ITU-T Workshop on Bridging the Standardization Gap and Interactive Training Session

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NGN Deployment and Its Experience

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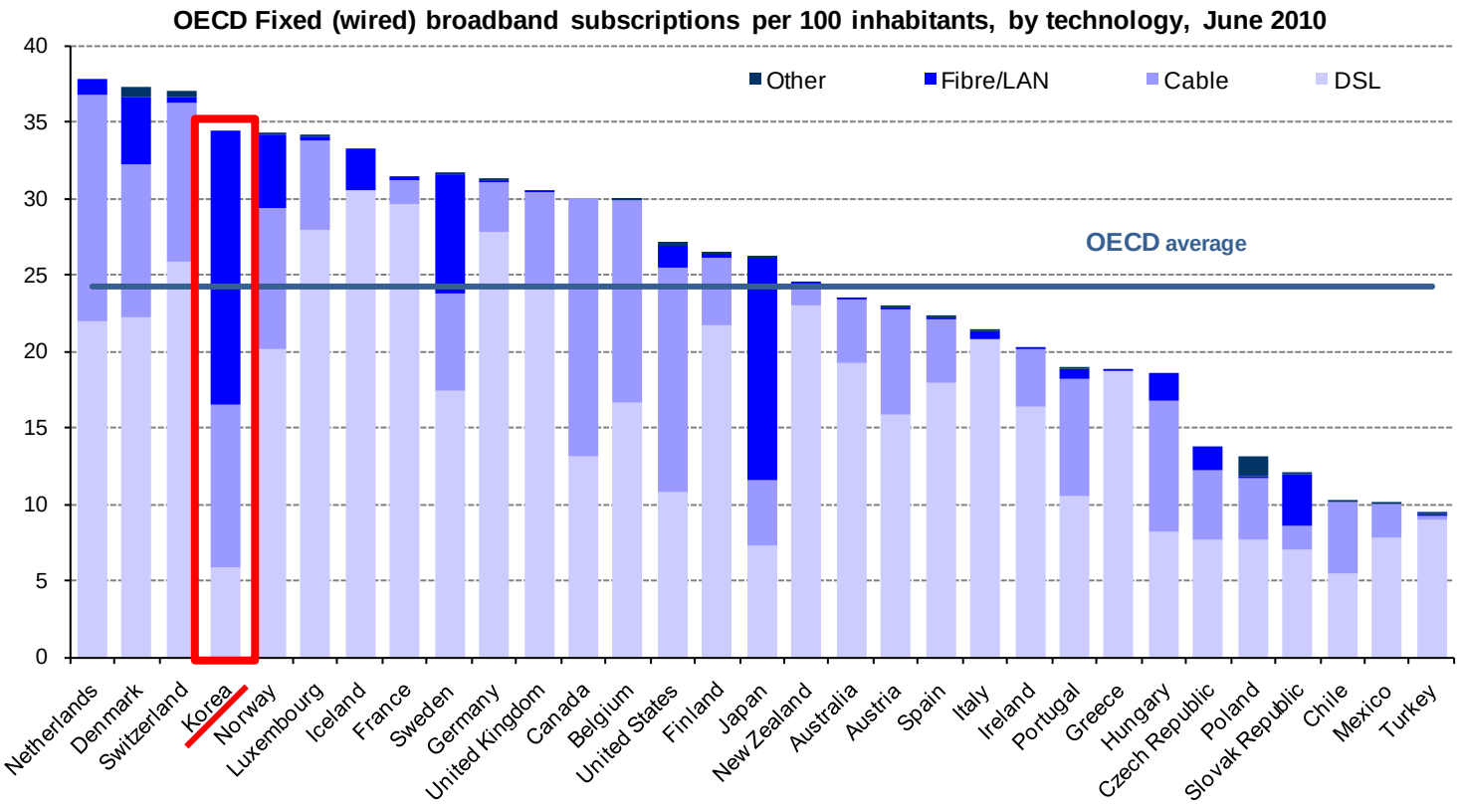
Agenda

- Introduction
- KT NGN Architectures
- KT NGN Services
- Considerations of NGN Deployment

Broadband status update : Korea

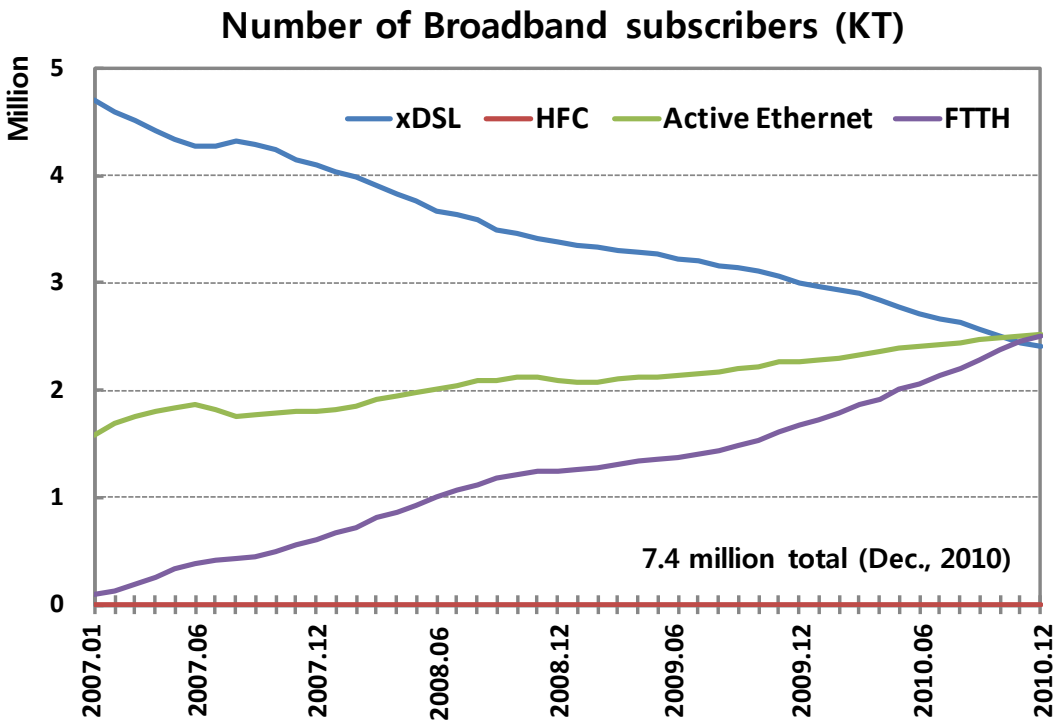
- **Korea, "Broadband wonderland"**
  - **34.4** broadband subscription per 100 inhabitants (OECD, June 2010)
    - Household penetration exceeded 100% in late 2010 (17.2M subscribers / 17.1M households)
  - **55%** of broadband users are enjoying super-speed FTTH or active Ethernet services



