

# IPv6 Progress in China Mobile





**Overview of IPv6 Progress**

**IPv6 Solutions and Problems**

**IPv6 Working Plan**

## Network Trail and Test

- 9 provinces are involved in network trail and test, including IP bearer, metropolitan network, IMS etc.
- End-to-end test are being done in lab before trial, including LTE, service network (WAP GW), BRAS etc.

## TDD-LTE Terminal and Network

- 4 new IPv6 TDD-LTE chip and terminal are being tested in our lab
- EPC networks are being experimented in 6 provinces

## IPv6 Address Allocation Plan

- In 2011, CM Obtain /20 IPv6 prefix from APNIC
- This year, we have planned how to allocate them in every province



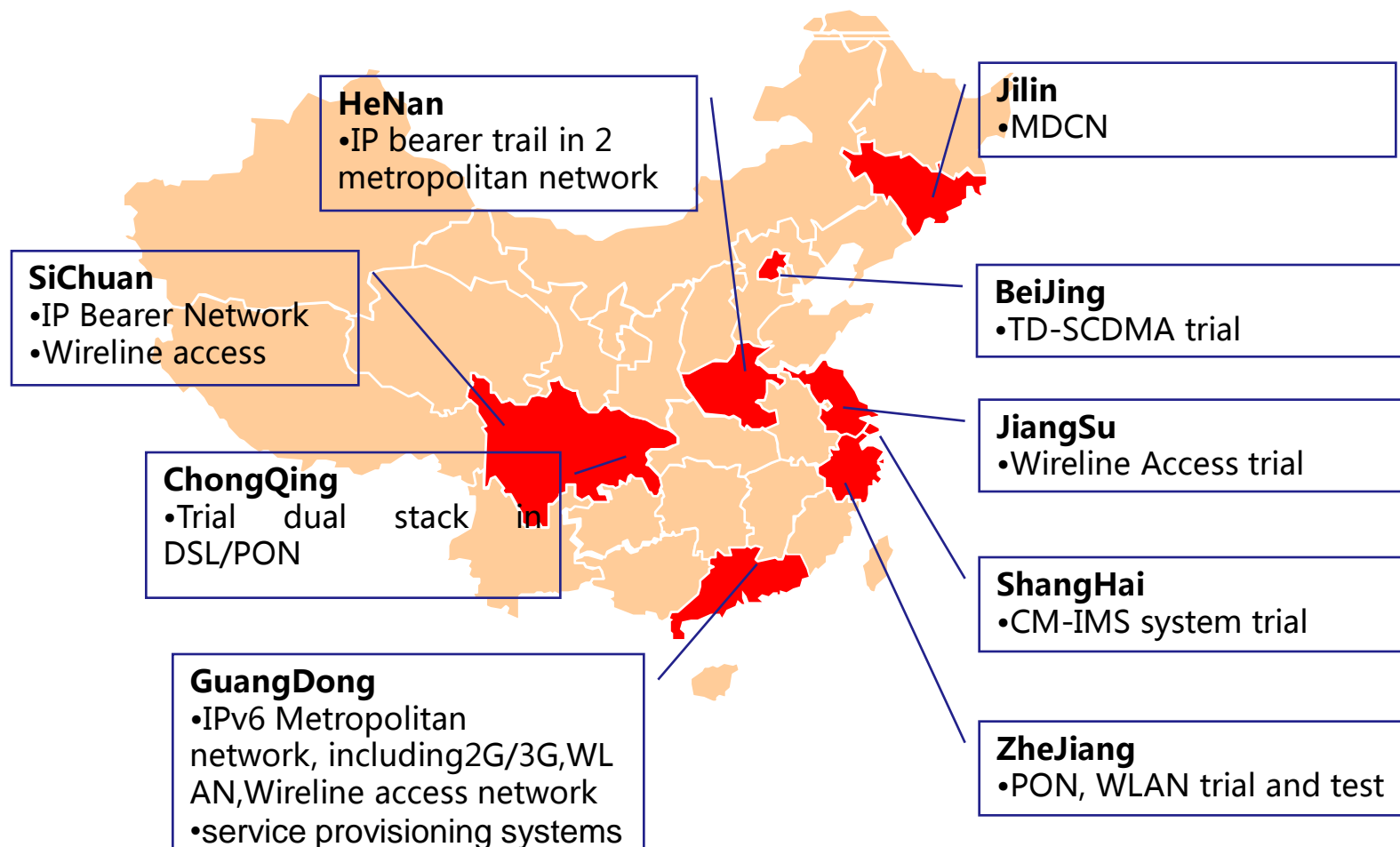
## Innovative IPv6 Migration Tech.

