South Asian Network Operators Group

Migration of TDM Network into NGN for the Fixed Wireline Access Network

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Outline

- Introduction
  - Objectives
- NGN Overviews
- Case Study- Nepal Telecom (NT) Access Network
- Conclusion

Introduction

- Demand of Bandwidth
- Present Access Network Technologies
- Limitations of Cu wire access network
  - TDM Technologies
  - (4-6.3)Km Cu distance from exchange
  - 9.5 dB transmission loss and durability of Cu wire
- High Speed Cu Access Network Technologies
  - ADSL+2 (24Mbps downstream, 1.5 Mbps upstream)
  - Oldage access network infrastructure
  - Network Management Costly
  - Bottleneck of Bandwidth
- Future Access Network Bandwidth Requirement

Services	Bandwidth Consumption
SDTV	2 Mb/s per channel
HDTV	8 Mb/s per channel
3D SDTV	63 Mb/s per channel
3D HDTV	187 Mb/s per channel
Basic HIS	5 Mb/s average
Gaming	10 Mb/s average
Multimedia surfing	10 Mb/s average
Video-conf. and learning	3 Mb/s per session
Telecommuting	4 Mb/s average
Voice-over-IP	110 Kb/s

Downstream Bandwidth requirements for future access network *[Urban et al., 2009]*

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- Fiber based Access Technologies
  - PON (FTTH, FTTB and FTTC)
  - Economically not viable
- Need of Migration from TDM network to IP Network
  - NGN is one of the promising solution
  - NGN decreases the CAPEX and OPEX of network infrastructure *[Ali Amer, IEEE]*
  - NGN increases revenues *[Ali Amer, IEEE]*

Objectives

- To migrate from TDM network to IP network and to address the challenges issues and network scenarios in the optical access network at NT

Outline

- Introduction ☑
- NGN Overviews
  - What is NGN?
  - Why transformation to NGN?
  - Principle of NGN
  - Architecture Layer of NGN
- Case Study- NT Access Network
- Conclusion

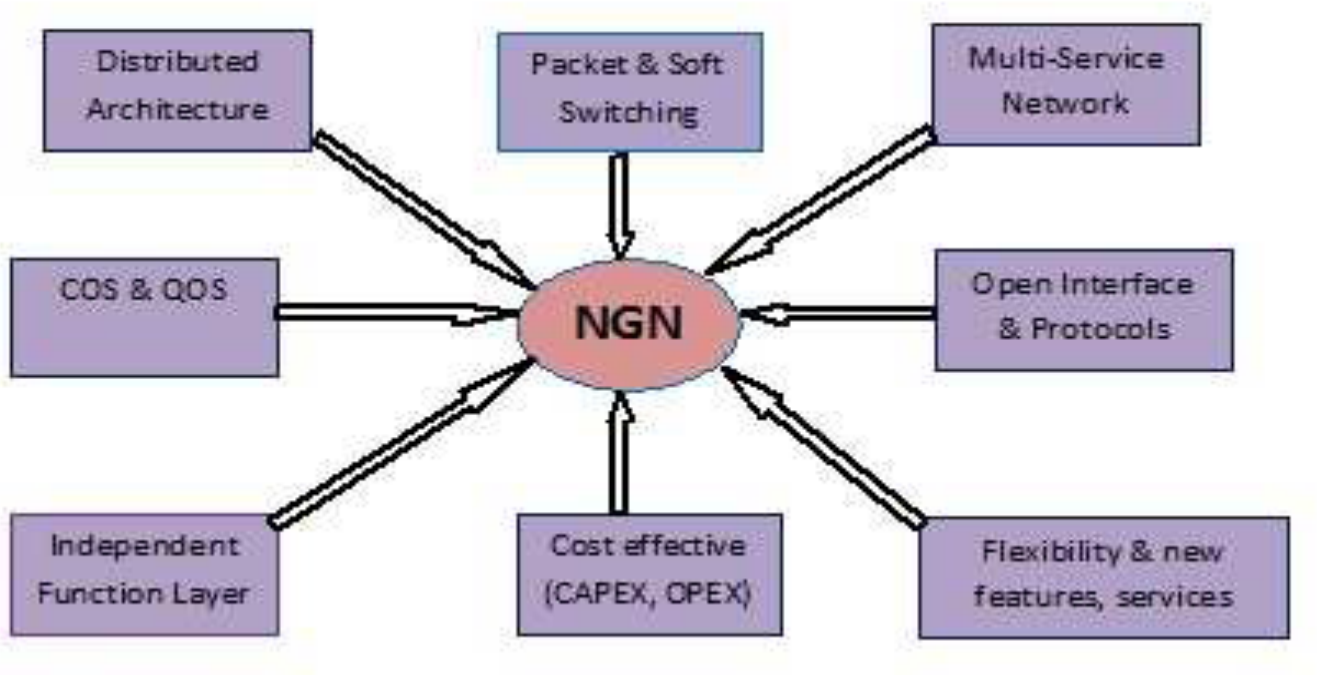
What is NGN?