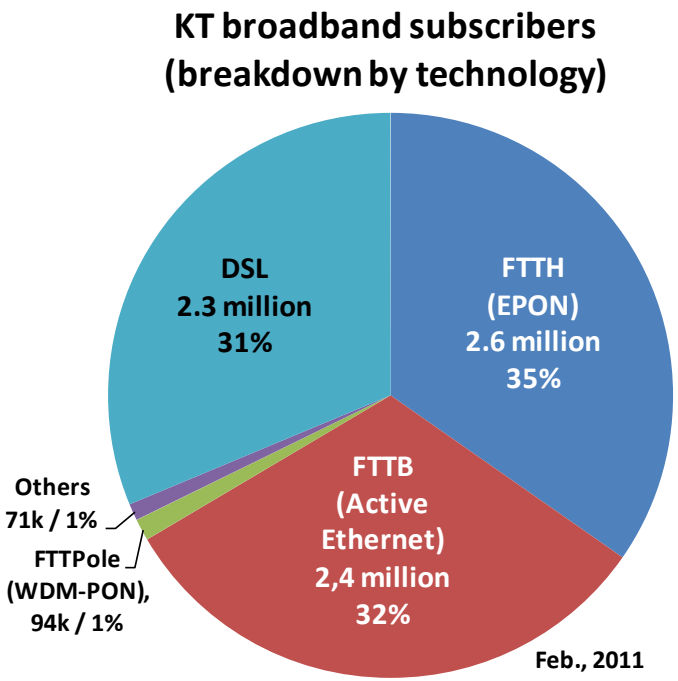
Source: OECD

Broadband status update : KT

- **In late 2010, FTTH became the major technology of KT's broadband network**
  - DSL lines are being faded out, rapidly replaced by FTTH and FTTB
  - FTTH for SFU(single family unit) area : **IEEE 1G-EPON**
  - FTTB for MDU(multi dwelling unit) area : **Active Ethernet**
  - 100Mb/s service coverage : **90.1%** (Estimated, Dec. 2010)

