IPv6 Deployment Best Practice by China Telecom

Contents

1. Preface

China telecom's IPv6 history can be divided into 2 stages:

Stage 1, from 2003 to 2010, the main tasks are technical research, test bed construction and its pilot, and the main purpose is to test and acquire experience.

Stage 2, from 2011 to 2015, match the period of China government's 12th 5-year plan, according to NDRC's IPv6 project schedule, this stage can be divided into 2 phases:

Phase 1(2011-2013) - Small scale commercial deployment;

Phase 2(2014-2015) - Large scale commercial deployment

2. Stage 1, CNGI Project

China telecom had participated in NDRC's CNGI(CNGI is China Next Generation Internet, which is launched by National Development and Reform Commission (NDRC) of China, together with other seven ministries. CNGI is a national program for promoting research and development of IPv6 and other new Internet technologies in China.) project in stage 1.

CNGI's core network has more than 40 GigaPops nodes, covering more than 20 provinces around China. Meanwhile, it also implements high speed connection with the international next generation Internet. This high speed network provides compatible platform for further network application research and experiment.

CNGI demonstration network is composed of six core networks, access network/CPN, and Internet exchange center (CNGI-IX). The six core networks are built by China Telecom, CERNET, China Unicom, China Netcom/CAS, China Mobile and China Railcom respectively, but China telecom takes on a leading role in CNGI construction. The maximum bandwidth of CNGI backbone network is 10Gbps. The following figure1 presents the topology of CNGI backbone networks, with colored points according to their conductors. Each operator implements its core network by its own design, which results in unnecessary GigaPops located within the same city, like Beijing, Shanghai and Guangzhou.

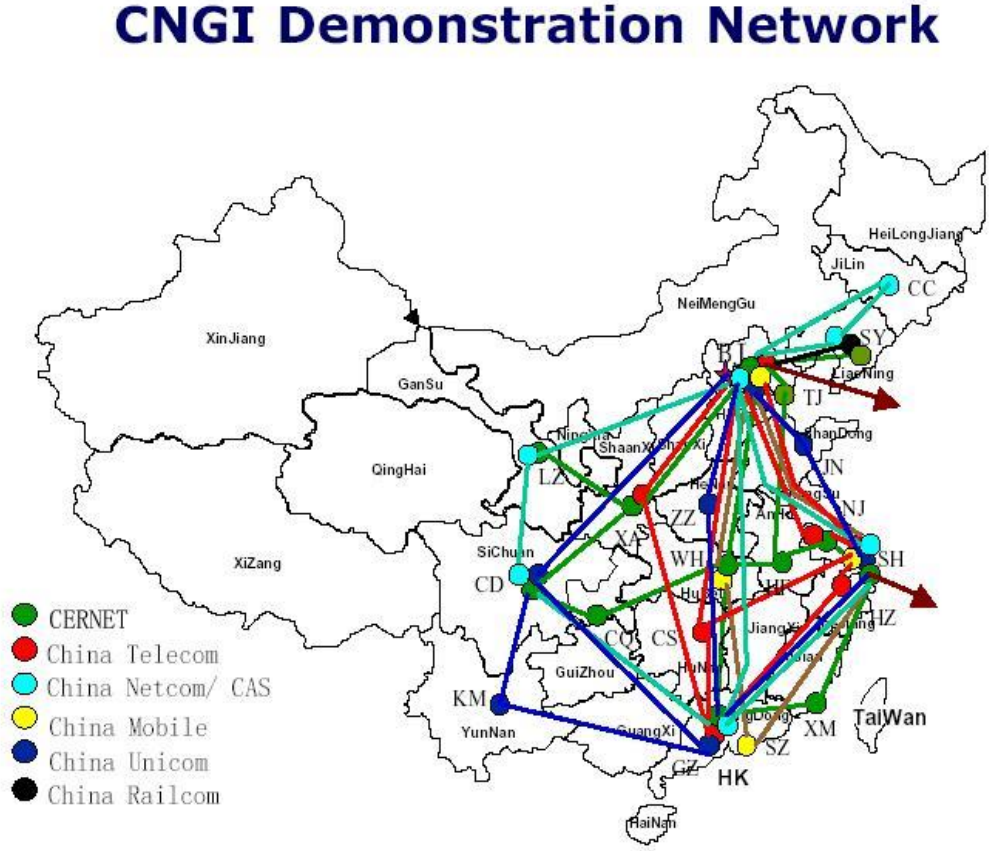

Figure1. CNGI Demonstration Core Network

Although those six core networks are built by different telecom carriers respectively, they are all under the framework of CNGI project. CNGI program requires that each core network is reachable by the other one. Internet exchange center is one of the major approaches to realize that goal. There are two Internet exchange centers in CNGI, which are referred to as CNGI-IX. The first one is built by CERNET, located in Beijing, and the second one is referred to as CT-CNGI-SHIX, which is built by China Telecom in Shanghai,. These two CNGI-IXes backup each other mutually. Figure 2 shows the connection between CNGI-IXes and the six core networks. On the top of providing interconnection, these CNGI-IXes act as the gateway to the international NGI networks as well.