- Telecommunication operator is migrating from circuit switched network into packet switched network with different fashion as:
  - Overlay with TDM network (requires softswitch, media gateways *[Ladan and Yari, 2008])*
  - Replace TDM network by NGN (existing switch replaced by IP switch *[Ladan and Yari, 2008])*
  - Upgrade TDM by NGN (requires introduction of IP core network, IP replacements of TDM trunks at each switch and IP Card provisioning *[Ladan and Yari, 2008]*)
- This new approach is NGN which enables network operator to migrate towards broadband services
- The ITU defined the NGN as a packet based network able to provide services including telecommunication services and able to make use of multiple broadband, QOS enabled transport technologies and in which service related function are independent from underlying transport related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users *[ITU-T Recommendation Y. 2001, 2004].*

Why Transformation to NGN?

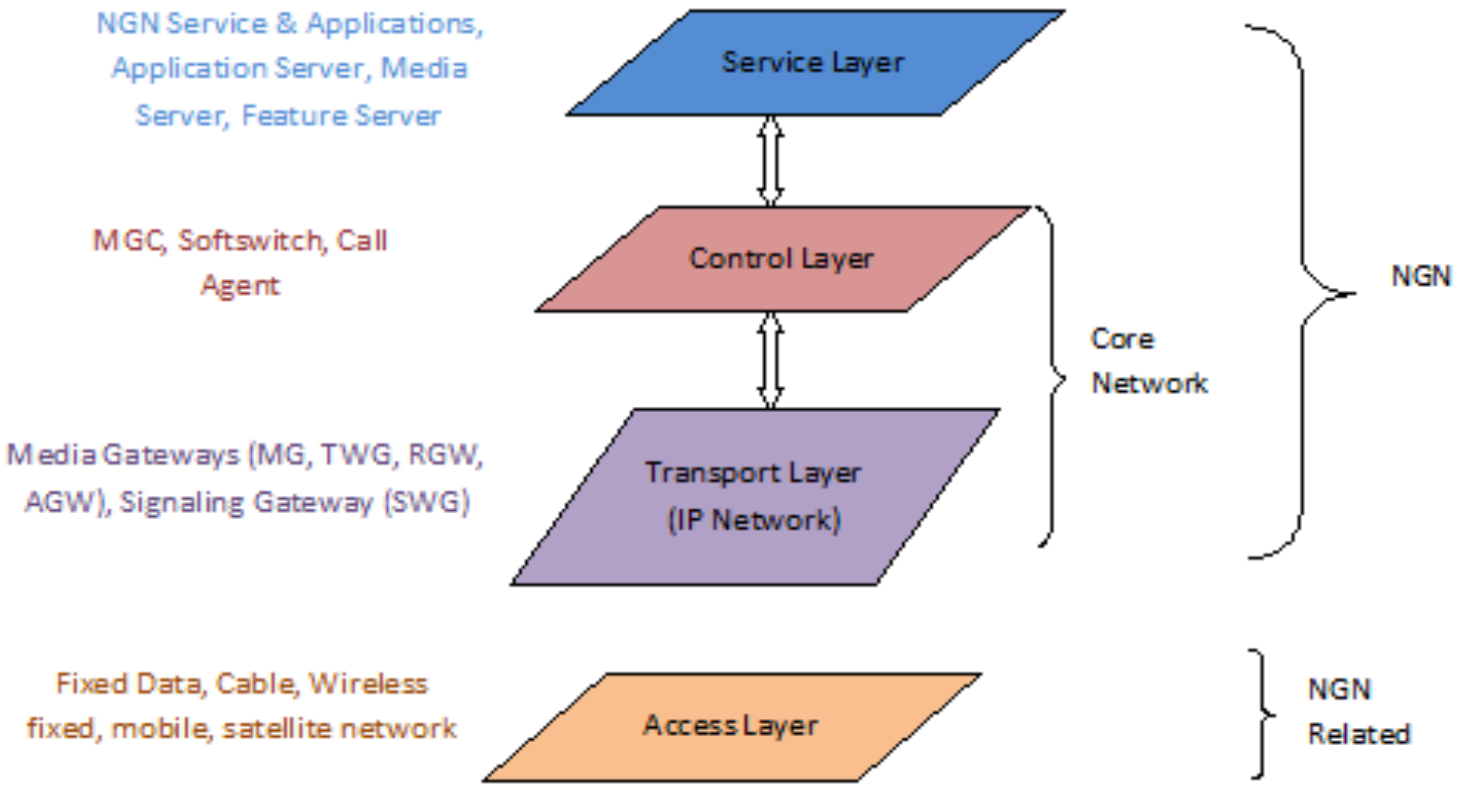
- Bottleneck of Bandwidth for multiservice network
- Obsolete of V5.2 equipment
- Oldage access network infrastructure
- Operation and maintenance cost
- Reduction on capital and ongoing cost
- Reduction in depreciation of Cu wire