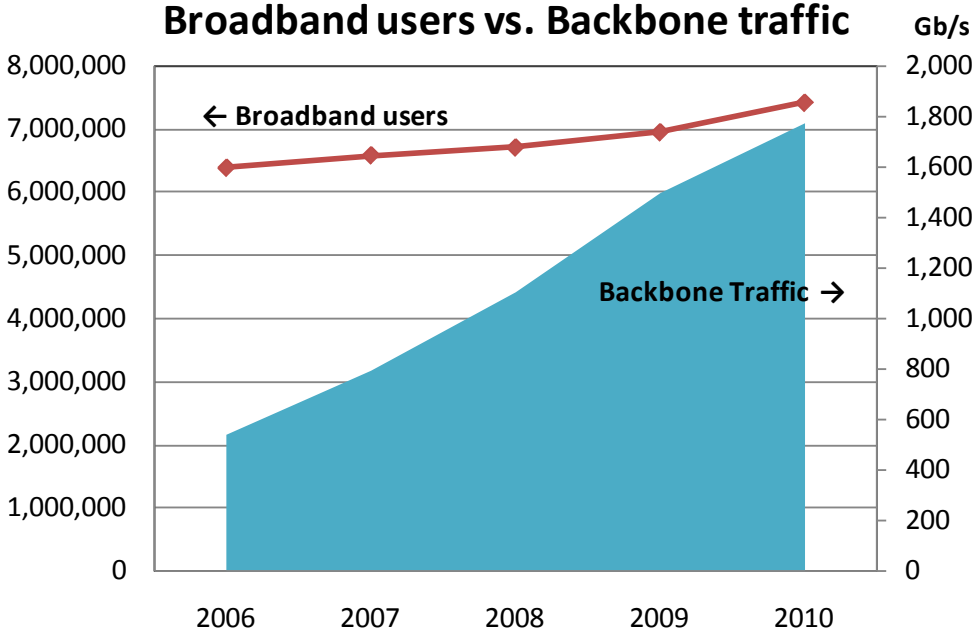


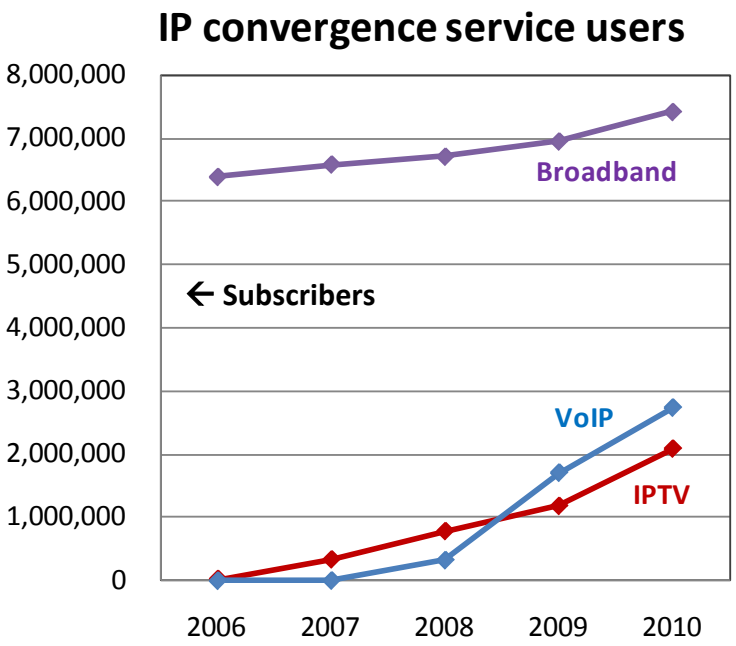
Source : Korea Communications Comission



Traffic growth

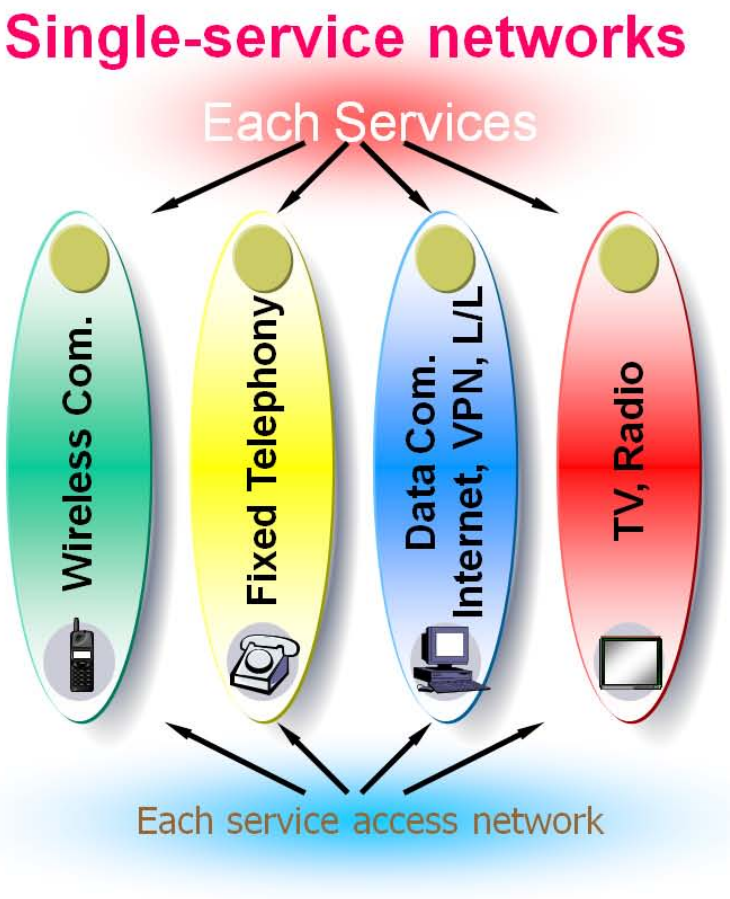
- **Backbone traffic has increased 3.3 times during the past 5 years**
  - For the same period, our broadband customers increased only by 16%
    → Dilemma of a decoupling in revenue and traffic
- **Spreads of new IP-based convergence services**
  - Customer bases of IPTV and VoIP are constantly growing

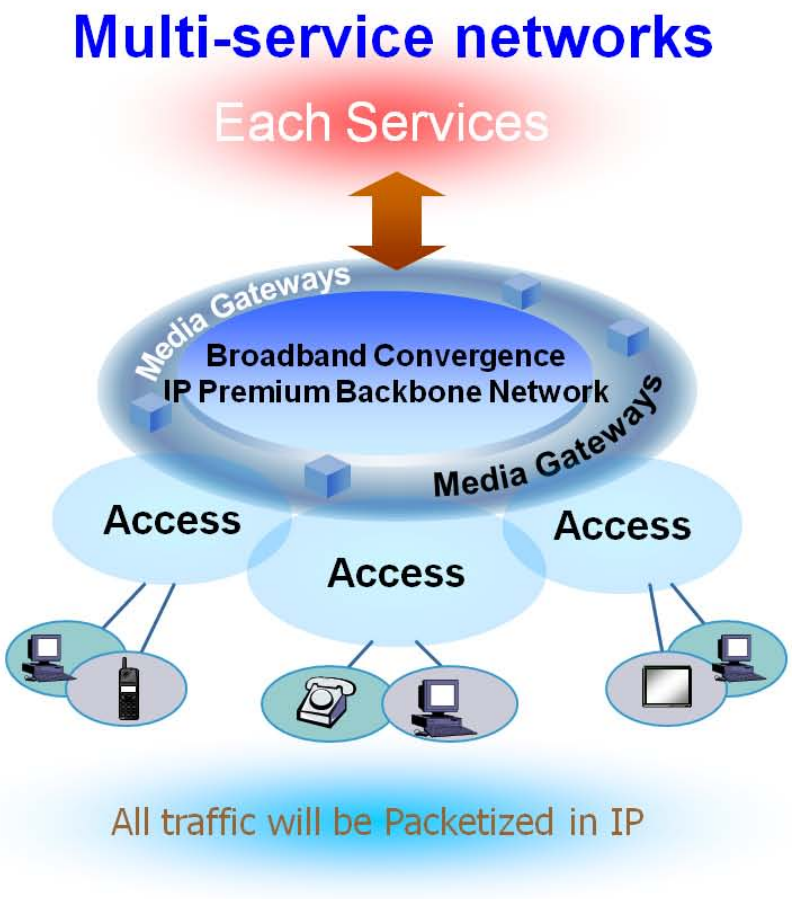




NGN concept

- IP Network which can provide various emerging services including voice, data and multimedia services over a single network.