- BIH/PNAT is adopted as RFC6535
- Many types of BIH terminals are being developed, such as mobile phone, CPE, STB, etc



# Large-scale IPv6 Network Trial

- Network trial and test are in 9 provinces



- TDD-LTE EPC are being tested IPv6 in Beijing and other 5 southeast provinces, the most developed provinces
- All the equipments in EPC, including P-GW, S-GW, CG and HSS, support IPv6 in the customer side

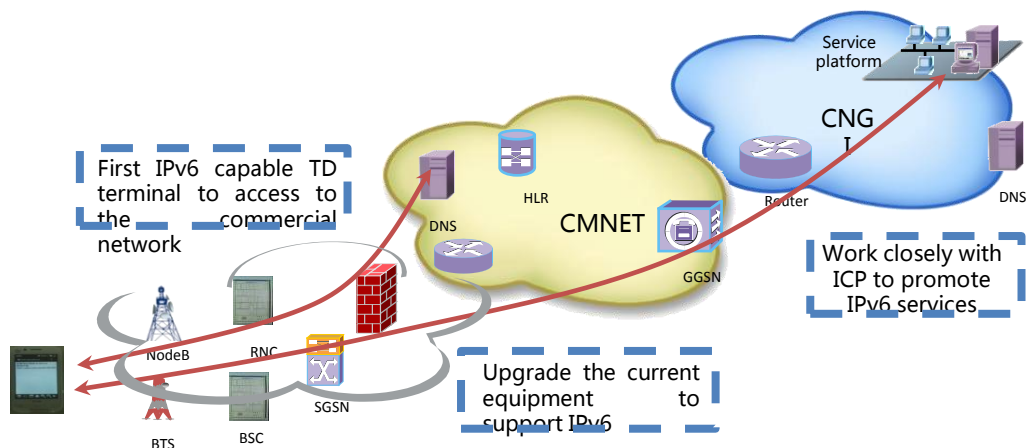


## Promote TDD-LTE device to support IPv6

- Cooperated with several Terminal and chip manufacturers, including Altair, Sequans, ZTE, innofidei, etc, to promote more than 4 types of data card support IPv6



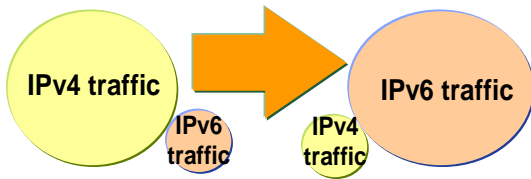
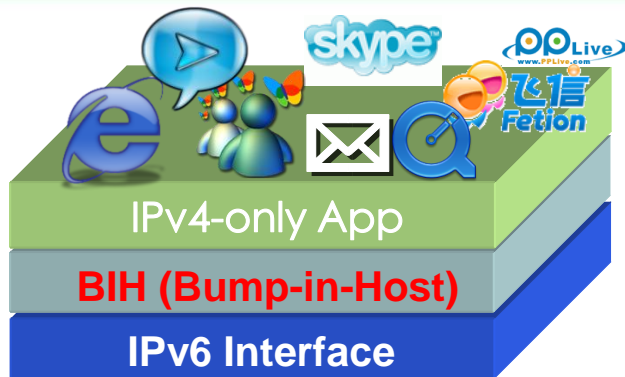
## First Time IPv6 TD terminal accessing to the commercial network