Principle of NGN



Principle of NGN *[Pavol Podhradsky, 2004]*

Architecture Layer of NGN



Architecture Layer of NGN *[Tomaz and Spela, 2009]*

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Case Study-NT Access Network

- Deploying 80 and 338 MSAN of Huwaei and ZTE Vendors of 100, 500 and 1000 port capacity
- Future Target of Deployment 1130
- Optical fiber or in some cases radio to MSAN and from MSAN the Cu network overlay in existing network or new secondary Cu network in new sites
- Can provide the quality of broadband services upto 2.048 Mbps (based on radial Distance of Cu network – 800 meters)
- Secondary network estimation based on demand sites and different port capacity is assigned into POTS (only for voice services), DSL (only for data services) and Combo (both voice and data services)
- The bandwidth for voice is assumed that 9% users are connected at a time and DSL is assumed that 33% users are connected at a time with a traffic scaled factor of 1.25 erlang

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Node Type	Equipped Ports				
	POTS Only	POTS + DSL	DSL Only	Total POTS	TOTAL DSL
100	48	16	16	64	32
500	240	80	80	320	160
1000	480	160	160	640	320

Node Chasis Type and Card Configuration *[ANPD-NT]*

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SN	Site	Node Chassis Capacity				Total Node	Total POTS	Total DSL	Total Combo	Total Port	BW requried for voice (Mbps)	BW requried for DSL (Mbps)	Total Bandwidth in Mbps
		500 Total	500-ID	500-OD	1000								
1	Bhandara	4	3	1	0	4	960	320	320	1600	13.50	132.00	145.50
2	Bharatpur	10	8	2	1	11	2880	960	960	4800	40.50	1,584.00	1,624.50
3	Gitanagar	5	4	1	0	5	1200	400	400	2000	16.88	41.25	58.13
4	ParsaDhap	1	1	0	0	1	240	80	80	400	3.38	8.25	11.63
5	Janakpur	0	0	0	1	1	480	160	160	800	6.75	66.00	72.75
6	Yedukoha	1	1	0	0	1	240	80	80	400	3.38	8.25	11.63
7	Sabaila	1	1	0	0	1	240	80	80	400	3.38	8.25	11.63
8	Nagrain	1	1	0	0	1	240	80	80	400	3.38	8.25	11.63
9	Bijalpura	1	1	0	0	1	240	80	80	400	3.38	8.25	11.63
10	Birgunj	8	6	2	1	9	2400	800	800	4000	33.75	1,320.00	1,353.75

