BEIJING – IPv6 Workshop
Wednesday, April 10, 2013 – 14:45 to 16:15
ICANN – Beijing, People's Republic of China

MAN: This is an audio timestamp. This is the auditorium room. Starting time is 2:45 PM local time and the time scheduled is 4:15 local. This is the IPv6 workshop. And the meeting will begin shortly.

WOMAN: As we get ready for this presentation, we're just taking care of a couple of technical issues here. But please know that we are going to be speaking in English. If you need the Chinese, you will need to get the headset.

Again, we appreciate your patience. We have some rather large files to load up and unfortunately, as remote manager, I was not allowed into the room right away. So we're just working on technology. We're on the third set of four, so just a couple of more minutes for your patience. Thank you.

MA YAN: Okay. Anyway. Before any technical issue be solved, we would like to starting our session first by introducing the objective of this session, this workshop, and introduce our speakers, and also get a small survey to know, attendance. Okay?

So first, I would like to introduce myself first. My name is May Yan, in Chinese spelling, family name first and the first name, the last. Lots of Oriental countries are like that. Now I'm working in the University of Beijing, post telecommunications.

A lot of connection with server providers, with the industry manufactures, researchers, and government. I am also currently the executive council member of APNIC, and those on the [A Pen IPv 0:12:11] working group, working, IPv6 working group chair.

It's my honor to have been invited by [? 0:12:20] and a lot of ICANN organizer as the moderator of this session. So I really welcome all of you that are attending of our workshop. Then I would like to introduce all of my speakers, invited speaker here.

First, Wendy Zhao from CNNIC. And she is responsible for international affairs in the CNNIC. And a lot of contribution to the regional inter development [laughs]. And also she is a member of APNIC, at the moment.

And then, Mister Jaijun Li from China Mobile. The largest mobile server provider in China, and hosts a lot of infrastructures, end users, and the services. So he will talk about how those TTLT, and there is 3Gs, 4Gs, and how those kind of services provide IPv6 access from end users, and how the infrastructure upgrading, and how to coordinate with all the server provider, [? 0:13:29] providers, the game industries, financial sector, a lot of industry working together in the mobile industry.

And then, I have a third speaker, Shinichi Yamamoto, he's from AT&T, CTC, CTC, sorry. Then he will talk about the access network. A lot of

success stories have had happen in Japan, so he has a lot of experience and a lot of details will be presented today.

And then we have Miwa from APNIC. She is the ambassador for IPv server program in APNIC, promoting not only the regional, but also global meeting. She is a frequent attender and a flyer everywhere from working IPv6. So a lot of people know her, and we shall have more further communication after this session in establishing our cooperation to promoting IPv6 in our – not only in Asia, but also globally.

So in this ICANN meeting Beijing 46 context, so really welcome all of you to attending this session. May I raise a very small survey to know how much of you came in from server provider side, from the manufacturer side, from the domain registry side?

So first, a group the server provider side please raise your hand. Okay. Really have a lot… Thank you. And how much from the domain name registry? Okay. We have some. Okay. Thank you. And how many other from some other sector, say education sectors? Research sectors? Okay. We have people here.

So also government? Yeah. We have a lot of people here. So welcome all of you, join us. And from all this different aspect from really multi-stakeholder fashion, so joining together to discuss, to share information about our development in IPv6 promotion, and they really benefit to our industry to our societies.

So this is a very brief introduction from before any session started. Is it okay now? Okay. Thank you very much. Yeah. So let's have the first

speaker, Wendy. Should I say something about the China situation? Thank you.

WENDY ZHAO: Thank you Ma. Good afternoon everybody. Like Ma introduced, my name is Wendy Zhao, I'm also a member of APNIC exec counsel. Today I'm here to talk about IPv6 implement and deployment situation in China. We are running a little bit late.

And I don't high very many slides, so hopefully I can win a few minutes back. So do we have my slides? Okay. Okey-dokey. Finally we get there. Okay the outline of my presentation will mainly cover the local network status, and the state driving, the industry support, how the network deploy the [? 0:18:32] in China right now, and last not the least is what the future challenge we're going to facing.

So slides please. Slides please. Okay. The chart here shows the growth of the internet user locally, which in China, joined with the IP address growth in China as well. And we can see since 2001 the addresses was a few step behind the growth of internet user.

And when APNIC in Asia Pacific region hit the running out stage into 2011, we can see the growth of IP addresses going flat, and that will carry on. But the growth of internet user will not, especially in a country with only 42% penetration.

So that's not the worst story. The story is we're facing a technology revolution at this stage. So the connect, the way to connect to the internet has changed. And the way how to compute, and computing

the data has changed. And then the devices which connect to the internet has changed.

It's not only PC and the mobile, we're fixing to connect the sensors, household applicants to the internet. So those are the model we're going to be facing on. So according to the estimation, there are going to be 34 billion addresses requirement in future five years.

Wow that's big numbers. So slides please. If we cannot find answer in IPv4, then we have to look at the answers in IPv6. At the moment, the main internet operators that to apply big blocks of IPv6 in 2011, coherent with the time IPv4 came out in this region.

And they be… On the right hand side, we can see the [threat-ment 0:20:48] of the IPv6 in China, that we know that applying the address also be the easier part to get IPv6 going on. It will only take you a couple of month. Announcing the address is easier, but getting the content up on IPv6 network, have your end user connect to the IPv6 network going to be the tough part IPv6 deployment.

