

Application Requirement for Beyond 400GE from Telecom Operators' Perspective

——*IEEE 802.3 Beyond 400 Gb/s Ethernet Study Group*

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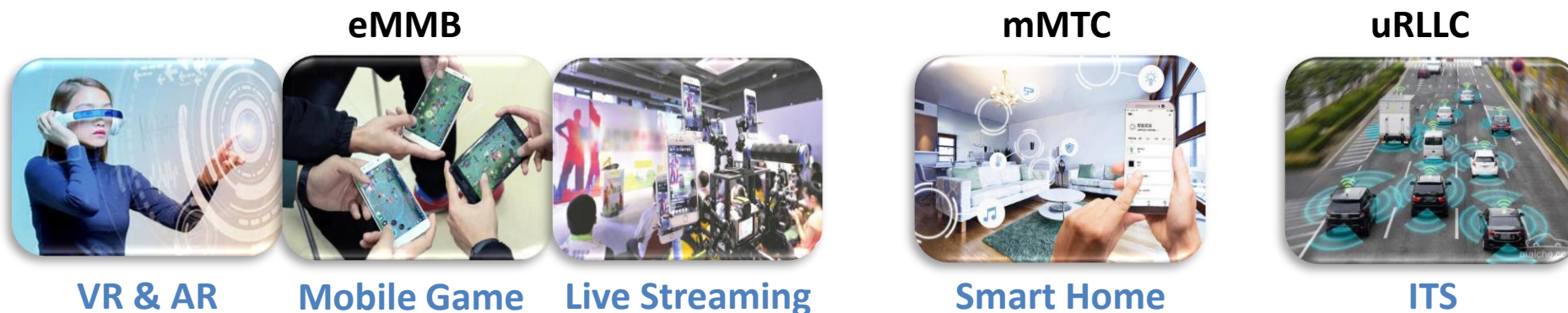
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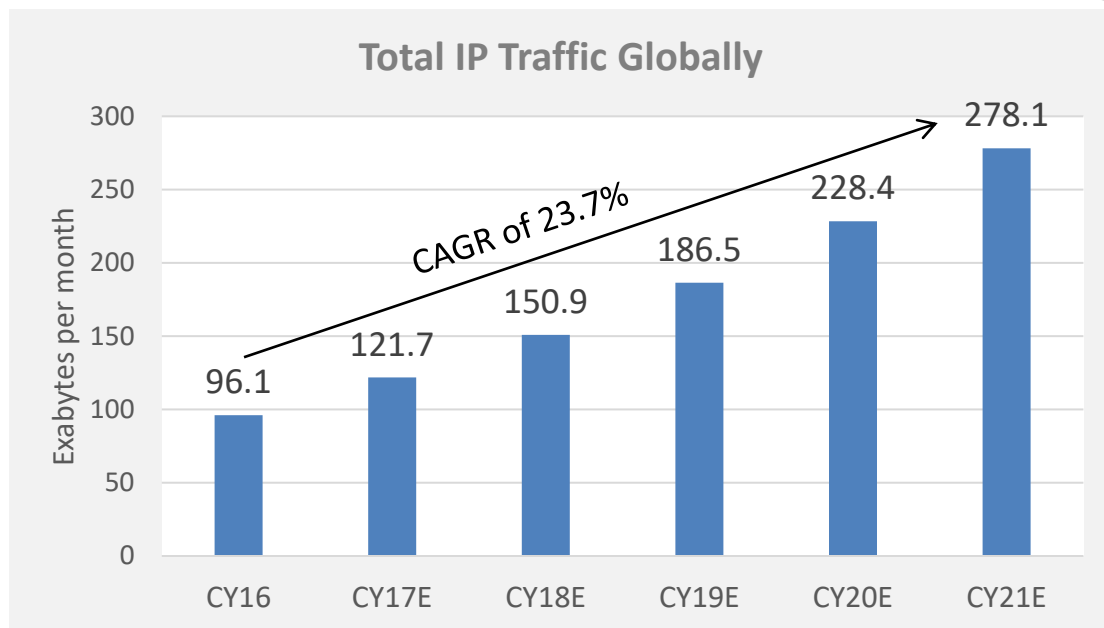
- 1** New Services Demands in 5G Era
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New Services Demands in 5G Era