Bandwidth Calculation for each site *[ANPD-NT]*

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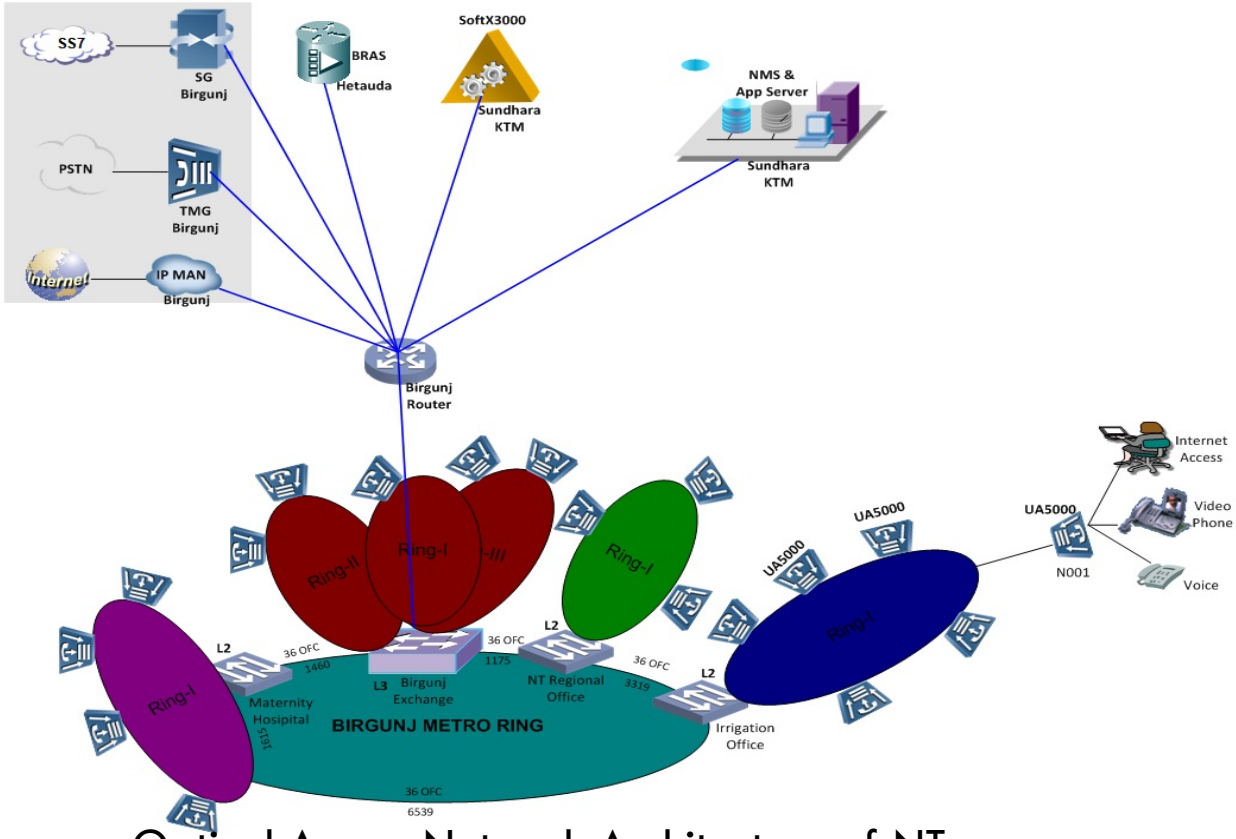
- Ring protected star topology architecture