- 2G/3G commercial network in Beijing is upgraded to support IPv6
- TD device, ZTE U900, access to the network successfully

Route aggregation and the need of services are the two basic principals in the address plan

- IPv6 address distribution concerns:
  - Route aggregation
    - Must consider which location and networks the address belong to
  - Address quantity in each service
    - Calculate the length of the subnet to meet the need of each service
  - Address management
    - Headquarter, provinces and cities allocate IPv6 address in different level
  - Security
    - Address must conveniently to be identified in ACL and so on
- address just is address, it should not contain:
  - QoS
  - Some parameters changing frequently



## Application Independent

BIH modules are transparent to conventional IPv4 applications, whereby it avoids modification of various applications and facilitates IPv6 deployment

## IPv4 & IPv6 Coexistence

BIH is one solution trying to migrate and deploy IPv6&IPv4 coexistence networks without any technical gaps

- BIH v1.0.0 has been contributed to OPEN SOURCE COMMUNITY.
  - the source can be downloaded from the below link

<http://code.google.com/p/bump-in-the-host/source/>

- Now we are developing various BIH terminals. The implementations have been cooperated with Huawei, ZTE, Innofidei, Coolpad and Borqs. Several kinds of terminals, including 3G/LTE mobile phone, USB stick and mobile routers, are expected to be commercial off-the-shelf



- BIH and 464xlat encourage the IPv6 transition by making IPv4 apps/hosts compatible with IPv6-only networks and providing IPv4&IPv6 interworking.
- Those are complementary relations in the period of IPv6 transition

Application and Host	Server	Traffic Flows
IPv6	IPv6	Native IPv6
IPv6	IPv4	Stateful NAT64
IPv4	IPv4	464xlat
IPv4	IPv6	BIH

- China Mobile has dedicated the efforts to contribute the coding combination,
- We are now proposing BIH&464xlat as a mandatory feature in CCSA (China Communications Standards Association) to motivate the terminal chains



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## Large amount of IP address is needed, IPv6 is essential for LTE

- LTE is always-on, which means whenever the terminal turns on no matter whether a service will be used or not, IP addresses should be assigned to the terminal.
- Multiple APNs is needed for LTE. Multiple IP addresses should be assigned to one LTE device
- Considering only about 5% users obtain IP address in 2G/3G at the same time, IP address amount in LTE is about 20times of that.
- Considering MiFi need IPv6 addresses pool by using DHCP-PD, such as /60 or /56, to assign to the terminals, LTE need dozens of times addresses. Of course, this situation is also existed in CPE in the fixed access network.