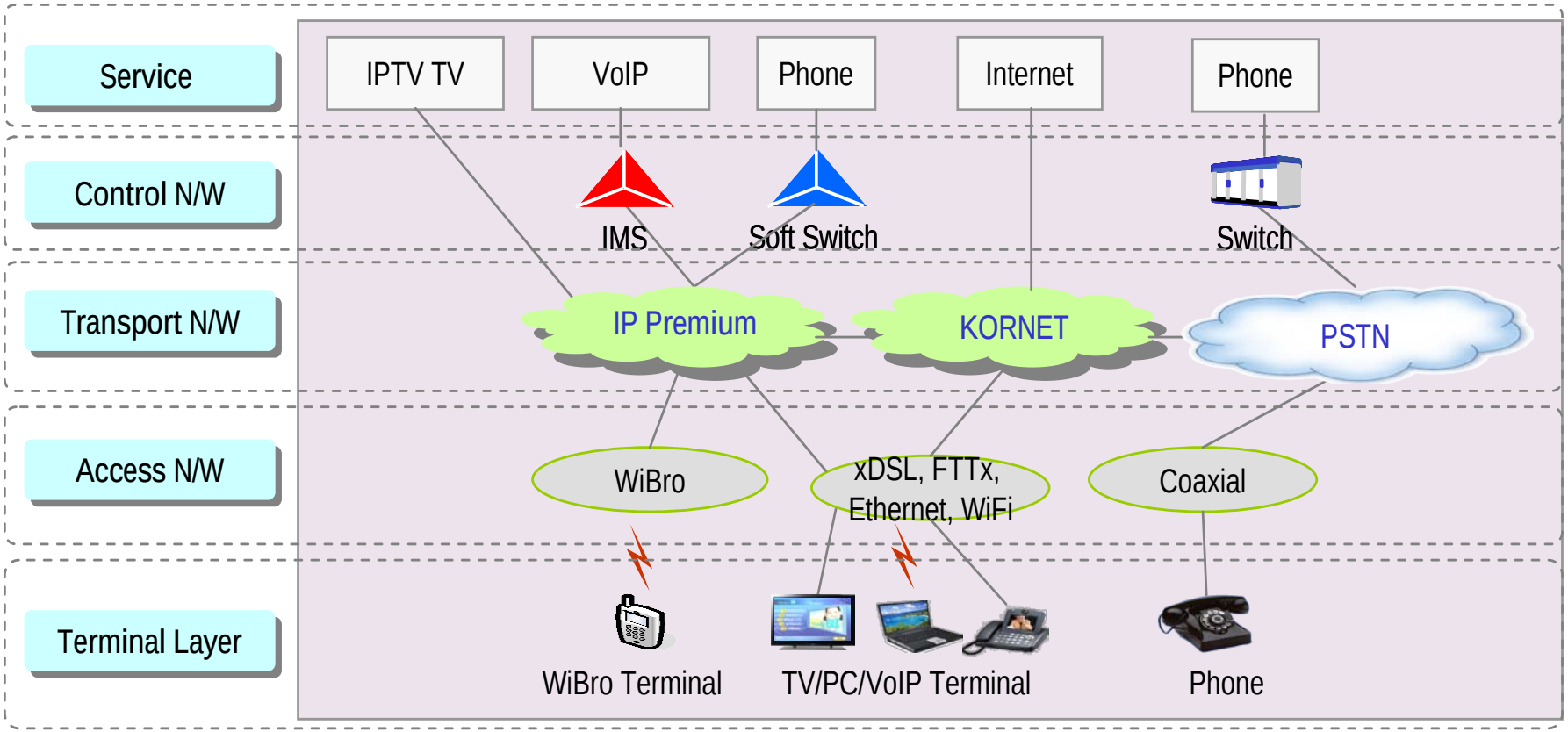


NGN goals

- New service infrastructure for more profit
- Integrated IP network architecture which will offer voice, data or multimedia broadcasting over a single network
- From voice-oriented service to high-quality multimedia services including high-quality voice, video, broadcasting and the like.
- Long-term cost-savings by introducing cost-effective hardware and developing in-house technological leverage

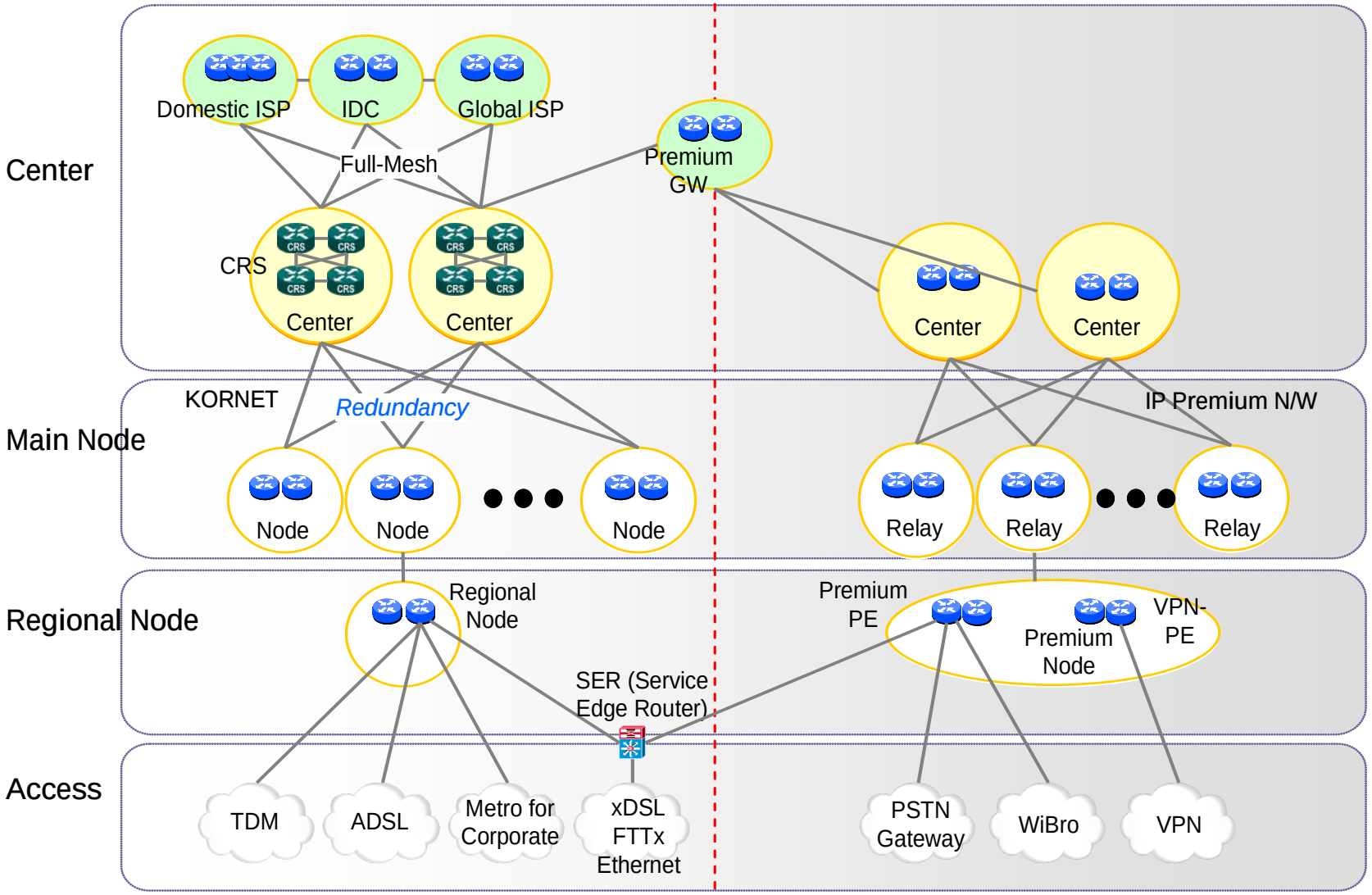
Architecture of KT-NGN

- **Divided into the IP Premium network and the KORNET network**
- **IP Premium network is a new backbone network for KT NGN**
  - IP/MPLS, QoS(Diffserv), Multicast(PIM-SM), High-availability