Optical Access Network Architecture of NT

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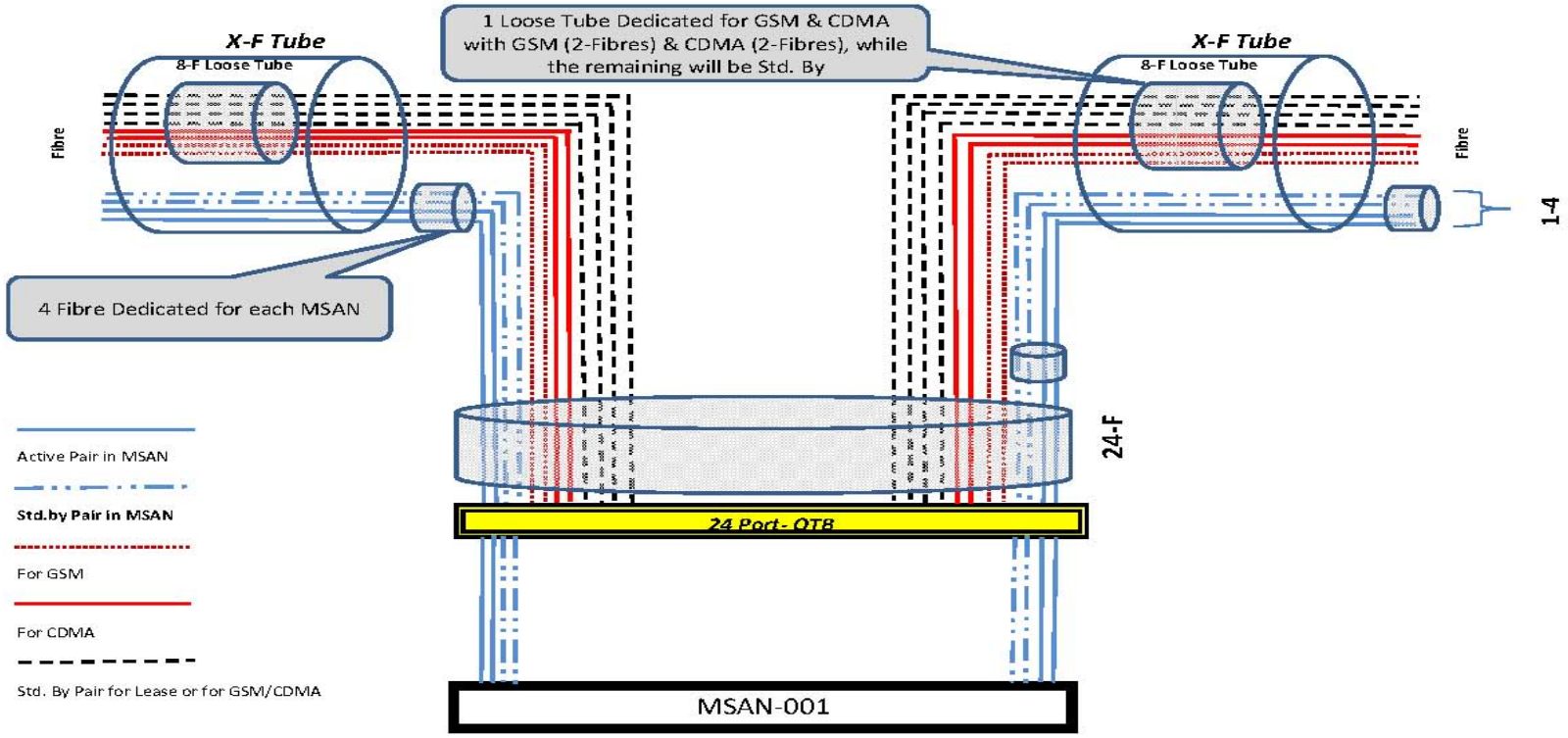