At moment in China, the end user will nearly hit 1%, but consider the population, it's still a large number. Slides please. As the out of country, at the beginning of the implement of IPv6, the government which is the state, will also be the driving force at this stage.

And the China government has entered the IPv6 deployment back to 1998, which is the year CERNET has had IPv6 test bed. And four years later was 2002. MIT has launched a project called 6TNet project, which is the small trial for telecom network. And there is a big project called the CNGI Project launched in 2003 and take five years.

That is the big project which is giving biggest benefit credit to the current IPv6 deployment in China. So I'm going to cover that in another slide. In the year 2010, we're nearly facing the running of the [? 0:22:31] in the Asia Pacific Region, so this state start to research the IPv6 commercial transition and deployment plan.

In 2012, which we can say is the year China launched IPv6 implementation plan. And NDRC has launched two special plans to promote the industrial development. And the same year in May, MIT launched, announced the 12th Five-Year Development Plan on Telecom and internet industry, which is the main plan having the clear time table and road map, how the local IPv6 industry going to be by the 2015.

And the same year September, MOST had launched research on IPv6 transition mechanism and also control system, and National Broadband Network plan. So in China state actually pulls in lots of effort on promoting and setting up IPv6 networks, but that only for only the start arriving the markets are not there yet. Slides please.

So let's look at market, how the industry support IPv6, the IP version six protocol. The local standard association was caused at CCSA has combined with domestic construction requirement to develop a series of the standards. The standards, including the resources, networks, applications, security and transition, for the addressing is the first stage.

We nearly get everything powered, so it's mostly the consume. For the domain, there is once local standard has been launched established. A network for the routing and the mobile, the standards is not only for technical, and there is a testing standard as been announced as well.

Applications, the mobile and IOT is the current work. And at this stage, the standard association has put lots of effort on the security and transitions. For the equipment, there is three aspects of networks, fixed terminals, and mobile terminals. For networks, like in every region of the world, the bearer networks has the best equipment.

Almost all the equipment vendors support the bearer's network. But for the access network, support server and O&M system, the local equipment vendor like [? 0:25:22] has a full series of equipment to support IPv6 protocol.

For the fixed terminal, PC, we know PC, most of PC has support IPv6 already. HG, actually the HG has lots of brand support IPv6, but the problem is the HG was purchased by the household themselves. So it is going to cost a lot of money and workload to replace those HG.

IPTV set up box, is not that hard because they only need a little bit of an upgrade, and is easy to be done. Broadband phone is customized, so it won't be the problem as well. For the cell phone, we know the local vendor has the model to be test of IPv6, but not embedded into our cell phone because the network and surveys is not there yet.

The same as network card. Slides please. For service platform. Service platform including website, search, P2Ps, basic services and VA Services of operators. For the web end service and the search, browsing emails has been quite good support. Like [? 0:26:44]… The email, the cstnet.cn has fully support of the email in IPv6.

For P2P, most of IM not support the, and the chat not support the IPv6, but download a video are quite good in the IPv6 protocol. For basic

services, like I said the phone data transmission, is not supported, but is not the hard part is operators [? 0:27:15]. So it could be done in a very short time, just the money concern.

For the VAS, the multimedia, music download is not supported. And I heard there is not a lot of solution for the multimedia music, but there is… I heard there is a couple of companies who has solutions lately to support IPv6. So there is a lot of the content application at actually the bottle neck of the deployment, that's from the operator side and ST side.

Slides please. So what happening on the web? The [I-Sock] has launched two plan which is one is in 2011 and one is in 2012, and dozens of Chinese website and you see participating in these plan. But there are not the biggest content provider.

The biggest content provider which already in the top ten of ALEC's laced, is the tennis and [? 0:28:24]. I have a lookup of the attendance and [? 0:28:28], which is www.qq.com actually support IPv6 already. And IPv6.baidu.com support it as well.

But inside, they are using the same technology, but they chose different way to promote it. One with the same domain name, the other two use of the IPv6 domain name. But qq.com doesn't support IPv6. Slides please.

So this is ICANN meeting, most of you from the ccTLD registry are registrar. So what we see through the DNS, seeing it as a TLD registry, we support [? 0:29:12] and back to 2006. And as long as dot [? 0:29:17] in Chinese character entered the root, and is support IPv6 as well.

So there is ten global DNS node throughout support [? 0:29:28] which is California, there is another – Washington, one in Frankfort, not including Beijing and Hong Kong. Those are the nodes support [? 0:29:29] as well.

So I put up data which is dot CN requirement of IPv6 daily. That will go up, the highs go up to 20,000 per day, and the lows can go down to 10,000. But that's due only 1% of IP required from IPv4. The layout of the distribution of country, the heat, the requirement from China is over 60%, and the second row is Australia, and then comes through to Japan.

Slides please. So CNGI. CNGI could be the biggest, the IP basics deployed network and plan, which is launched in 2003, take late by eight ministries, the lead is NRC. The key task of the CNGI is to construct biggest, actually it's one of the biggest IPv6 internet backbone.

And within this networks, we can deploy certain technologies and applications, and to promote the industrialization and equipment. And there is also going to be some soft document. There is some key number I have highlight here, the achievement here is there is six backbone networks including the backbone from Cernet, China Telecom, China Netcom at that time, joined with CAS, China Mobile, China Unicom and also China Railcom.

There is, in Beijing and Shanghai , there is two international exchange point for the IPv6 and they construct 2,073 assessed networks and cover more than 20 cities. There is 59 kernels and including 100 [? 0:31:53] in your states, and research in 73 enterprises. There is more than 2.5 gig bandwidth of the backbone.