# IPv6 Solution – Mobile Service

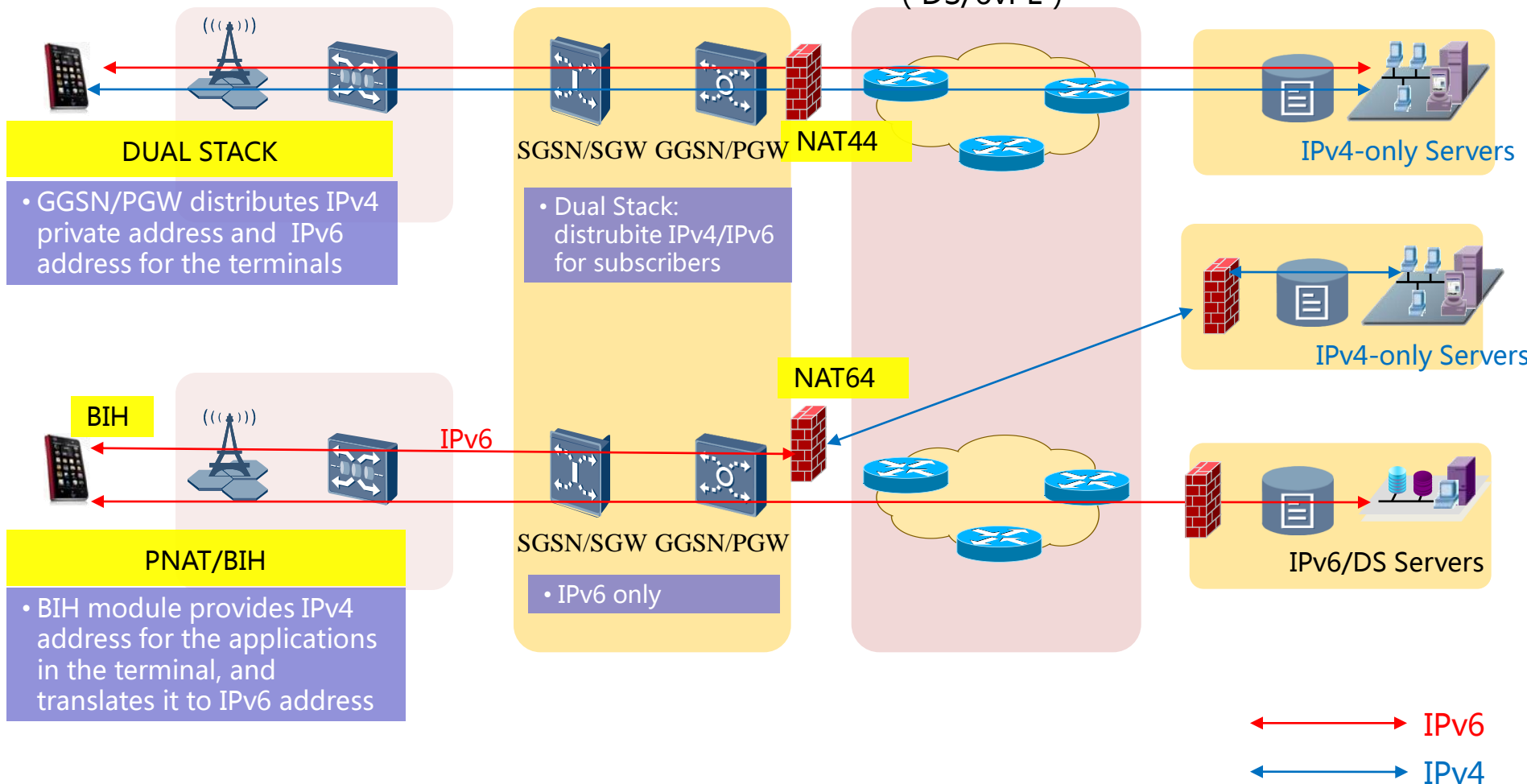
Terminal

RAN

Core Network

IP Backbone  
( DS/6vPE )