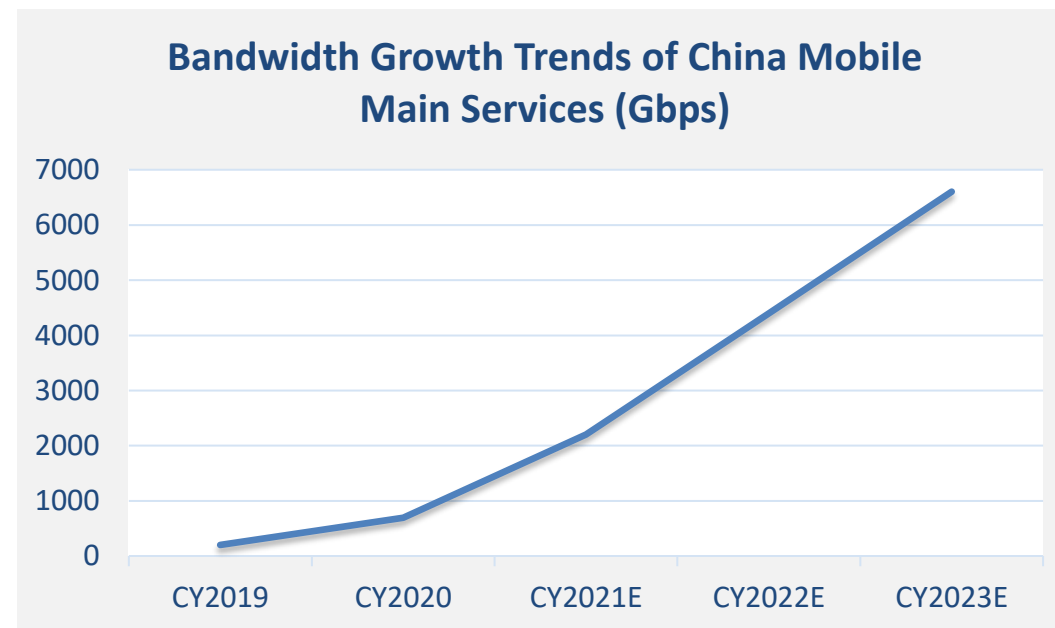
Diversified Services



Network Traffic Increases Sharply

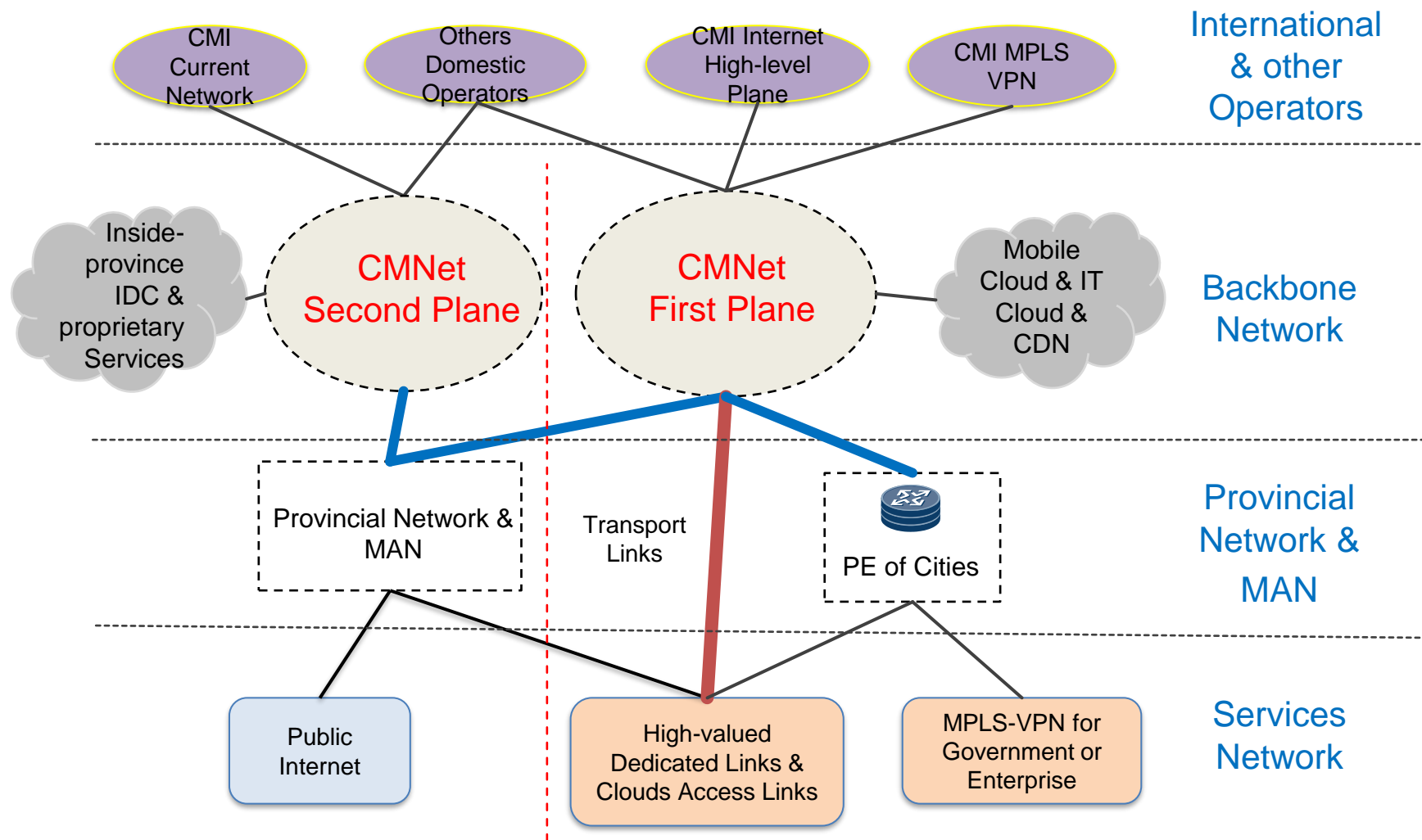


Source: Cisco VNI Predicts Global Annual IP Traffic to Exceed.



Source: Based on the Research and Prediction of the Authors from China Mobile.