And there is outlines of dozens of sender draft, there are dozens of domestic and foreign [? 0:32:07]. Slides please. So what happened in the commercial networks? The current commercial networks, including backbones, assess networks, and the ends.

For the backbones, the CR and DNS the mainstream of the devices support IPv6 routing protocol already, but most need software update. And there is a small part of the equipment need hardware replacement.

DNS play the same. The administrating DNS software support four A and A6 record. For the [mens 0:32:50], which are the BRAS and SR mainstream device support IPv6 configuration and access. Some part really need software upgrade. PDSN, administrative device almost part of the mobile need software upgrade.

For the access, access networks is a little bit complicated. Range of access network equipment, there is a bad and good. The support situation is a little bit complicated. [? 0:33:17] has quite good support. For the HG, almost all support IPv6, but just the replacement cost and the workload is huge.

For the end, the client side of the gateway before 2010 doesn't support dual stack. And the mobile terminal chips doesn't support it. But there is a model has been test, just not embedded into our cell phone. Slides please.

So for the commercial network there is a target to achieve by the end of this year, 2013. For the three main operators, which is China telecom, China Unicom, and China Mobile, they have set up their pilot cities having the trial of their IPv6 implementations.

China telecom has 15 cities on the MAN and access networks, 11 cities on CP/SP/IDC. Same with Unicom, they choose ten cities on MAN and AN, BSS, and IDC. China Mobile, which my colleague, Haijun, is going to giving a little bit more details, they have ten trial cities with six fixed networks, BSS, IDC, and IT security.

So the user goals by the end of this year, which is 2013, there, each of the operators should have three million end user be connected to IPv6 networks. And they target for 2015 should be 25 million in all. Consider the populations, the number is big, but the reach is not that big, probably only 2% of the population connect to the IPv6.

As a summary, this page which is the future challenge, has been talk on and on by several person. But I always choose these as my summary. Which is, we still like the return on investment. At the early stage, the state and government can drive the industry, but without market, the industry might not go that far.

People still waiting for the killer applications, but for the IOT on the mobile internet, some of the people think that might be the IPv6 killer applications, which is way too safe.

For the driving force, who leverage IPv6, the user. Users actually applications are only on IPv6 networks. Only small percent of them on IPv6, sorry IPv4 networks and only support a small part of them IPv6. And users actually only concern about the applications and as ICP is concerned about the user and the market, and no one concern is about IPv6.

And the regulators at this stage is concerned about the security. For the terminal issue, which is forever the IPv6 and before is not compatible. And there is no ideal smooth evolution program for transition. So those still are the problem we're going to facing, going to solve in the future, and even the current.

So still tough time for IPv6, but we see actions and some movement in this region. That will be all for our running up. Thank you very much.

MA YAN: Okay. Thank you Wendy. Because of time limitation, maybe we can have the wrap up session and then more question all together. I'd like to invite the second speaker, Haijun to give a talk. Okay? Thank you.

LI HAIJUN: Sorry. I don't… Slides. Okay. Good afternoon everyone. Thanks for giving me the chance to share IPv6 Progress in China Mobile. And next slide please. My presentation has three parts. The first is overview of IPv6 progress. And the second is the IPv6 solutions and transition technologies. And the we will say some progress we found in test.

And the third part our IPv6 working plan in the future. And next slide please. In 2012, we have four main works in IPv6. The first part is network trial and test. The second part is TDD-LTE Terminal and Network. The third part is IPv6 address allocation plan. And the fourth part is innovative IPv6 migration tech.

And I will show the work one by one. Slide please. And we did network trial and test in nine province. And in different province, we have

different trial. For example, in Beijing we had Td-SCDMA trial. It's the TD trial.

In Jiang Su, we had Wireline Access trial. In Shanghai we had the IMS system trial. In Zhejiang province we had PON, WLAN trial and such other such as the DSL trial and such as WLAN trail. We had different trial in different province. Slide please.

And we have many work in TDD-LTE network. So we have test TDD-LTE EPC in six province, including Beijing. And all the equipment in EPC, including P-Gateway, S-Gateway, CG, and HSS all support IPv6 in the customer side. And next slide please.

Well I will say work about terminals. And in 2012, we had promoted four manufactures to produce IPv6 LT terminals. We cooperated them on the development of chip and operating system. This include such as GT in the theater and the now four types data card that support IPv6.

And TD-S domain areas, we upgrade the [coordinate 0:41:39] work in Beijing, and we use the IPv6 TD device ZTE U900 to access the commercial network the first time. Slides please.

And now I will show our IPv6 address allocation plan. We consider a lot of aggregation and the need of service are the two basic principles in the address plan. The route aggregation means we must know which location and networks the address belongs.

And we must calculate the length of the subnet to meet the need of each service. And in the address management, we thought we should distribute the address in different level. And we are also should have consider security in address plan. And also, we think IP address is only

address, so we don't think it should contain some parameters maybe change frequently. So this is our IPv6 address allocation plan.

Next slide please. And let's talk about our IPv6 migration technology. PNAT and BIH. And BIH has the[? 0:43:43] and its being contributed to open source community. We can download the source from the link.

Please next. And BIH and 464xlat encourage the IPv6 transition my making IPv4 hosts compatible with IPv6 only networks and providing IPv4 and IPv6 interworking. The firm issues, the fourth areas of the network.

And next slide please. I think will show IPv6 solution and problems we find in the trial and the test. Please next slide. First I will say we considered IPv6 is essential for LTE. And the reason, as we all know, is the LTE is always on, which means whenever the terminal turns on no matter whether a service will be used or not, IP address should be assigned to the terminal.