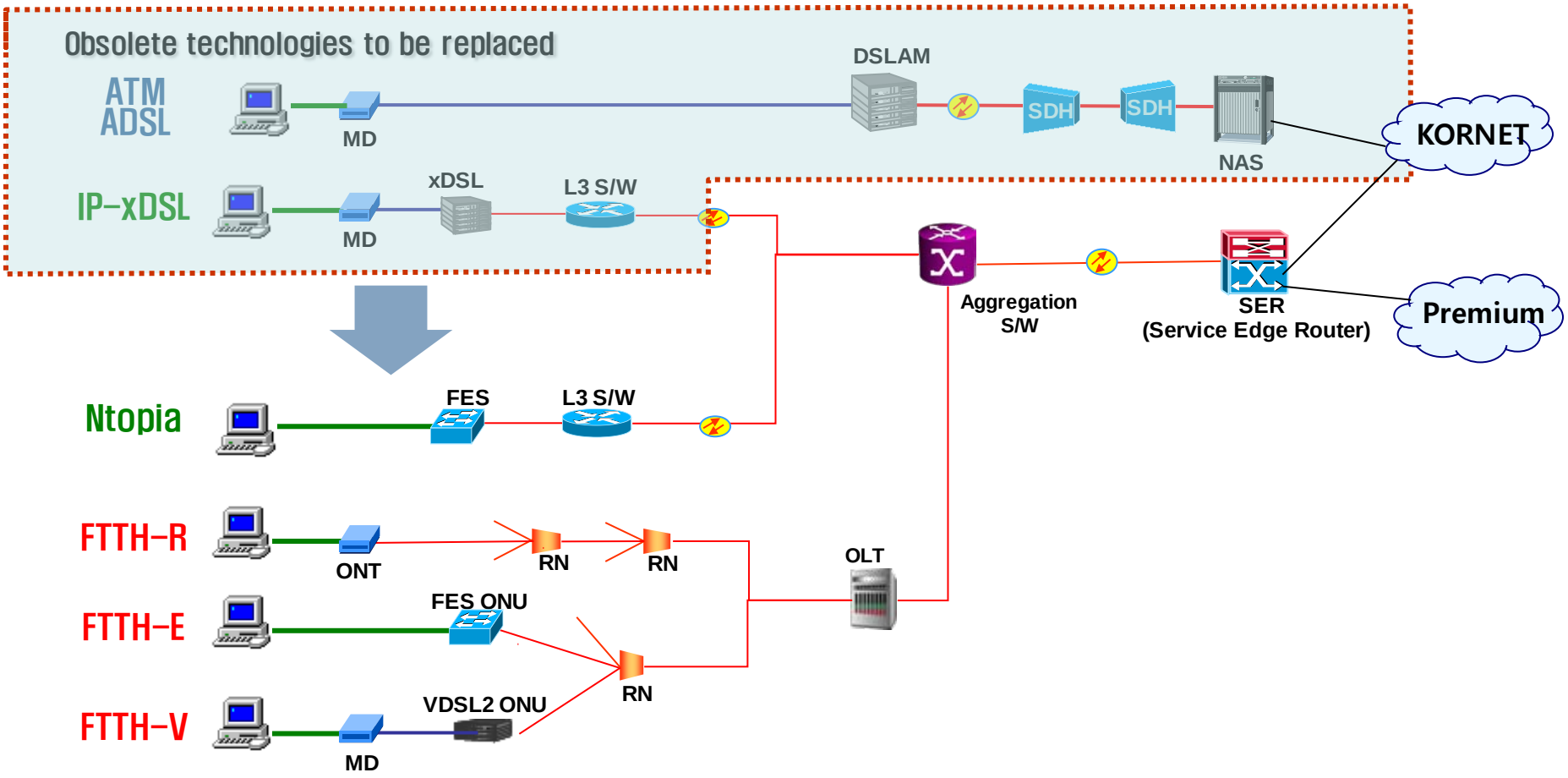
Architecture of KT-NGN Backbone Network

- **Star topology with two distinct centers in Seoul**



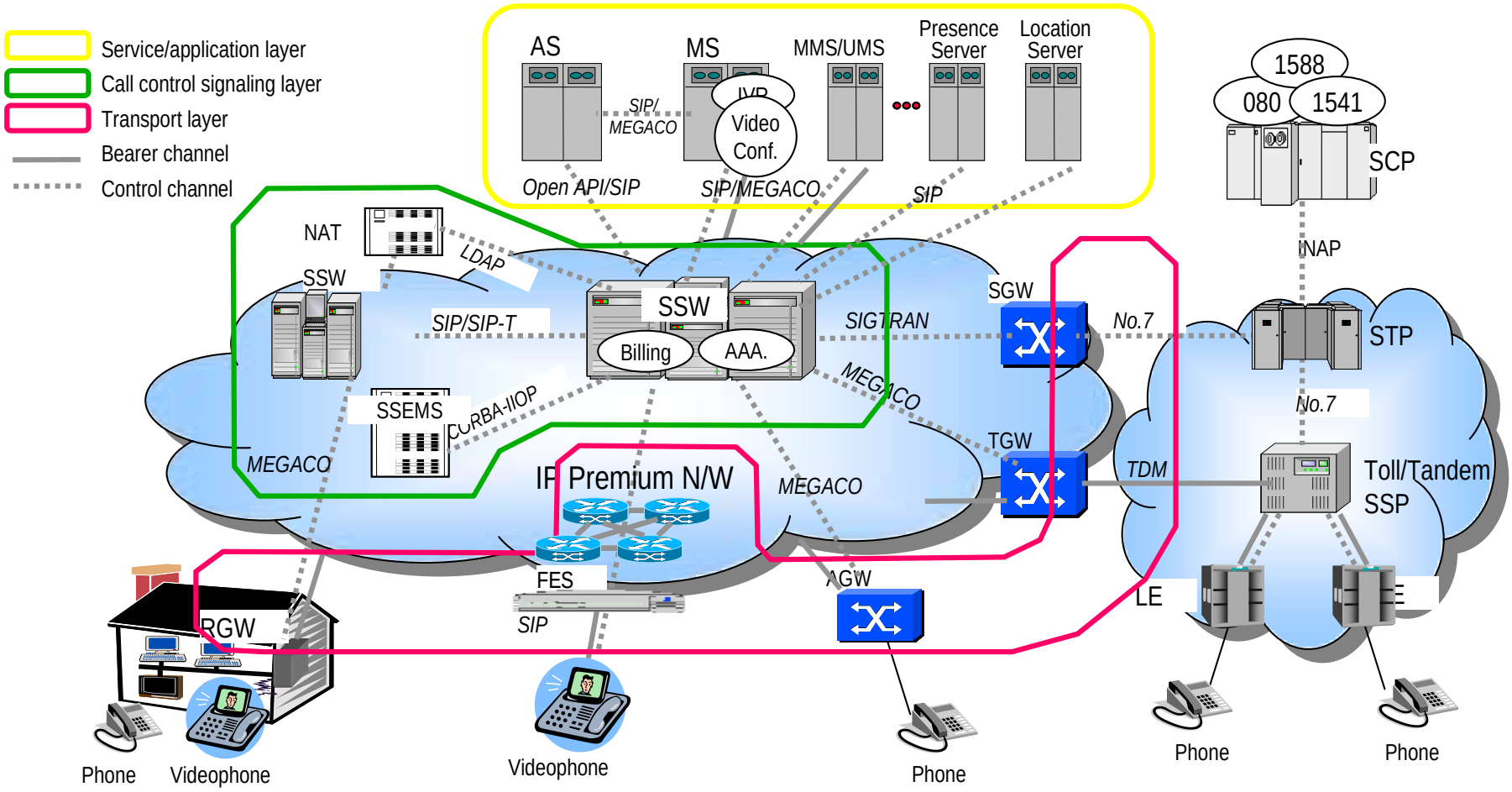
Architecture of KT Access Network

- DSL demands are becoming saturated