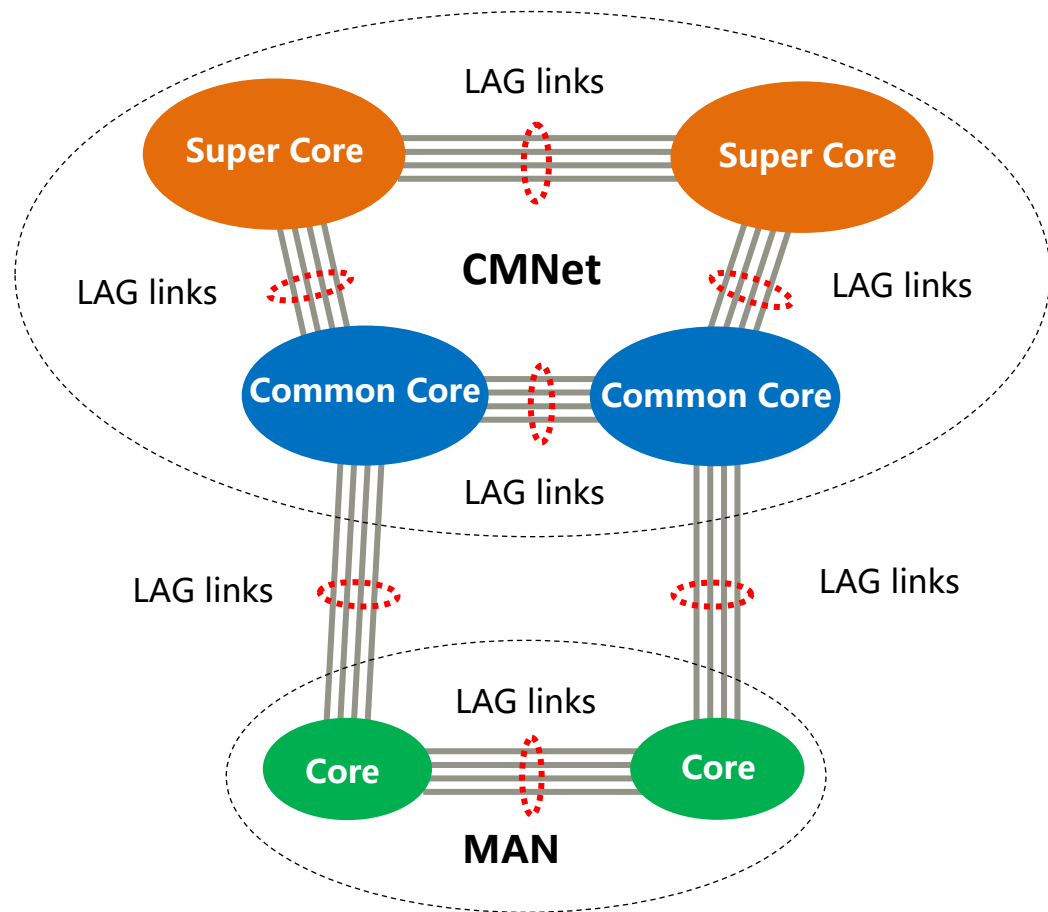
Network Architectures



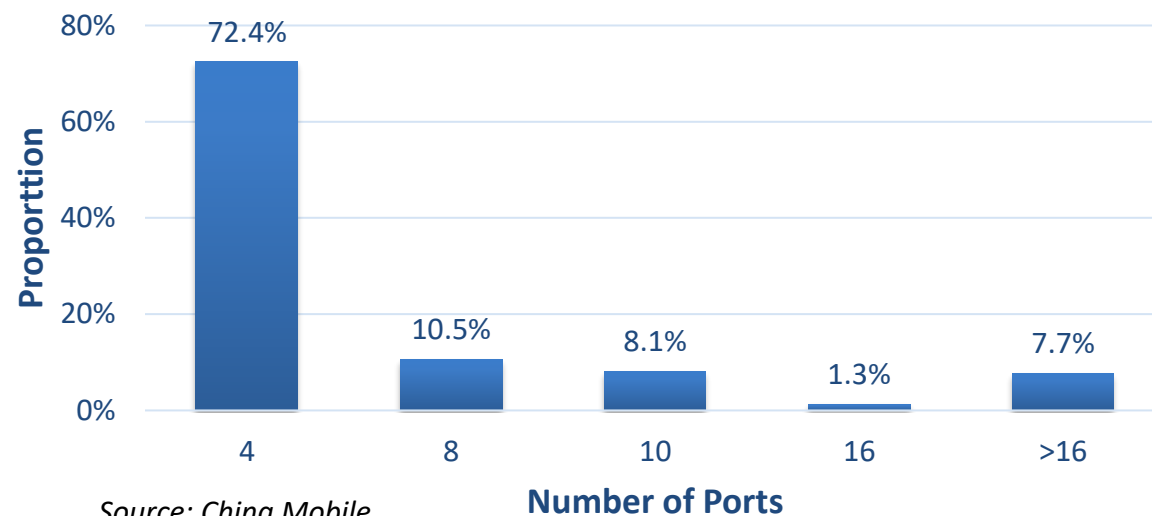
- China Mobile builds **two backbone networks** to underlay **diversified services** with different requirements
- According to the network structure and traffic flow, the **architectures** of these backbone network are optimally adjusted
- meanwhile the **bandwidth** of the links is expanded, in order to meet the diverse demands of the carried services

Note: CMNet First Plane mainly carries the cloud services; CMNet Second Plane mainly carries the public internet services.