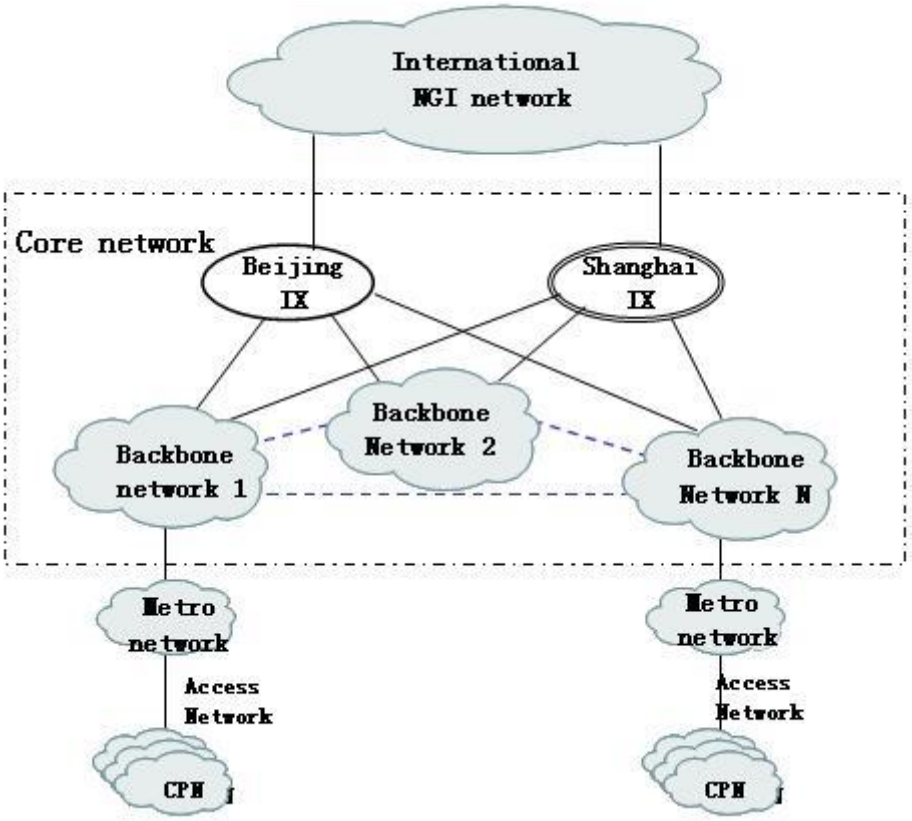

Figure2. CNGI-IX connection topology

China Telecom's CNGI network is called CT-CNGI; the topology is illustrated as Figure 3:

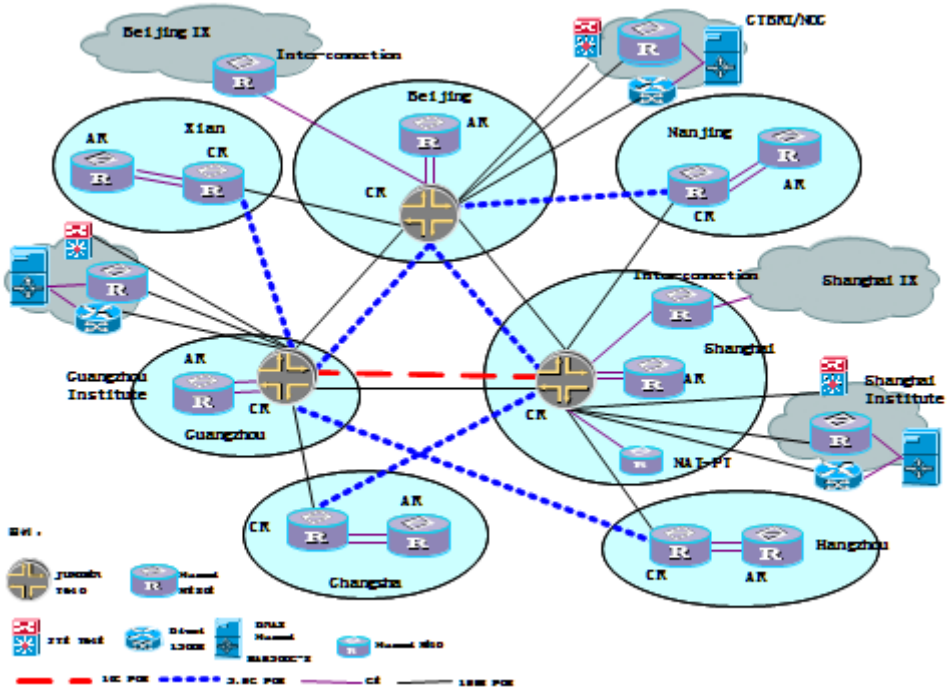

Figure3. CT-CNGI topology

CT-CNGI has 7 super POPs in 7 major cities of China, including Beijing, Shanghai, Guangzhou, Hangzhou, Nanjing, Changsha and Xi'An. In addition, there is a Lab inter-connection among China Telecom's three subsidiary Research Institutes.