- Currently, FTTH has become a great part of KT access network



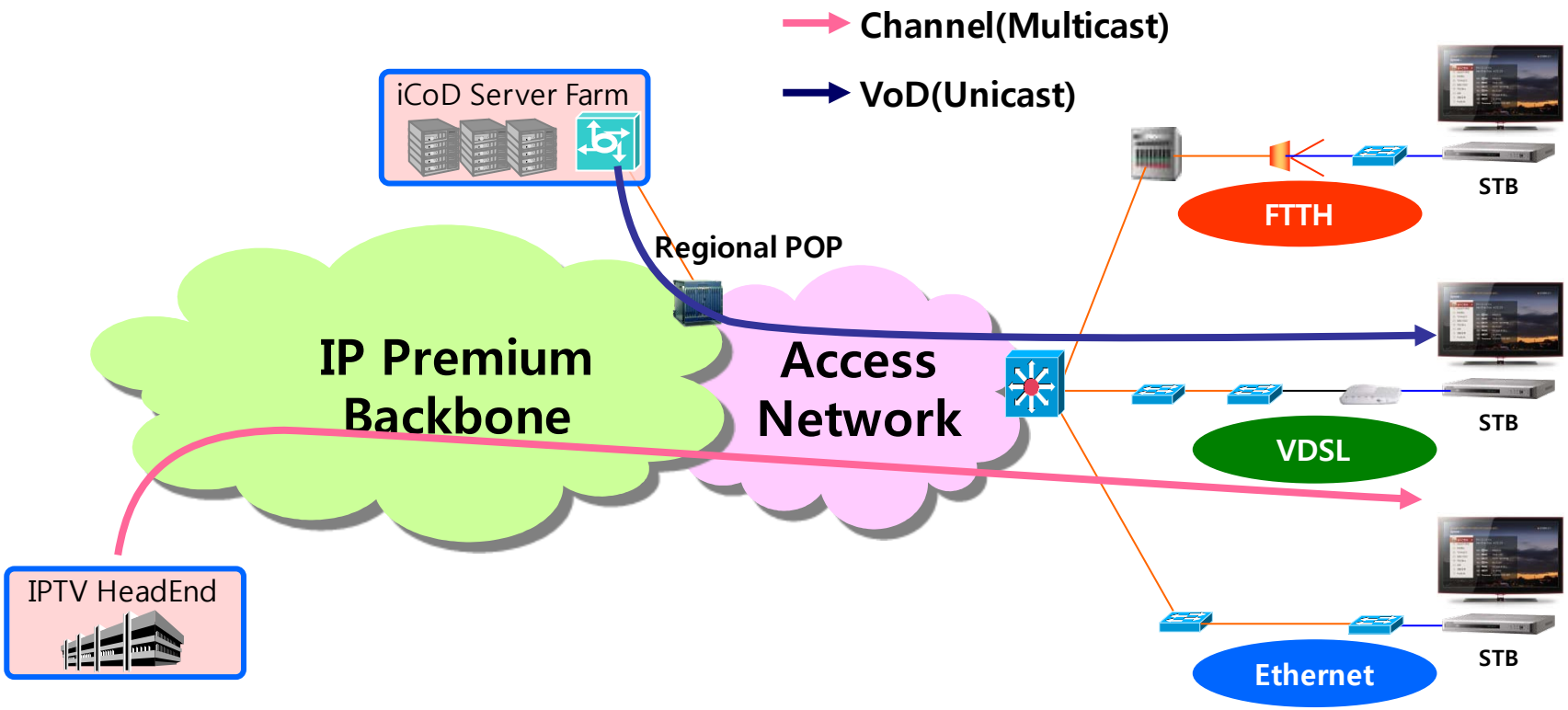
KT-NGN Service Architecture : Voice Call

- **PSTN voice traffic is transferred over the NGN.**
- **VoIP service offers diverse value-added services including video telephony, Internet fax and SMS**