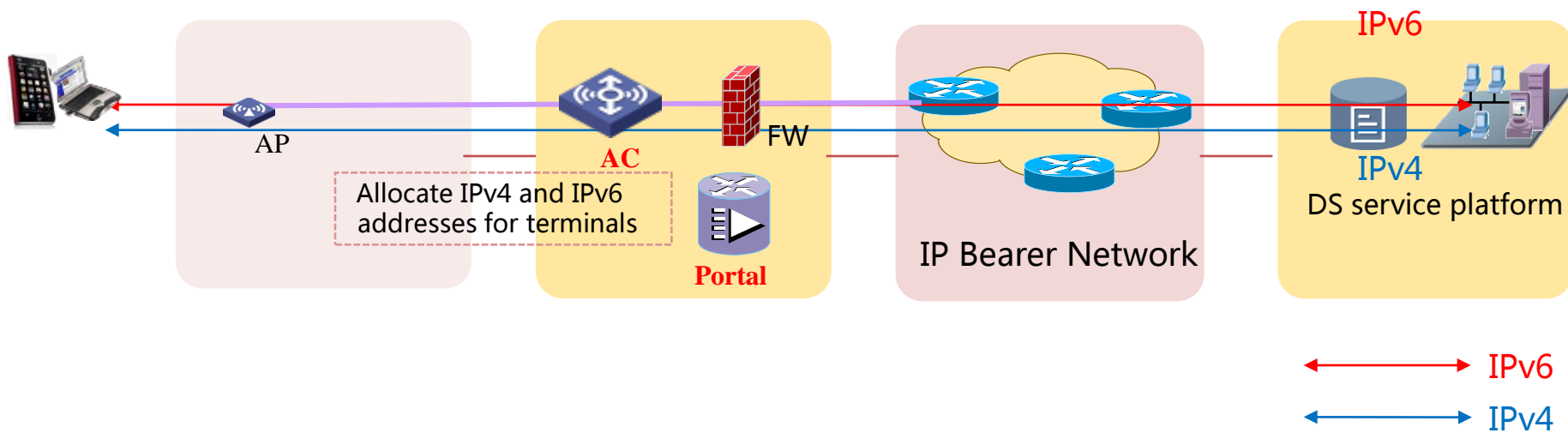
Content Servers



WLAN terminals can obtain an IP address before authentication, that means only 20%-40% IP-obtainers are the active users in China Mobile's WLAN network. The mechanism of WLAN result in the waste of IP addresses. So IPv6 must be imported to WLAN.

IPv6 Solution: based on dual stack

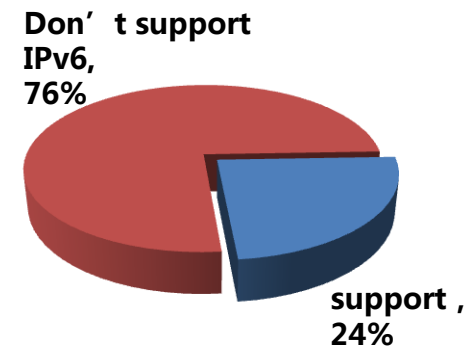
- dual-stacked ACs to support IPv4/IPv6 access.
- Portal system is also to be rebuilt or upgraded to realize IPv6 authentication.



- **2G/3G/LTE terminals' chips and operation systems need to be updated to support IPv6**
  - The communication chips in the mobile terminals should support IPv4, IPv6, and IPv4v6 PDP/PDN
  - For android, although the Linux inner-core had supported IPv6, the mobile phone OS often shield this function
- **WLAN terminals only need to update their OS to support IPv6**
  - WinXP users must startup IPv6 function manually, and they may have difficulties using DHCPv6 and DNS6
- **IPv6-supported L3 CPE should be used in fixed access network**
  - Because of the PPPoEv6 problems in WinXP, L3 CPE must be used
  - L3 CPE can integrate more transition technologies in one device, so the provider could deploy IPv6 more flexibly.

## Most of Applications and software are still in IPv4-only

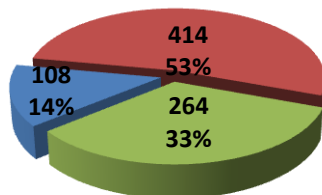
- We tested 50 kinds of popular clients and applications running on PC in our lab, about 76% Clients are just developed for IPv4-only
- Unfortunately, most of the 12 dual stack applications are browsers and mail clients, none of IM, online music or video, online-maps support IPv6



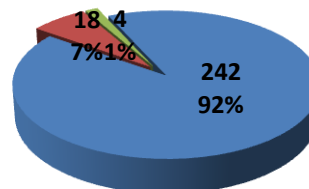
Type of Apps	Quantity	Results
Browser	7	Support
IM	7	none
Mail Client	6	3 support(Core Mail、 outlook2007、 thunderbird)
FTP	2	1 support (FileZilla)
Download	6	1 support (utorrent)
Online music	7	none
Online Game	3	none
Online Map	3	none
Micro-Blog	4	none