Fiber Jointing of MSAN *[ANPD-NT]*

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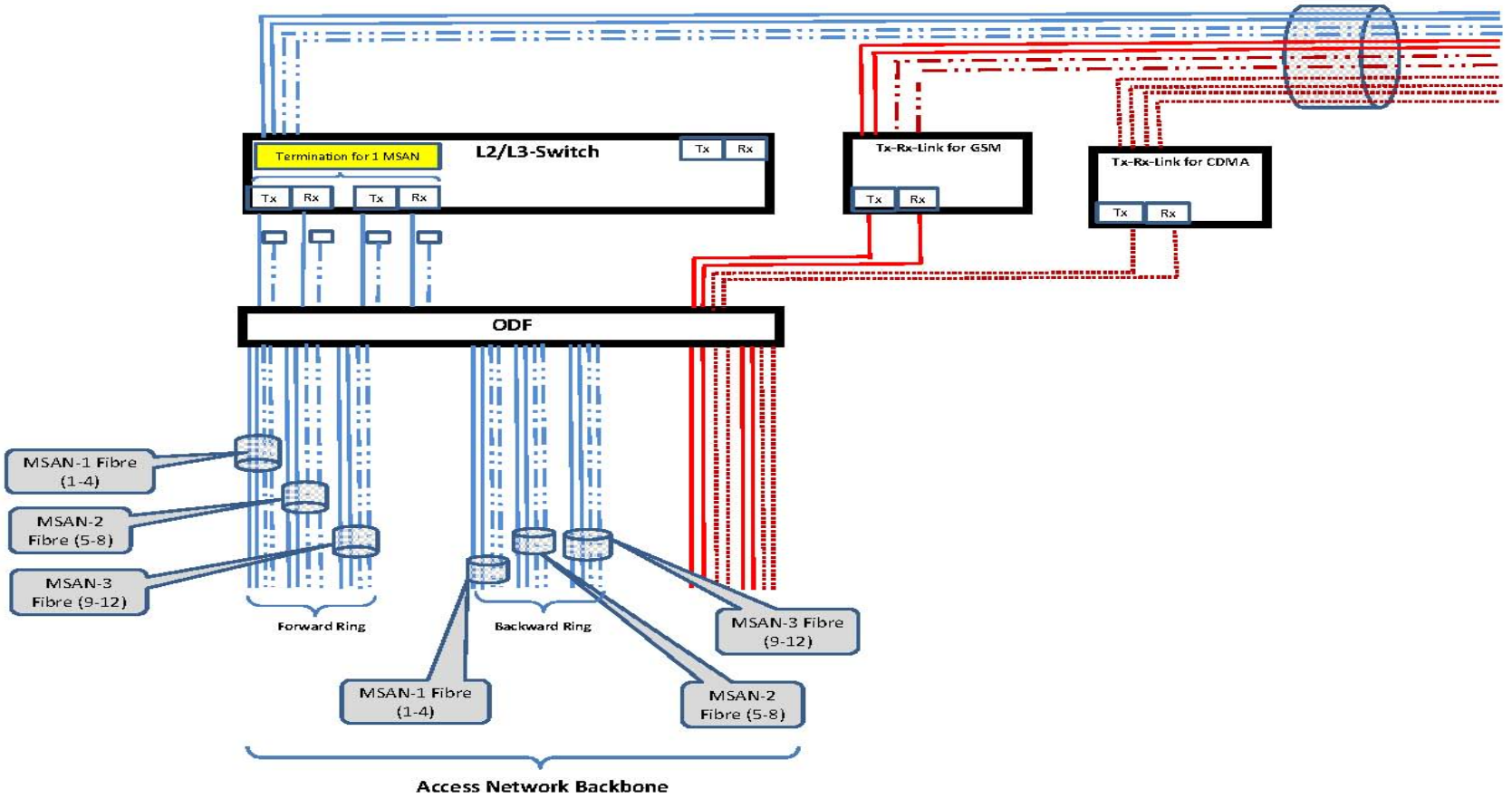

Schematic diagram of optical access network backbone *[ANPD-NT]*

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Conclusion

- NGN deployment is in early stages at NT
- Purpose of migration is to reduce capital and ongoing cost and depreciation of various copper network
- Can provides the users upto 2.048 Mbps bandwidth for broadband service

Questions?

Thank you for your attention!!