And multiple APNs is needed for LTE. When a IP needs one address, so multiple IP address should be assigned to one LTE device. And also considering only about 5% of users can obtain IP address in 2G or 3G at the same time. But in LTE is about 20 times.

So we think LTE we need a large amount of IP address, and IPv4 is not enough. So IPv6 is essential for LLTE. Next slide please. Now I see our IPv6 solution in mobile service. And first dual stack is primary transition technology. And we we set GGSN PGW distributes IPv4 private address and IPv6 address for the terminals.

And we use Net four, four after GGSN and PGW. And the other solution is BIH in this scenario. BIH module provides IPv4 address for the applications in the erminals, and translates it to IPv6 address.

When we must deploy net four six device after GGSN or PGW or in front of the service platform if the terminal wants to access the IPv4 only service. Next slide please. And we also show our IPv6 solution in WLAN.

WLAN terminals can obtain an IP address before authentication, only 20% to 40% IP obtainer are the real active users in China Mobile's WLAN network. So list much IP addresses. So IPv6 must be imported into WLAN. And we consider WLAN's IPv6 solution must be based on dual stacks.

And WLAN AC should be upgraded to support IPv6 and allocate IPv4 private address and IPv6 address for the terminals. And the portal system is also to be rebuilt or upgraded to realize IPv6 authentication. Next slide please.

And now I talk about the problems. We think the most problem is the terminals. 2G, and 3G, and LTE terminals' chips and operation systems need to be updgrade to support IPv6. And WLAN terminals only needed to update their OS to support IPv6.

And IPv6 supported L3 CPE should be used in the fixed access network. Next slide please. And another problem is the applications are not ready. And we can see, we tested 50 kinds of popular clients and applications. And understand we can see some popular applications such as music or video, is not support IPv6. Slide please.

And another question is some equipment are not ready for IPv6. And we can see some is not support IPv6 not well. Slides please. And the firm is the test result of BRAS. You can see there is some problem in the test. Slides please.

And the final part is the IPv6 work plan. And in China Mobile will promote IPv6 in the end to end industrial chain and carry out commercials in the next few years. And we have three periods. And from 2011 to 13, we have the trial in ten province. And as Wendy said, we should develop about three million subscribers.

And we will produce more LTE or 3G terminals supporting IPv6. And the second period is from 2014 to 15. And we complete network IPv6 transition. And we develop more IPv6 subscribers.

And the third period is from 2016 to 2020. And we should all the increased subscribers and service can use IPv6. Slide please. And the tell our network, TDD-LTE network in six province we will support IPv6 and we're develop 800,000 subscriber.

And WLAN and Wireline Access in subscriber will be 2.2 million. And we will upgrade ten self-service platforms to support IPv6. Next slide please. And terminals, we also said we will continue to promote TDD-LTE terminals to support IPv6. Next slide please.

And summary of our presentation. First, the demand of IPv6 has become increasing urgent, so the mobile internet must steer in IPv6, especially in LTE. China Mobile has required all the EPC equipment and LTE terminals supporting IPv6.

And almost all the IP equipment used in the commercial networks need to be upgraded in hardware or software to support IPv6. And the network management system, and the service provision systems, and the security systems must be upgraded. And the cost if very high.

And the ecosystem of IPv6 is still incomplete and needs more work to accelerate the process, especially in terminals and contents. Okay. That's all. Thank you.

MA YAN: Okay thank you. We notice that there are data that show more smart mobile shipment than the fixed line desktop computers. So really, the mobile internet will be getting more and more distributed more worldwide.

So next the story will becoming by Yamamoto from a city in Japan, about as a network, how to enable IPv6 in action networks. A lot of stuff, successful stories. Thank you. Please.

SHINICHI YAMAMOTO: Thank you Ma Yan. And thank you this opportunity developing IPv6 in last [? 0:54:36]. I'm Shinchichi Yamamoto, Chubu Telecommunications, senior network engineer. I would like to introduce our experience in bringing IPv6 [? 0:54:47] to our fixed network customers in this presentation.

I'm giving this presentation into these five sections. Next please. I guess no one knows about our company. To talk about enabling IPv6 [?

0:55:10], let me introduce our corporate profile at first. My company's name is Chubu Telecommunications.

We call it CTC as a short form. CTC is one of the token carriers in central Japan. The number of employees is 618. CTC is a medium sized telecom carrier in Japan. We are providing our services in the five prefectures as well as KDDI group companies.

Our selling point is that we have the optic fiber network build by our services in central Japan. The total length of it is 9,400 kilometers. It's about two and half times longer than the circumference of the earth. Next please.

We provide many kind of telecom services based on our optical fiber network. Services for business, [? 0:56:21] internet access, wide area internet, and some other services are provided to corporate customers. And a services for consumers is provided to service over FTTH name is commufa HIKARI. Commufa is our coined word, it comes from communication.

HIKARI means right in Japanese. This word represents our optical fiber network. The IPv6 [? 0:56:57] is the main topic in this presentation. Next please. Commufa story was started the 27th of November, 2002. How many customers subscribe to commufa right now?

It's about 570,000 as of last month. Commufa HIKARI provides high-speed internet access, VoIP, and fiber optic TV as a [? 0:57:30] service. The maximum line speed is one gigabyte part second. And the monthly fee is fixed charge, so customers don't need to care the usage of internet access.

