Application requirement for 400GE in 10km and above distance

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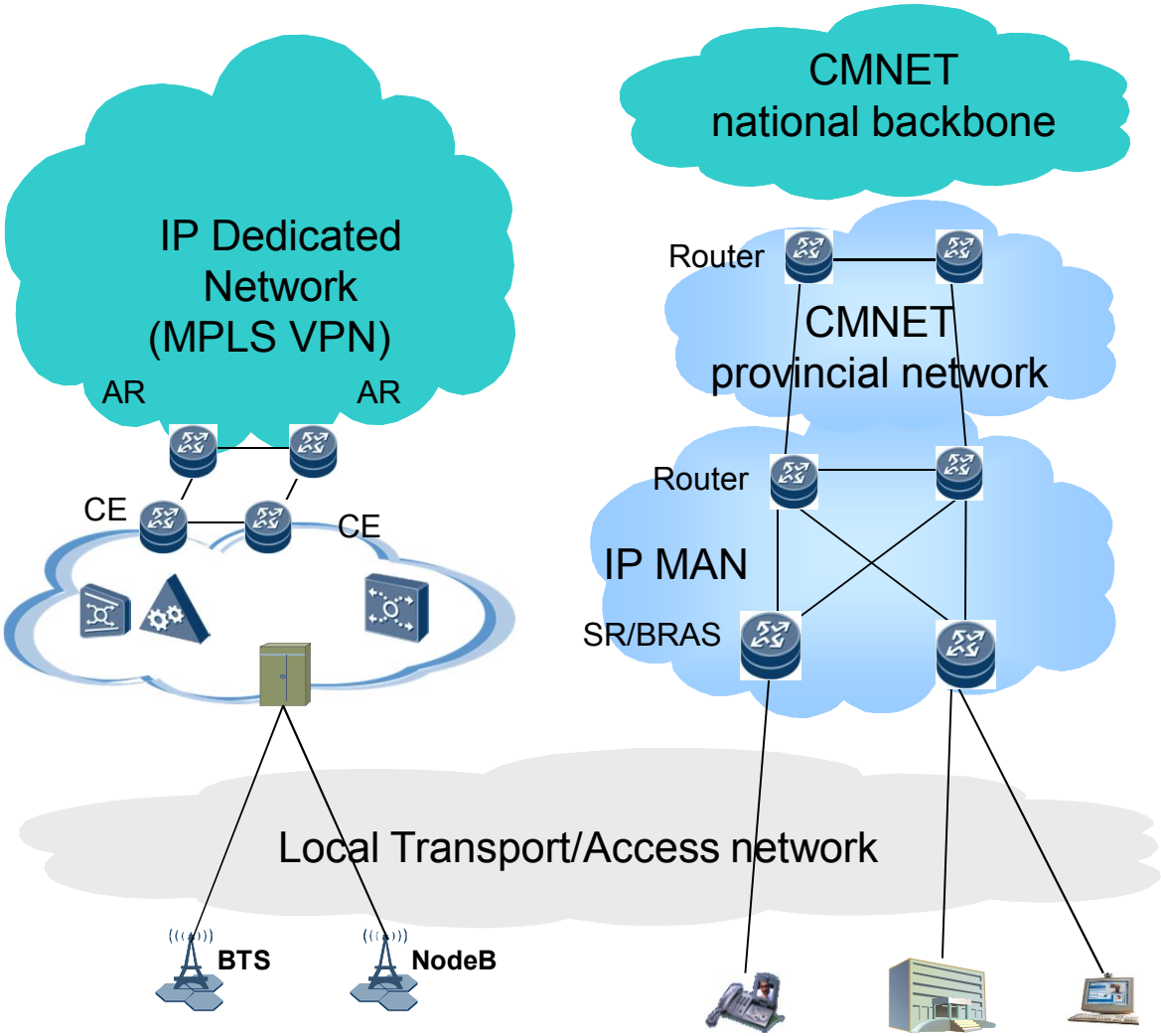
China Mobile IP Network Architecture