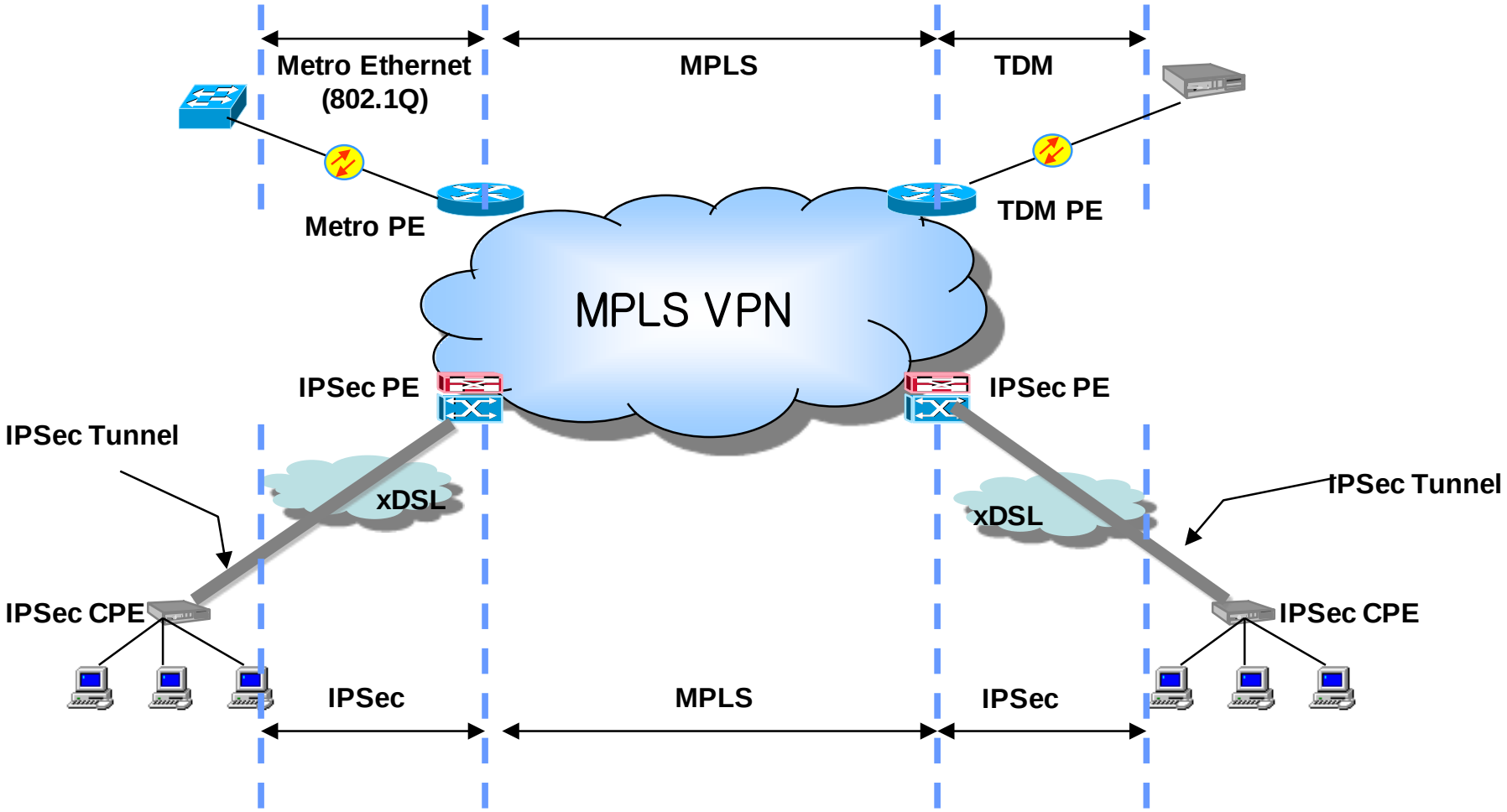
KT-NGN Service Architecture : IP-TV

- **New service that merged the strengths of TV and high-speed internet**
- **Provide IP-TV services under the brand name of “Olleh TV”**
  - Live channels : 300+
  - VoDs : 90,000+
  - Interactivities : information, entertainment, T-Commerce etc.



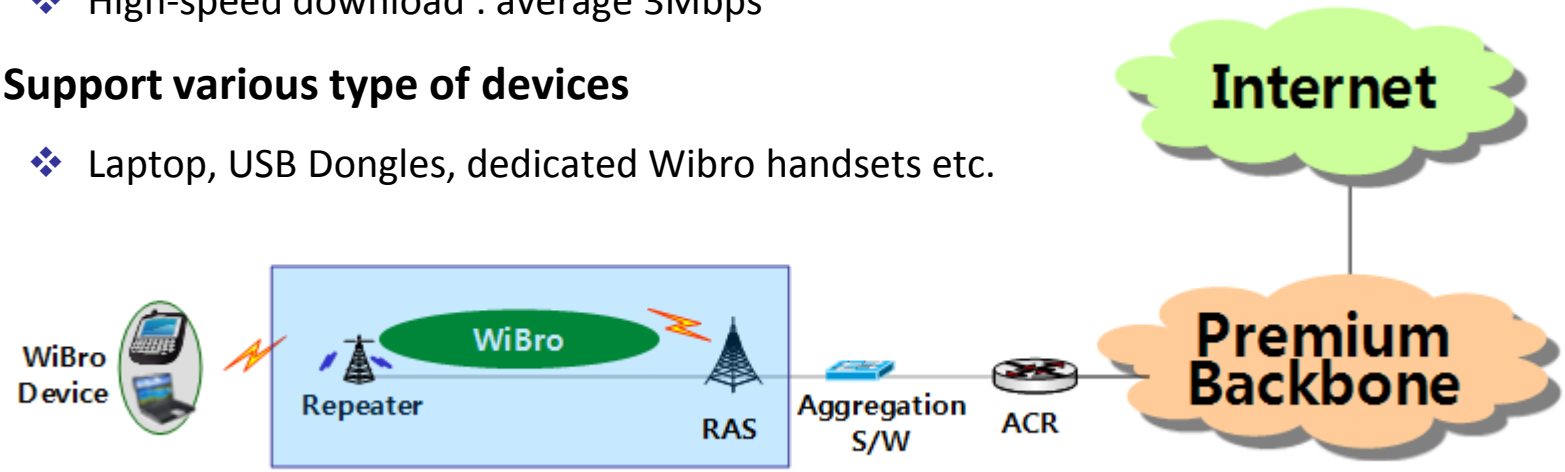
KT-NGN Service Architecture : VPN

- Provide MPLS VPN and IPSec VPN services for enterprise
- In addition, Multicast VPN and L2VPN(VPLS, VPWS) services were added in 2009