Commufa HIKARI is chosen as the high speed internet access service at a low price. Next please. At the section, I'll explain the overview of IPv6 deployment on commufa HIKARI. Next please.

In 2010, on allocated IPv4 addresses of INANA tended to be exhausted. And other ISPs started getting ready for IPv6 deployment in the network. CTC decided to IPv6 deployment at the same period. From March 2010 we started researching how to deploy IPv6 on existing IPv4 network.

One year later, we started the IPv6 deployment project. This project member of [? 0:58:42] in our company. Many network devices, servers, and systems had to be upgrading for deploying IPv6 on our IPv4 network. Next please.

This diagram shows the overview of the IPv6 deployment project for supporting IPv6. Routers, bases, DNS and web servers, network management system, and home gateways were upgraded to become [? 0:59:17] devices.

So all of them can support IPv4 and IPv6 now. Please note that home gateway is a kind of CPE device which we lend to our customers. And then, home gateway and customer management systems were upgraded to support IPv6 addresses. These allocations are consistent with of this systems.

If this systems have programs of each authentication function, it would be a big issue for user accessibility. For avoiding that situation, it took us a month in test phase. About 700 test items. Next please.

This project kept running for one year and a half. IPv6 access was started on commufa HIKARI from 22nd of August last year. Next please. Seven months later, the results of our IPv6 deployment showed up on each IPv6 measurement website as below.

The percentage of our IPv6 traffic is 13.16 on world IPv6 launch. And as of 22nd of March this year. And the percentage of IPv6 capable networks is 17.68 on APNIC levels as of 25th of March.

This means about 100,000 subscribers network are IPv6 capable. We have deployed IPv6 to these networks within seven months. How did we deploy IPv6 to them in seven months?

I'll explain about it in next section. Next please. The third section is the deployment, development of IPv6 access service of commufa HIKARI. Next please. In order to get IPv6 connectivity, computer devices in home network must support IPv6. If their OS don't support IPv6, they will not get IPv6 connectivity.

It is difficult for most customers to check if their devices support IPv6 or not. Because users don't care about it, or even don't know what IPv is perhaps. So our goal on IPv6 deployment project was the ultimate IPv6 access service.

In other words, plug and play, so that the customers can access IPv6 internet if they had that device supported IPv6. Before the project, our home gateways already had the IPv4 internet access function. So we decided to add the automatic IPv6 internet access function on home gateways.

We targeted to IPv6 access service, anybody can access IPv4 and IPv6 internet easily. Next please. We took two main approaches. First approach is the home gateway development. Second approach is a new service menu. Next please.

At first, I'm talking about the home gateway development. Deciding what access technique we use, we choose PPPoE for integrating IPv6 network into IPv4 network, because PPPoE has been used for providing IPv4 connectivity. So no changes are required in existing access network.

Therefore no development was required to implement, we stuck PPPoE to home gateways. There are two approaches in dual stack PPPoE model. There are single PPPoE approach, and the dual PPPoE session approach.

In the single PPPoE approach, IPv4 and IPv6 access services are supported over a shared PPoE session. In the dual PPPoE approach, one PPPoE session per address family is used.

One session is used for IPv4 and another session is used for IPv6. We decided to implement single PPPoE session with dual stack to human gateways in the development, because dual PPPoE session approach requires twice the [buses 1:04:51] compared to the single PPPoE session approach.

Next please. Home gateways got automatic IPv4 and IPv6 internet access functions by the implementation. This diagram shows the internet connection and the addressing the home gateways in your

home. Single PPPoE session is used for getting both IPv4 and IPv6 connectivity with dual stack on home gateways.

CTC is the first ISP used this approach over FTTH in Japan. [? 1:05:36] assign home gateways certify 58 static addresses, address prefix, by a HTT [? Six 1:05:46] delegation. Home gateways assign computer devices a dynamic 64 bit address prefix by a router advisement.

When this deployment completed, many home gateways had [drown 1:06:05] in customer's home. However, this home gateways were upgraded to the latest [? 1:06:12] …by a home gateway management system.

How does it work? Let's see the next slide. At the first step, home gateway access, home gateway management system as soon as the customer connect the cable at home. The system [? 1:06:38] of home gateway, the latest version of firmware and configuration. And then home gateway downloads them from the system automatically.

At the second step, home gateway upgrades and configures itself automatically. Now, they got IPv4 and IPv6 connectivity. At last, if the customer has computer devices supported IPv6, they can access IPv6 internet. It is easy for customers to access IPv6 internet by this approach. Next please.

Next building a new service menu. This menu was not only made for IPv6 deployment, but many promoting our new services and prices. In the new service menu, home gateway is a standard equipment. Next please.

Providing home gateways and IPv4 and IPv6 connectivity have started as the new service menu of the first of June, 2012. At the same time, old service menus had stopped accepting new customers.

The older menu customers can get IPv4 connectivity only, but if they change to the new menu, they will get home gateway so they get IPv4 and IPv6 connectivity. And the monthly fee is maximum cheaper we priced. So how many customers have IPv4 and IPv6 connectivity so far?

I will talk about it in next section. Next slide please. Next please. At this section, I'll explain the IPv6 statistics of commufa HIKARI. This bar graph shows the numbers of subscribers at the home gateway and other subscribers during the time from January 2012 to March 2013.

The arrow line shows the percentage of home gateway users. The new service was started from June 2012. So you can see the number of home gateway users has been increasing since then.

The other increasing rate is 13%. IPv6 network is spreading on commufa HIKARI at a good rate. Next please. This is the IPv6 traffic graph of an interface of a backbone router.