The bandwidth growth rate of China Mobile's backbone network will stay around **over 30%** in the next two years



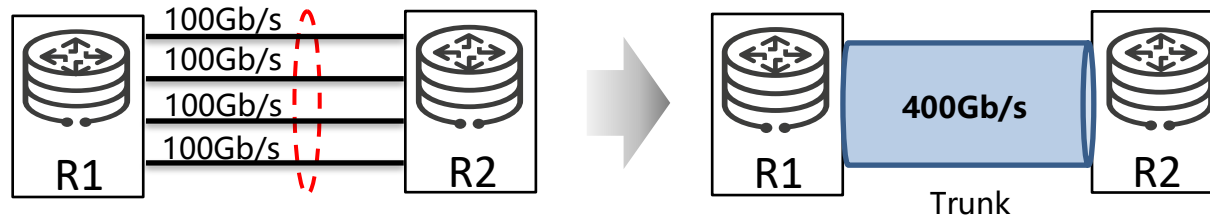
LAG Links Distribution in IP Backbone Network



- There are about **70%** of LAG links with **4 ports**, the equivalent bandwidth of which is **400 Gb/s** due to the 100 Gb/s member links in current CMNet
- Note that although the present proportion of the LAG links with more than **8 ports** is less, it will grow rapidly driven by massive services

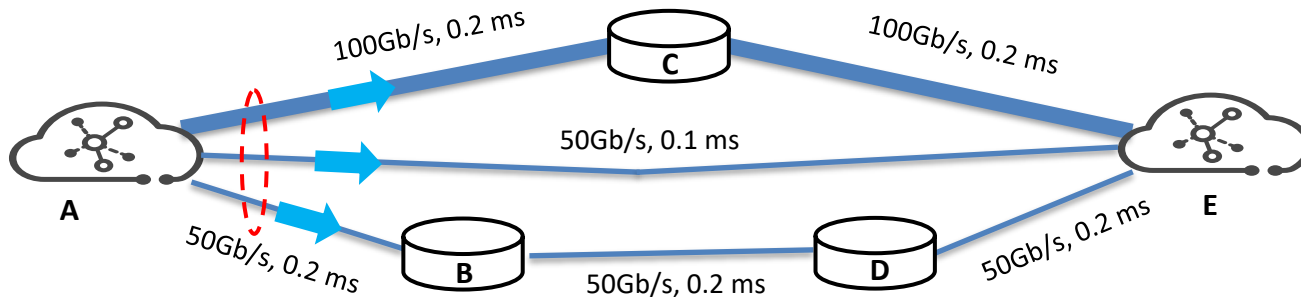
Pros and Cons of Link Aggregation

Grouping multiple link or port resources into a single logical unit for a **higher aggregate bandwidth**



— Individual link
⊖ Aggregated link

Four 100Gb/s Links Bundle
for One 400Gb/s Link



Example: for the same aggregation group, its member links may be with different lengths, delays, and QoS

Pros:

- Bandwidth expansion & Link standby
- Achieve **Equal-Cost Multipath Routing**: traffic can be distributed across multiple links
- Economize IP addresses: multiple aggregation ports share an IP address
- Adding a link or port to the aggregation group will not cause the routing oscillation