## Many equipments must be updated or replaced

- Test Result shows that IPv6 capability is not supported well in some equipments. For example,
  - 5 types of BRAS from 4 vendors are tested
  - Basic IPv6 protocol functions, such as PPPoEv6 and routing, are supported well
  - DHCPv6 Server function is not supported in 4 types of BRAS from 3 vendors.
  - IPv6 FIB capacity is only 10% of IPv4 FIB Capacity because of the hardware limit
- Some important data equipments in IDC, for example, Fire Walls and Load balancers, are not support IPv6



FireWall



Load Balancer

- Have supported
- Need software upgraded
- Need to be replaced



# Example: Testing results of BRAS

Items		Results	Observations
Standalone testing	IPv6 protocol	1) Can't integrate DHCPv6 Server function; 2) Can't support MLD and PIM/SM	1) Operator has to build separate DHCPv6 server; 2) multicast-based services are hardly developed
	Performance testing	1) IPv6 FIB capacity is only 10% of its IPv4 FIB capacity; 2) Line card throughput is much less than the nominal values when data packages length shorter than 128B	With IPv6 data packages are increasing, it is expected that performance should be upgraded
L2TP networking testing		1) BRAS can't support IPv6 address delivery through L2TP tunnel; 2) BRAS can't distinguish IP flow in term of IPv4/IPv6 traffic	1) IPv6CP signaling is not supported in the case of L2TP tunnel deployed; 2) operator can't carry out custom charging policy based on different IP families characters



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- China Mobile will promote IPv6 in the E2E industrial chain and carry out commerciality in the next few years

## Start-up Period ( 2011-2013 )

- To 2013:
- Do IPv6 experiments, trials in related provinces, develop about 3M subscribers
  - Produce more and more LTE/3G UE supporting IPv6 with the association of manufacturers

## Promotion Period ( 2014 - 2015 )

- To 2015:
- complete network IPv6 transition
  - Start IPv6 commercial deployment
  - Develop more IPv6 subscribers

## Application Period ( 2016 - 2020 )

- To 2020:
- All the increased subscribers and service can use IPv6 address
  - All the backbone and MAN can use IPv6

## According to China Mobile IPv6 plan, until 2013:

- TDD-LTE IPv6 trial will be carried out in 6 provinces, and the commercial customers number will achieve 800,000 at least
- WLAN and Wireline Access in IPv6 will be taken in 10 provinces, and there will be 2.2M subscribers
- Commercial Service
  - More than 10 China Mobile's self service platforms and 4 service base will have been upgraded to support IPv6, including mobile reading, mobile mailbox, etc.
- Totally, there will be around 3M commercial users by the end of 2013 in China Mobile. And according to the State Plan, IPv6 commercial users will achieve 8M until 2013

- By the end of 2013, China Mobile will associate with more than 4 vendors to develop at least 4 TDD-LTE new terminal chips and 5K TDD-LTE terminal prototypes using in IPv6 trials and commerciality.
- Including:
  - TDD-LTE single-mode mobile phone and data card
  - 2G/TD/TDD-LTE multimode mobile phone, Data Card, and MiFi
  - TDD-LTE CPE

1. The demand of IPv6 has become increasingly urgent, so the Mobile Internet must steer in IPv6, especially in LTE.
2. China Mobile has required all the EPC equipments and LTE terminals supporting IPv6.
3. Almost all the IP equipments used in the commercial networks need to be upgraded in hardware or software to support IPv6, including routers, DNS, core network, etc, that will cost much CAPEX and OPEX
4. Network management systems, service provisioning systems, and security systems are difficult to upgraded, and the cost may be much higher than that of networks
5. the ecosystem of IPv6 is still incomplete and needs more work to accelerate the process, especially in terminals and contents

# Thank You



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