segment	Core Requirement	Fiber type	Fiber (OD)	HDPE Duct Type	Duct (OD-ID)	Duct Way	Duct Type
Backbone	288	Single Sheath single armored	18	Regular	40/33	2-way	Regular
HH to FDH	24	Single Sheath single armored	10.1	Regular	40/33	1-way	Regular
FDH to M-FAT	24	Single Sheath single armored	10.1	Regular	40/33	7-way	Regular
M-FAT – FAT (Plot)	6/12	ABC	2.3 ± 0.2	Micro	7/3.5	4-way	Linked/Hexa

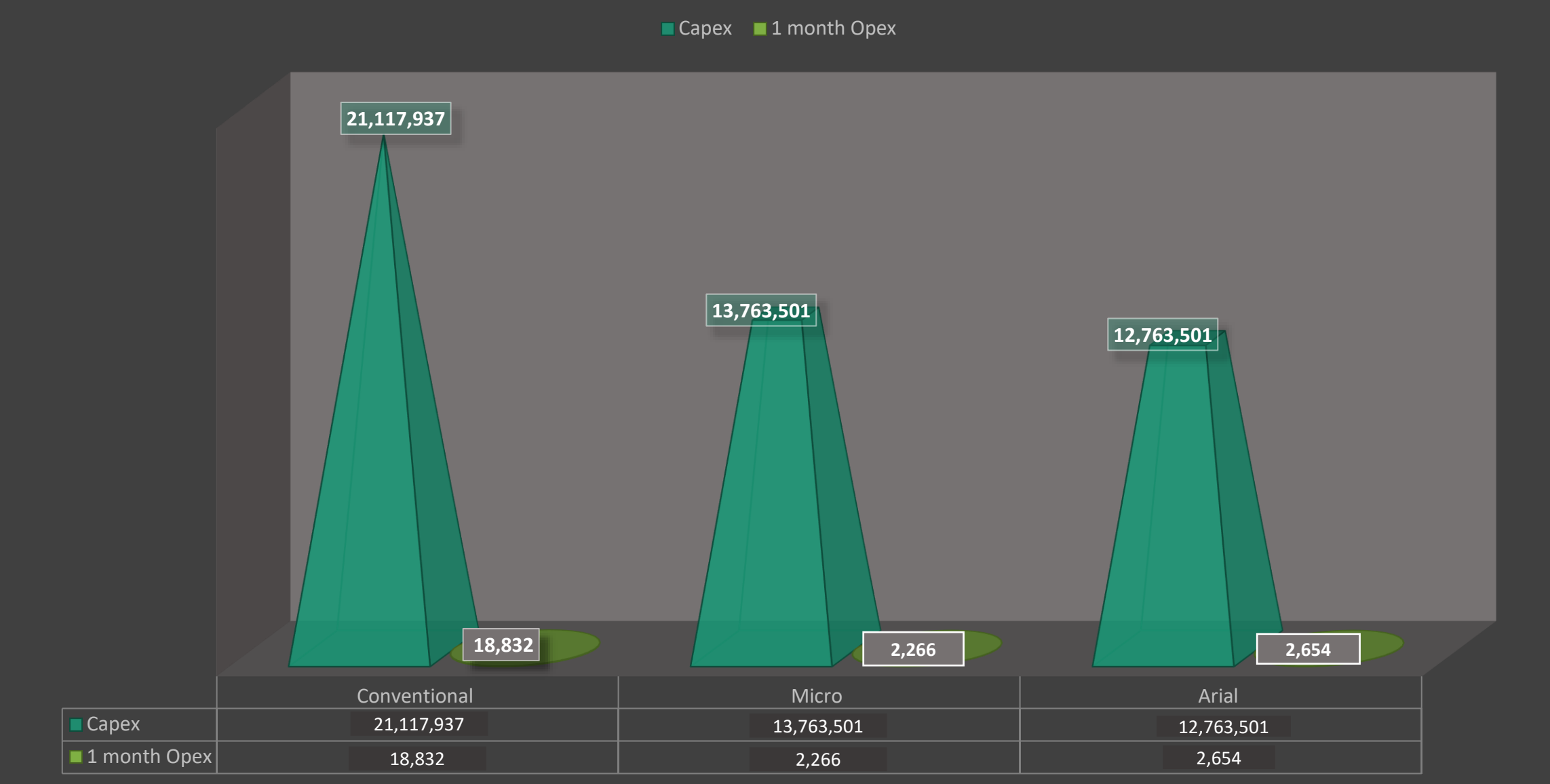
New Area

Segment	Core Requirement	Fiber type	Fiber (OD)	HDPE Duct Type	Duct (OD-ID)	Duct Way	Duct Type
Co-HH (Backbone)	2*144	ABC	8.0 ± 0.2	Micro duct	14/10	4-way	Square/Hexa
HH to FDH	24	ABC	5.2 ± 0.2	Micro duct	12/8	2-way	Flat (If 4-way-Sqr)
FDH to M-FAT	24	ABC	5.2 ± 0.2	Micro duct	12/8	7-way	Flat/Hexa
M-FAT – FAT (Plot)	6/12	ABC	2.3 ± 0.2	Micro duct	7/3.5	4-way	Flat/Linked/Hexa
Co-HH (Backbone)	1*288	ABC	10.3 ± 0.2	Micro duct	16/12.5	4-way	Square/Hexa

Deployment Challenges



Financial Difference between Conventional Vs Micro FTTx (Capex & Opex)



NB: All values are calculated in USD\$.

Conclusions

In terms of bit rate, XGPON technology is the natural evolution for GPON networks, but the need for larger bandwidth will lead operators to evolve directly to NG-PON2. However, coexistence with current GPON networks, technology and cost of optical components will be determining factors.