As mentioned above, CT-CNGI-SHIX (AS38035) is being operated and maintained by China Telecom. Before 2010, all participants of CT-CNGI-SHIX (China Telecom, China Mobile, China Unicom, CERNET, BT, SingTel, NTT and KDDI) built eBGP peer with IX-R (AS38035). The topology of CT-CNGI-SHIX is described as figure 4:

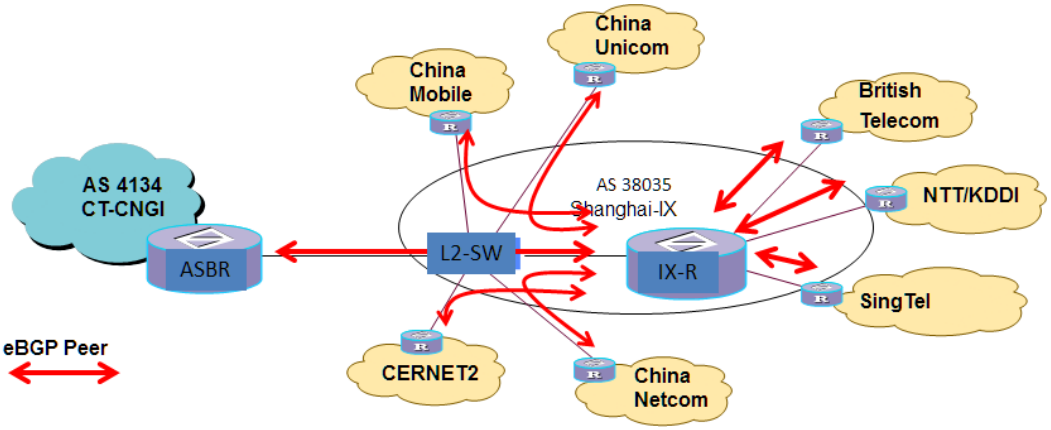

Figure4. CT-CNGI-SHIX topology

3. Stage 2, Commercial IPv6 project

Apart from CNGI, NDRC launched a commercial V6 deployment project in the end of 2011 for 3 tier 1 ISPs in China (China Telecom, China Unicom and China Mobile), and it is called stage 2.

3.1 Phase 1 of Stage 2

As far as construction scale, in Phase 1(small scale commercial deployment), duration is from 2011 to 2013, CT plans to upgrade native IP backbone(ChinaNet) to support dual stack, upgrading 6PE/6VPEs of MPLS backbone(CN2) to provide IPv6 VPN service;

At the same time, upgrading and reforming IPv6 infrastructure (BOSS, metro area network, etc.) in 10 provincial branches for fixed network, including 21 MANs (Solutions: Dual stack, NAT444, DS-Lite) and 14 IDCs (Solutions: Dual stack, NAT64);

For NAT444, it is a solution to solve private IPv4 address shortage problem, once operators deploy private V4 address widely, IPv6 upgrading would not be essential, they will lose the motivations on V6 migration.

On contrary, DS-Lite solution is a more positive approach to solve the IPv6 challenge. DS-Lite only requires the assigning of IPv6 addresses for users. So the network infrastructure must first be IPv6-enabled. Therefore, through this way, IPv6 is mandatory, and substantially encourages the service providers to deploy IPv6.

In ICP transition scenario, from the operators' point of view, we prefer upgrading their service to dual-stack. If V4 content can be accessed by V6 end users via NAT64 gateway without software upgrading and re-coding, ICP will lose their motivations to migrate to IPv6, just like negative influence of NAT444 in broad band access network scenario.

In terms of the goal of user numbers, CT plans to provide 3 million real IPv6 end users in fixed network.

3.2 Phase 2 of Stage 2

In phase 2(Large scale commercial deployment ,2014-2015), the main task of this period is to expand the scale of construction, CN2 upgrade to fully support dual stack, include all P and PE routers; Finishing IPv6 infrastructure (BOSS, metro area network, etc.) upgrading and reforming in 30 provincial branches for fixed network, including 160 metro area networks and 70 IDCs.

3.3 Current situations

By the end of June this year, the network infrastructure improvements is basically completed, including the dual stack transition for all ChinaNet PoPs, core CR, part of SR dual-stack upgrading in 21 MANs of 10 provinces, as well as setting AFTR/CGN function card for hundreds of BRAS.

The 14 IDCs has realized the IPv6 ready through software upgrading, equipment replacing and architecture re-design and so on.

The majority of provincial branches have already realized the business operation support system transition, to support IPv6 end to end

process for users (opening accounts, resources reservation, service opening, business activation, fault warning, authentication and billing).

3.4 Obstacles

The IPv6 function and feature supporting of home gateway is imperfect and immature, need bulk replacement, resulting in costs increasing;

Market share of Win 7/8 are still limited, makes a barrier to user migration;

ICP little transition efforts result in deficient content and service.

The commercial IPv6 network interconnection is not yet implemented between the three operators as well as with overseas (ChinaNet, CN2 and 21 dual-stacks enabled MANs are isolated IPv6 island at present); Commercial IPv6 IX must be built as soon as possible.