It shows the [? 1:09:58] since IPv6 connectivity was provided. The blue line is a downstream IPv6 traffic from the internet. The green line is the upstream IPv6 traffic to the internet. We can see IPv6 traffic is being [? 1:10:18] since late August.

The downstream IPv6 traffic was enormously increased on September. The reason of it is as customer started to access Google via IPv6, IPv6 traffic is increasing as the home gateways increase. It seems that IPv6

traffic can be increasing more if there are more IPv6 websites on the internet.

Next please. The conclusion of IPv6 deployment in CTC. Routers and servers became dual stacked devices. Management systems of home gateways and customers were being upgraded for one year and a half.

For providing IPv6 internet access by home gateways, home gateways were implemented single PPPoE session with IPv4 and IPv6 dual stack and some functions. There are two point of features of IPv6 deployment.

By providing home gateways, customers can get IPv4 and IPv6 connectivity automatically. And by providing the new service menu, the number of home gateway users is increasing. This means IPv6 capable network is spreading on commufa HIKARI.

Thank you very much for your time.

MA YAN: Okay thank you. So our last speaker is Miwa, he will talk about IPv6 development in our region and also the message from APNIC. So your floor please.

MIWA FUJII: Thank you Ma. Just give me a second. Okay. Good afternoon everybody. My name is Miwa I am from APNIC. I'd like to talk about IPv6 deployment status today, and also there is some information from the Asia Pacific region.

And I'd like to conclude my presentation by touching upon the way forward message from APNIC. Let's dissect the IPv6 adoption. To dissect the IPv6 deployment status, we need to focus on multi-stakeholders deployment status.

IPv6 deployment, as many times in this community we've been discussing the multi-stakeholder approach, the internet consists of multi-stakeholders. IPv6 deployment has to go through many phases in different stakeholders realms. Therefore, in order to have the holistic view, we need to have multi-stakeholders information, statistic information from different layers of the internet.

So we need to see IPv6 adoption density in logical order. Probably first place we can look into is the IP address allocation by regional internet registries like APNIC. Asia Pacific Network Information Center. The second place we can look into is IPv6 adoption level in the core networks.

Some networks, including core networks, and BGP prefix announcement into the global lodging table, and ASN data could be helpful to see this information. And thirdly, the third logical place we can look into is content providers readiness and enterprise readiness on IPv6.

DNS server and www reachability data will help us to analyze this data. And the last place we can look into is access networks that allow end users to access to IPv6 resources. We're looking to the end users IPv6 readiness for this.

So this first chart showing the percentage of members with both IPv4 and IPv6 in each regional internet registry. Yellow bar chart showing the APNIC members, about 50% received IPv4 and IPv6.

Red about 50%, that is from LACNIC. And green bar chart is showing the RIPE NCC members percentages which has the IPv4 and IPv6 both. So from this chart, about 50% of members amongst those regional internet registries, and also the AfriNIc and ARIN regions are following to reach the 50% marks amongst their members to receive the both IPv4, IPv6.

And this chart is showing the IPv6 address allocation cumulative data provided by APNIC. As you can see, after the 2010, 2011, 2012, 2013, APNIC start showing quite a large growth of IPv6 allocation. This is reflecting the IPv4 address exhaustion in the APNIC's region.

So is reflecting those two data, we can say IPv4 address allocation in this region, and also the other part of the region, has happened and is happening very smoothly. So let's look into the second layer, which is networks ready with IPv6.

This chart is showing the IPv6 BGP table size. The last two years, IPv6 prefix announcement into a global routing table, starts showing about 50% year on year growth. Obviously, the global routing table prefix announcement doesn't say everything, it's only shows us the one aspect of the network readiness, but at least there are some activities happening from various AS members announcing the prefixes.

And this chart showing the growth of AS nodes and links, the comparison between IPv4 and IPv6. The solid line is for IPv4 and dotted line is for IPv6. As you can see, both AS members which is announcing

IPv6 and IPv6 prefixes, and also the AS numbers which has IPv6 links start showing a quite robust growth.

It's very close to the exponential growth. To compare to the IPv4 linear growth, IPv4's growth rate is quite significant, although the absolute number of AS numbers and links are about one tenth of IPv4. And this chart is showing IPv4 adoption in the internet core networks.

Top 20 so called tier one ISPs, very closely recall of the internet is 100% ready with IPv6. But as you can see in this chart, once you start going farther away from the core of the internet, the IPv6 readiness becomes smaller.

So if you look into the all transit ISPs including the regionals, more transit IM providers it's become the IPv6 readiness become about 20%. So by looking into those data, we can say the IPv6 prefix announcement into the global routing table, and AS number announcing this prefix shows healthy growth, particularly after the world IPv6 launch event in 2011 and 2012.

And so called tier one network operators shows very high level v6 readiness. And we can safely say, the internet core is ready with IPv6, however we need more work in regional and local transit networks.

And let's look into the third layer, the content providers and enterprises IPv6 readiness. The first chart I would like to show is the IPv6 enabled DNS servers. This chart is showing the IPv6 DNS servers amongst the top Alexa 50 sites.

About 20% of them ready with IPv6 enabled DNS servers. And next chart showing the IPv6 enabled www sites. Again, we looked into the Alexa top 50 sites. About 6% of them ready with www site over IPv6.

So by looking at those two data, we can say many network operators use some sort of excuse, no content available therefore – no content is available on IPv6 therefore we are not deploying IPv6.