- China Mobile is one of the largest mobile network operators in terms of the number of subscribers, and has deployed two IP-based network for different services/subscribers.
  - CMNet(China Mobile Internet): Internet service with 2-level structure including national IP backbone and provincial network.
  - IP Dedicated Network: Internal service



Traffic in China Mobile Network

- The bandwidths of **China Mobile**' networks had been increasing more rapidly by 8 times from 5 Tb/s to 40 Tb/s during the period from 2009 to 2012 due to the boom of 3G mobile dedicated services. Along with the massive deployment of Time Division-Long Term Evolution (TD-LTE), a higher growth rate could be expected over the next few years.
- To meet the bandwidth demand, China Mobile will roll out 100Gb/s from backbone to metro step by step. The predicted volume that will be introduced each year is illustrated in Figure 1.

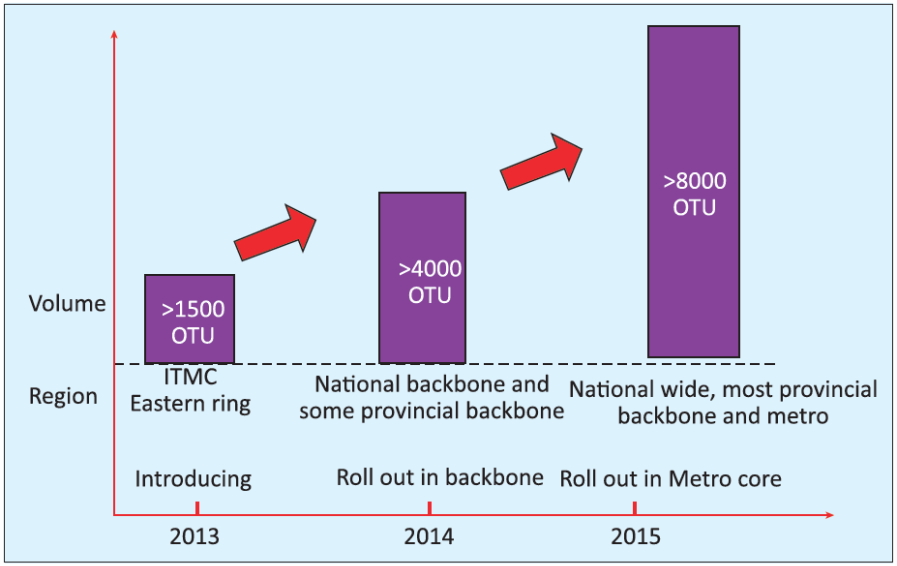


Fig.1 *China Mobile's Roadmap for 100Gb/s deployment*

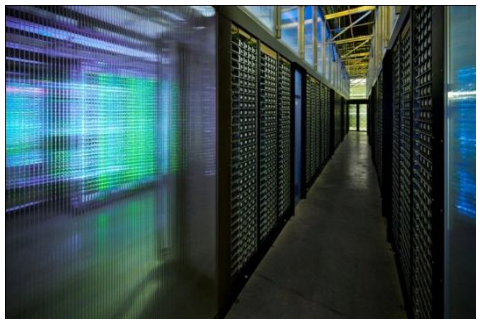
Requirements and Strategy of China Mobile on 100-Gb/s Based Wavelength Division Multiplexing Systems
http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=06506928
In 2013Q1

The Demand of 400GbE Interface

- Nx100GbE LAG link will be deployed in backbone by China carrier network to meet the exploding bandwidth requirement in the next several years!