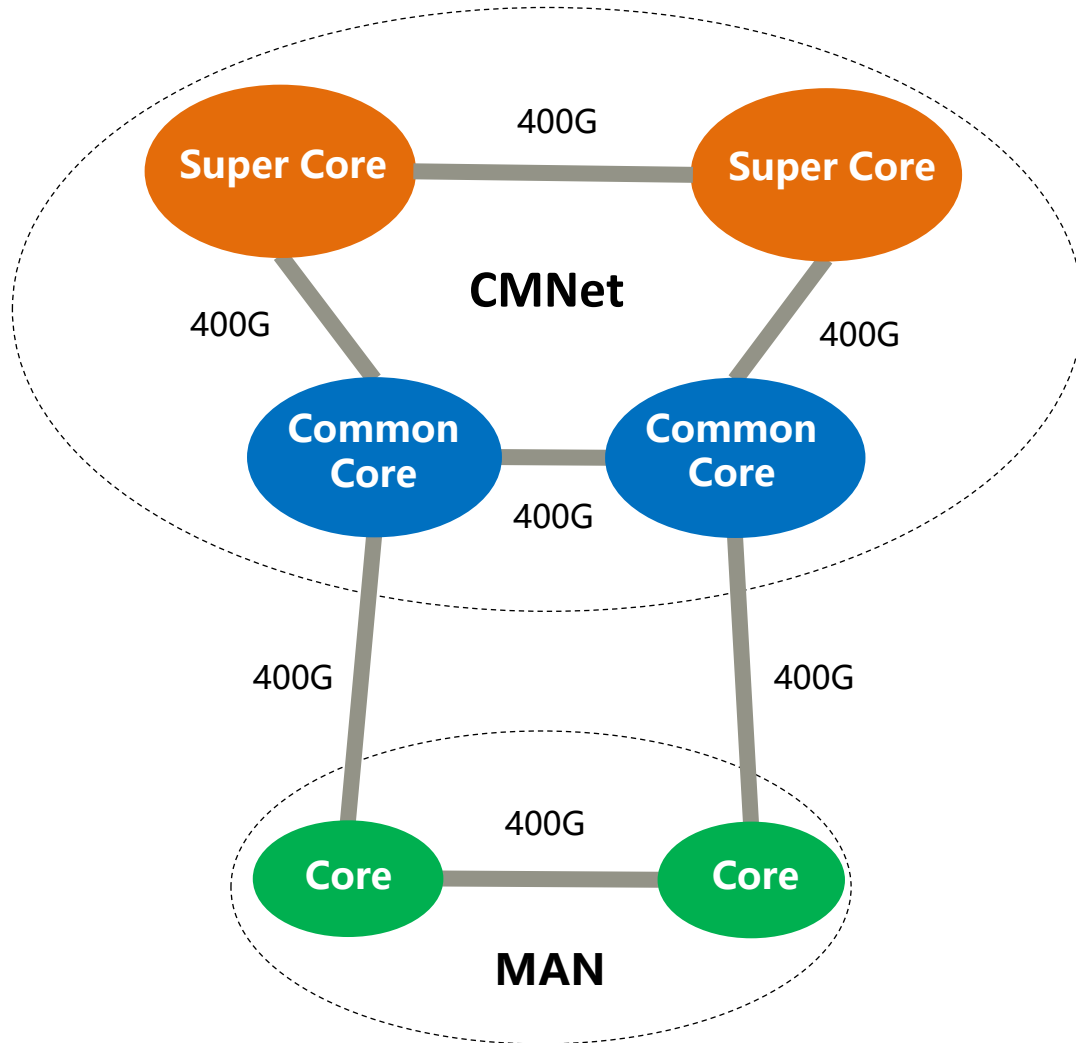
Cons:

- Hard to operate & administrate: when one link of the group is broken, the aggregation port is still running and cannot sense the fault
- Layer-2 Technology, and Layer-3 routing policy cannot be applied to carry out the flow optimization
- The same path, the different quality of service, since the transmission distances of these links are different in practice

Feasible Solution

Replacing the aggregation links by employing the higher-rate ports (eg. 400 Gb/s)

400Gb/s single port for traffic load balance and the simplification of OAM



Advantages:

- **Addressing the issues of load imbalance in LAG links:** when multiple links are bundled, the traffic may not be evenly carried by these links
- **Simplifying OAM:** the topology and the network configuration can be simplified
- **Saving resources:** optical fiber (75%), IP address, and so on, can be reduced in proportion
- **Enhancing reliability:** the number of fault points (eg. transceiver module, etc.) is reduced

Deployment:

- From 2021, China Mobile is going to deploy 400Gb/s ports in IP backbone network **step by step**
- 400Gb/s ports with **10 km** and **40 km reach** will be considered firstly to be deployed, and the configuration location will be in the cities

Summary:

✓ At present, the LAG links in CMNet First Plane and CMNet Second Plane are **predominantly** with 4×100Gb/s bandwidth. After the LAG links are unbundled, there are large demands for **400 Gb/s** ports

- CMNet First Plane: LAG links with 4 ports make up **34%**
- CMNet Second Plane: LAG links with 4 ports make up **37%**

✓ Considering that the average usage of the links in backbone network is about **60%**, 400Gb/s ports cannot cover all the aggregation ports when the LAG links are unbundled totally

Proposal:

✓ Meanwhile, the requirement for **800 Gb/s** and **1.6 Tb/s** ports is also **potential**, in order to meet the traffic growth of IP backbone network at the annual average rates of over 30%

Thanks!