But probably we can say this is a myth. The ISPs and network operators need to pay attention to this growth trend of IPv6 ready content, while they are preparing their networks for future growth, especially their access networks.

Because access networks readiness determines the end users capability to access to IPv6 resources. And so… And also, let's not forget about the rapidly increasing internet access from mobile device. We'll talk about this in more details later.

Although those Alexa top 50 high layer of the content providers are getting ready with IPv6, still the content providers, particularly in local contents, regional content providers, and enterprise customers need to keep working on enabling IPv6 in their internet resources.

And thirdly, the fourth layer, the IPv6 readiness in end users. We use the data provided by labs.apnic.net and this chart is showing the current world average of end users who can access through the IPv6 resources through IPv6 ready access networks, and IPv6 ready core networks, with using their IPv6 ready devices.

The world is about 1%, and the number of the absolute value of this number is so small, 1%. However, the growth rate is quite significant.

And also, this chart could be a little bit too small for you to read. 1% is world average, we start seeing the diversified numbers and readiness amongst end users in different economies.

For example, Romania, small country, small economy, in Europe is ready with IPv6, 9% for the end users. Followed by France, Luxemburg, and Japan. So what region say is, although the absolute number of end user IPv6 readiness for the world average is still very small, the growth rate is quite robust.

And there are great disparities across economies we start observing. Like we had a presentation from CTC from Japan. CTC Japan is a regional ISP, but their IPv6 readiness for the end user is quite high.

And as such, we start seeing quite diversified the IPv6 readiness for their end users amongst individual numbers, therefore in economies level. End users IPv6 readiness depends on IPv6 readiness in last miles, ie access networks. We need to have more localized, we need to prepare IPv6 and need to make informed decisions in regards to IPv6 deployment to manage for their future growth of the business and maintaining business continuingly.

Deploying NAT444 CGN without deploying IPv6 for this networks… Deploying NAT444 CGN without deploying IPv6 for this networks doesn't secure for sustainable business growth for their networks.

We need to have the ISPs understanding, localized ISPs understanding to make an informed decision when they think about IPv6 transition technologies, not only focusing on extending the IPv4 address, IPv4 lifetime.

So now let's look into the IPv6 deployment status in the AP region. Let's look into China first. This is China's end user readiness. The data provided from the labs.apnic.net. It's going up and down, but general trend is toward right hand side up.

An average is about 0.5%. Obviously, as Wendy and also the Haijun mentioned, there are going through the testing and the implementation test bed process right now. And this data shows such current activities in China.

And we can say transit networks, providers clearly have IPv6 capability in their core. End user deployment is always going to be very difficult, challenging, because the CPE upgrade cost and customer provisioning cost. But by looking into the ISPs of network incorporators successfully deploy IPv6, we can say a few common strategies, like CTC Mister Yamamoto mentioned, the provider IPv6 as default servicers for new subscribers.

And also upgrade existing IPv4 customers when ISP start doing the service upgrade, this is a good chance to upgrade existing IPv4 customers CPE with IPv6. And these are strategies are commonly used by ISPs and network operators who successfully deploy IPv6.

And China, the next couple of slide I would like to talk about interesting trend of the public sector, cooperation between public sector and private sector. And I would like to start from China. As Wendy mentioned, the great leadership was shown by the Chinese State Council. IPv6 mandates to the industry was issued by the Chinese State Council in November 2011, and obviously this impacted to at least three major telecom operators in China.

China Telecom, Unicom, and Mobile's IPv6 activities. We start seeing the more active movement amongst the end user readiness chart through the labs.apnic.net. And from other data as well. They are obviously working towards the goal of three million users for each operator by 2013.

And 25 million users as a whole by 2015. This is quite encouraging news. So next is also the Australia and I'll talk about Australia, Hong Kong, Korea, and Singapore, but I won't go into too much details, you can take a look at this slide on your own time because slides that is available online already.

But common theme of the government from the Asia Pacific region, what we can say is they are applying the multi-stakeholder approach and trying to encourage the partnership between private sector and public sector.

Australian government made it very clear the procurement requirement for IPv6 for their ICT requirement. So therefore such requirement cascaded into the industry. Largely Australian enterprises have IPv6 adoption in their governance profiles.

And Hong Kong government also showed interesting initiative. They organizing the IPv6… They organize the project to raise the IPv6 awareness amongst the end users in collaboration with civil society like [I-Sock 1:27:51] Hong Kong. And India, the Indian government also worked very closely with the industry to develop the national IPv6 deployment roadmap. The first version was issued in June 2010, and the most recent version, updated version, version two was announced just recently in 2013.

And Korea [? 1:28:15] Korean government and SK telecom, number one mobile network operator in Korea. Just recently tested IPv6 on LTE mobile networks in 2012. The LTE mobile network on IPv6 as Haijun mentioned, they are quite a few challenges. But they started at least testing them before going into the production network.

And Singapore government. They are taking a significant leadership to increase the skills on IPv6. They are providing the capacity building training sessions on IPv6 to the industry and subsidizing some cost.

As such, the AP region, we start seeing the quite positive collaboration between the government and the public sector, and the private sectors. And this kind of effort may take few years before we start seeing the actual effect, but it is quite good news, encouraging news.

And I wanted to share that with you. Now I'd like to conclude my presentation by touching upon the way forward of APNIC's message. With reflecting those data and the anecdotal [? 1:29:33] of the IPv6 deployment in this region, APNIC has come up with a couple of key messages.

The first message we would like to emphasize for this community is that there are a couple of strategies network operators can apply to make successful IPv6 deployment. The new networks of service providers are good place to start enabling IPv6.