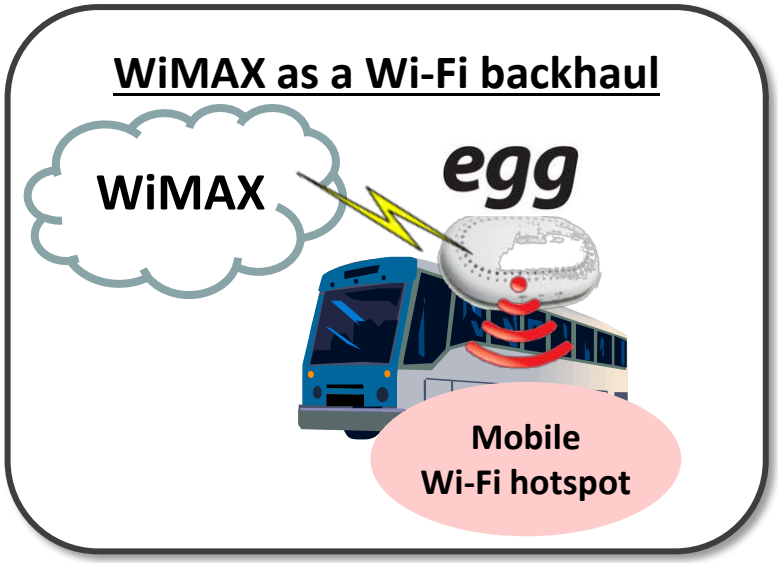


KT-NGN Service Architecture : Wibro

- **Wibro service developed for high-speed mobile internet**
  - High-speed upload : average 1.2Mbps
  - High-speed download : average 3Mbps
- **Support various type of devices**
  - Laptop, USB Dongles, dedicated Wibro handsets etc.



- **Mobile data offloading through mobile Wi-Fi hotspots**
  - egg : WiMAX-WiFi gateway



Considerations for NGN Backbone

- **Guarantee of reliability and stability of existing services**
  - How to deploy NGN without legacy services interruption
- **Meeting of new service requirements**
  - Mobile Internet, PSTN transformation, multimedia service
- **Consideration of the future evolution**
  - Should be considered service and network development strategies
- **CAPEX**
  - How to minimize the investment
- **OPEX**
  - How to minimize complexities in operation and management

NGN service requirements

Service	Requirements for Each Service	Network Requirements
Voice Service	• Guarantee PSTN-level QoS (e.g., less than DTD 600ms) • PSTN-level reliability • Guarantee differentiated transport based on priority • Security on signaling traffic	• Survivability • QoS • MPLS/VPN • Multicast • IPv6 • Service control • O&M • Security
IP-TV	• Multicasting (real-time broadcasting traffic transport) • Real-time transport / differentiated transport based on priority • Stability as a broadcasting station • Scalability to accommodate hundreds of channels	
Mobile WiMAX	• IPv6 and Mobile IP • QoS and strengthened network security	
VPN	• MPLS VPN and end-to-end QoS • Reliability of VPN service	

*DTD : Dial Tone Delay

Service Classification

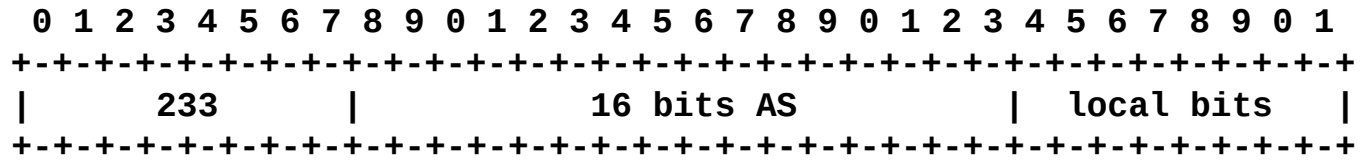
- QoS profile for KT NGN

Class	Code Number (IP ToS, MPLS EXP)	Serve For	Queuing Policy
GOLD	7	Reserved	Priority Queuing
	6	Routing protocol packet Voice traffic	
SILVER	5	Reserved	50% of remaining BW RED (Random Early Detection)
	4	IPTV-Multicast traffic	
BRONZE	3	IPTV-Unicast traffic	30% of remaining BW RED (Random Early Detection)
	2	data traffic	
BEST-EFFORT	1	Reserved	20% of remaining BW RED (Random Early Detection)
	0	Others	

Considerations for Multicast

Multicast address allocation

- For interoperable multicast channels, Should use 'GLOP' address(defined RFC 3180)
- GLOP address space : 233/8



- Example
  - KT KORNET ASN = 4766 = **00010010 10011110**

    18 158 ➔ 233.18.158.0/24

Multicast high-availability

- Static Join
  - Static IGMP Join on the edge routers
  - Provide a sub-second channel zapping time
- Fast Convergence
  - deploy IGP fast convergence for Multicast fast convergence
  - Tuning various timer settings : Carrier-delay, LSA delay, SPF delay, Mcast RPF update timer etc.

Considerations for Multicast(con't)

- **Multicast security**
  - Group range filtering : filtering improper multicast group except approved GLOP addr.
  - PIM register filtering : only approved source can register to RP
  - MSDP SA filtering : limitation for SA information
  - Multicast Route limit : limitation of maximum multicast route entry
  - BSR message filtering
- **Optimal RP positioning**
  - In KT practice , **RP == HE Router**
- **RP redundancy**
  - Dynamic RP vs. **Anycast RP**
- **Multicast traffic load balancing issue**
  - Based on source IP and Multicast group address

Other considerations

- **Routing policy**
  - Consider routing policy to maximize the operational convenience
    - BGP(Route Reflector), IGP(OSPF), MPLS(LDP)
- **Service migration to NGN**
  - How to transform PSTN to NGN without any interruption
- **Network scalability/stability**
  - How to eliminate single point of failure
  - How to deploy fast convergence to minimize routing failure time
- **Operation**
  - Standardization of operating process
  - Extensive training and education programs
  - Troubleshooting guidelines
- **Security**
  - How to prevent massive malicious traffic attacks

Question?

Thank You

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