LTE
Mobile Internet

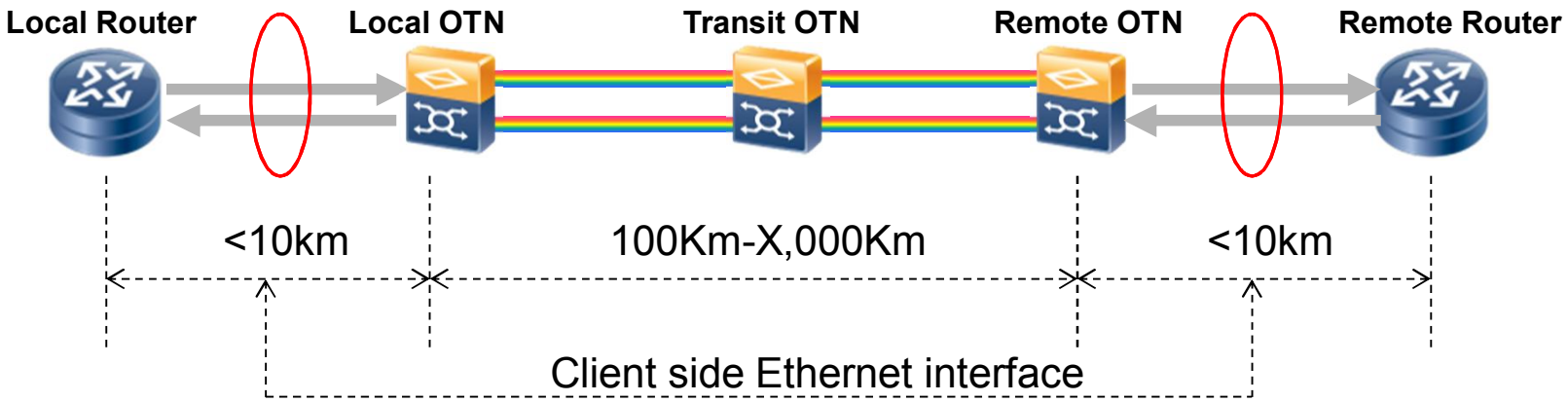
Online Video
SNS



Data center

Cloud
Compute

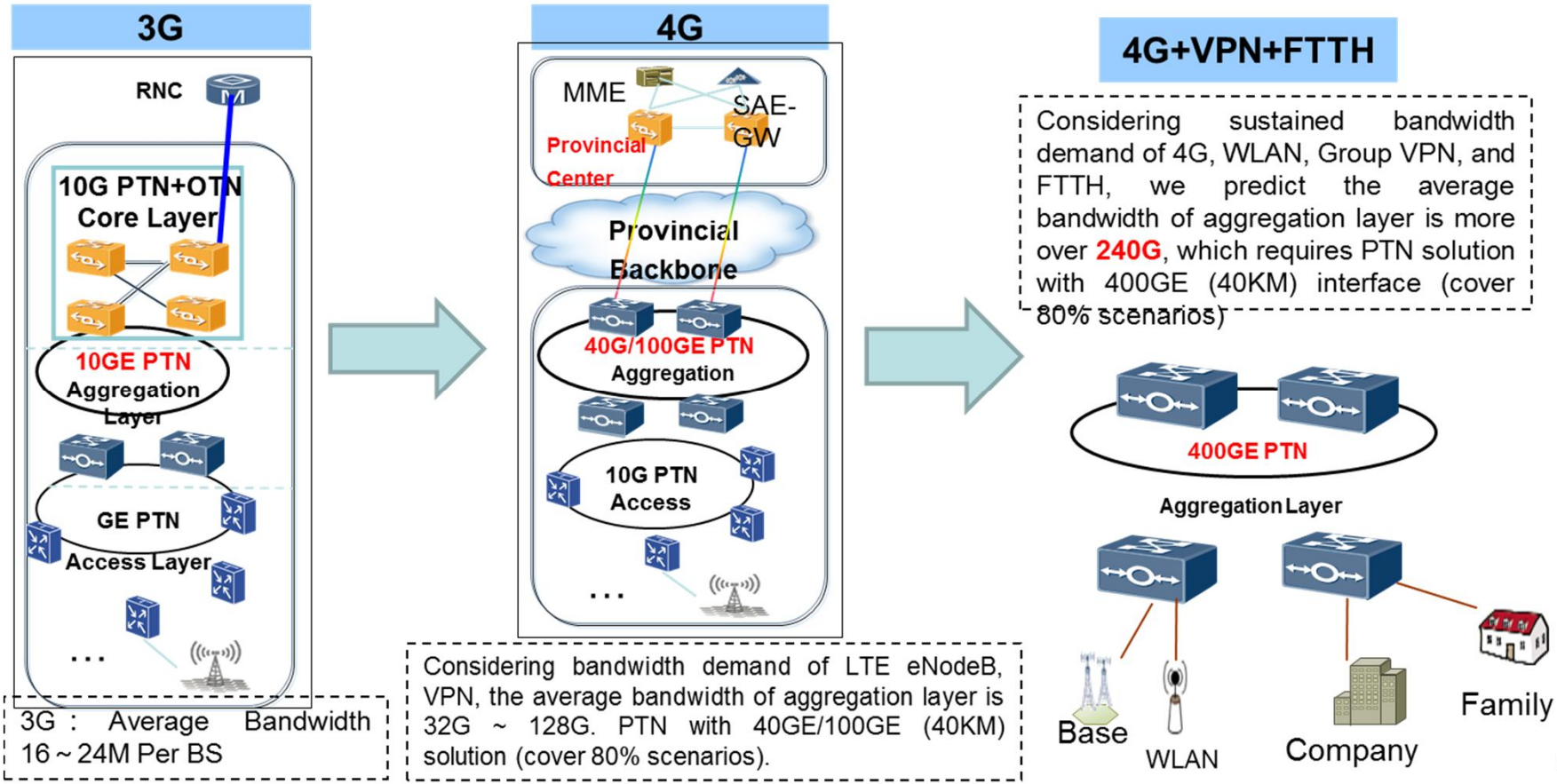
Link Scenario in IP Core Network



- **The interconnection between Core Router and OTN transport include "Inside Building" and "Outside Building".** For most applications about 2km is required and some of the scenarios may need over 2km.
  - **2km and 10km SMF objective are necessary in the IP Core Network**

Link Scenario in Backhaul Network

- Based on Ethernet technology, we choose PTN to build the mobile backhaul networks of China Mobile
- Because backhaul network is in metro area, where is usually lack of OTN, most of link between PTN nodes are direct fiber connection
- With the large scale deployment of TD-LTE, PTN is evloving from 10GE to 40GE/100GE, and we believe 400GE will be necessary in the near future



Proposal

Set China mobile as example:

- Now, China mobile has deployed more than half million PTN nodes, GE in access and 10GE in aggregation and core.
- According our survey last year, more than 0.5 million 10GE modules has been deployed in CMCC PTN field network, and the proportion of different types of 10GE modules are shown in following table:

Transmission Distance	<2km	10km	40km	80km
Ratio	0.28%	44.46%	44.05%	11.20%

- We intend to use 40GE and 100GE interface in metro core and aggregation layer to replace 10GE.
- 40GE and 100GE long distance (40km and 80km) modules are expected to be used with the same percentage as for 10GE, because the application scenarios are totally the same.
- We trust that IEEE802.3 will develop a 40km PMD for 400GE over duplex SMF in a future project.

Summary

- Support 400GbE application in WAN/MAN, IP backhaul interconnect networks
- Support the installed duplex SMF fiber infrastructure, because no parallel fiber is deployed in current IP Core/Backhaul network
- Provide Physical Layer specifications which support 400 Gb/s operation over:
  - at least 2km on Duplex SMF fiber
  - at least 10km on Duplex SMF fiber
  - at least 40km on Duplex SMF fiber in a future 400 Gb/s Ethernet project
- Maybe in 2016, we will begin 400GE trial and plan to deploy some 400GE links in 2017

Thank you

Q&A