So whenever you have new subscribe setting up new networks, make sure you provide a default IPv6 for new customers. And also, the Large Scale NAT, Carrier Grade NAT also known as NAT 4444, are not a transition mechanism to IPv6.

These are merely extending the IPv4 address lifetime. If network operators seriously considering expanding their business to its future, they really need to think about what transition technologies, what IPv6 transition technologies they need to implement.

They need to come up with the strategy aligned with the long term vision of the operator. And choices of transition technologies determines number of [? 1:30:50] of transition.

Achieving the native IPv6 at once could be quite a big jump, and there could be few transition implementation, IPv6 transition implementation could be required in such case. The minimizing such iteration is the important goal for network operators.

And also, APNIC wanted to mention about the IPv6 mobile networks. Many times, in various presentations in this different sessions, the mobile devices coming into the quite robust rate into the internet. And these smart devices, smart mobile devices is not only coming in as a huge number, it's not a simply gross of number of devices, these devices keep holding IP addresses longer, and making more number of connections.

And IPv4 does not support today's business needs. The IPv6… The current solutions we have for this issue is IPv6. IPv6 is ready to be used in mobile networks. And several, a few large mobile network operators already deployed IPv6.

And NAT, CGN again, NAT 444 or just sourcing IPv6 addresses just to extend IPv4 address lifetime, does not provide the ultimate for mobile network operators to cope with the huger business growth.

So is it effecting this reality? And also the APNIC survey 2012, we received the collective voice from the APNIC's internet community. The APNIC, they said, the APNIC's community said, APNIC should step up effort regarding IPv6 deployment and training.

And APNIC is responding to such request with some tangible plans in 2013. We are providing more hands on IPv6 trainings, and we providing engineering assistance on IPv6 deployment. And we are increasing more community outreach on IPv6. And this is the sample page of the renewed www.apnic.net/ipv6. We are trying to provide hands on information which can directly impact to the operation to the service providers.

The information on this page include key IPv6 messages, IPv6 data and statistics, v6 transition stories, v6 for governments, IPv6 best current practices, about CGN.

So please feel free to share this site with your colleagues and use this for your day to day operation to increase IPv6 deployment. And we are looking forward to collaborate with you in this room, so feel free to approach us anytime. So thank you very much.

MA YAN: Okay. Thank you Miwa. Really, we're sorry to take more than one minute. But may I request for one, another minute? Maybe we have a lot of, more information to say just in my university we have over ten gigabyte internet already congested.

Pure [? 1:34:38] traffic. So a lot of other information we like to share. But anyway, we would like to open the mic for one question. Yeah

please. Because of time limitation, we have a full discussion after session, all speakers on stage.

NICHOLAS: Thank you. My name is Nicholas. I just want to know, why you insisted so much on 444 as an example… Is this like a strategy in your country for coping with the IP address allocation? Or it was just an example you gave? Thank you.

MIWA FUJII: Thank you very much for the question. I love to answer for this question. May I ask you what kind of background you have?

NICHOLAS: …engineering.

MIWA FUJII: So for engineering. Right. The NAT 444 as I mentioned to you many times, only extend IPv4 address lifetime. It doesn't provide the IPv6 transition technologies. In service providers networks, if they are expanded their networks to cope with the future growth of their business, they need to start deploying IPv6, NAT 444 only provide the IPv4 lifetime to extend IPv4 lifetime.

It doesn't provide IPv6 solutions. Therefore, I am just emphasizing so strongly, any service providers only deploying NAT 444, they are not deploying, they need to understand, they are not deploying IPv6 transition technologies.

Not denying NAT 444, some service providers definitely need IPv4 lifetime extension because they need to deploy dual stack probably. To deploy dual stack, they need IPv4. And there is no way to squeeze out IPv4 out of thin air.

APNIC cannot give anymore IPv4 addresses except last slash 22 to members. Therefore, I am strongly emphasizing, if you are only deploying NAT 444, you are not deploying the future solution which is IPv6. Hope I answered for you, your question.

MA YAN: Because the next session will starting ten minutes later, may I have some other more questions here? Okay. That lady first. Maybe. At the back end. The first, and then the second. Okay. Thank you. [Laughter]

Sorry, keep you waiting for the present time. That lady there. Do you have any questions? No. So here.

WOMAN: Well my question is for the Japanese operator.

MA YAN: CTC.

WOMAN: Yeah CTC. I'm so sorry. I was very interested to know about the last mile, which you have in your network. So did you actually have to do additional investment in order to provide that to your customers?

And whether you also charge your customers for that? Okay. So I'm interested to know about the last mile that you have, whether you had additional investment in order for you to provide that.

And also whether you charge your users. Thank you.

SHINICHI YAMAMOTO: Japanese translator. [Japanese 1:38:19 – 1:38:26] CTC, I just translated what he answered in Japanese. CTC… It has required CTC to increase, to give some additional investment to manage the last mile IPv6 deployment, but they didn't charge that cost to the customers.

MA YAN: Okay. So one more question here please.

JASON FESTER: Jason Fester, Yahoo. Just a comment to CTC. Dual stack by default, the numbers clearly reflect the success that you have with this, and I very much hope you guys see a benefit from this from the IPv4 perspective. So thank you.

WOMAN: All right, are we all set?

MA YAN: An answer? Just a comment, okay. Okay. Thank you. Thank you for all your active participation, and also thank you for all the remote

participants. Let's finish this session and hope to see you in the next ICANN meeting. Yeah.

[Applause]