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>> IZUMI OKUTANI: Good afternoon, everyone. I'd like to give it one or two more minutes to see if more people are coming, but then we'll be starting shortly. Yeah, it would be great if you could just gradually get ready for the session.

So I don't see too many flows of people coming in, so let's start, and welcome, everybody, to the session on IPv6 in the Asia Pacific Region. Myname is Izumi Okutani. I'm from JPNIC, a registry in Japan, and I'm serving as one of the MAG coordinators for the Best Practices for IPv6 for the global IGF, so I'd like to just take a look at how many people in this room are familiar with IPv6. I do see familiar faces, but can you raise hands on if you think that you know what IPv6 is? Can you just, you know, show your hands.

Okay. So I guess everybody knows what it is. So there's no need for introduction. And so then I'd like to introduce why are we discussing about IPv6 in the APrIGF while there has been -- this topic has been discussed many times on many of the technical forums as well as of the RIR or NIR meetings, and the reason is that to deploy IPv6 and make it really effective for the Internet, you cannot do this on your own, and it's not just a matter of a single organization, but then -- and it's not just a technical operator who's willing -- who has the knowledge and willing to deploy, but you need key business decision-makers to agree that they can start their v6 to be commercially ready.

There might be a role where government can play in creating an environment that would encourage v6 adoption in their local country or, like, in

a smaller area, and, so there are various players that you need as a whole for IPv6 to be ready, and I think IGF is the perfect platform to have these kind of discussions where we have different players, different stakeholders joining the meeting so that we can discuss what will be the role of different stakeholders can play in encouraging the v6 deployment. So that's the basic introduction.

And actually, in the global discussions, since last year, from 2015, what's called the Best Practices Forum on this theme has started, exactly for the reasons that I've shared, and we have actually produced a document that describes what are the -- collecting the case studies of government measures from different parts of the world that has encouraged v6 deployment or our task force initiatives in different, again, parts of the world, or what are the lessons learned from private sectors, so that was one output document that was produced in 2015.

If you go to the global IGF website and click on the Best Practices Forum, IPv6, you can actually confirm this output document from last year.

And also this year, in 2016, there's continued work on this theme at the global IGF, but building on last year's work, the focus this year is to study what is the economic element in encouraging v6 deployment, both in terms of looking at in a bigger picture of how would v6 deployment help in more development for the ICT industry as a whole as well as individual business cases for -- for the interesting this year, and we started collecting cases, and the case from the Asia Pacific region is strongly encouraged, and anyone is welcome to make a contribution.

With this, with this session today I would really like to focus the perspective from the Asia Pacific region, and I've invited a panel of speakers sitting on my side, and so I'd like to start first from Paul Wilson from APNIC, who will give us a view on why is it important for the Internet to be v6 ready, so Paul, would you be able to give a brief three minutes' introduction on your view on --

>> PAUL WILSON: Sure, sure. Of course. To introduce myself, I'm Paul Wilson, head of APNIC. It's the IP address registry, one of five organizations that exists around the world, nonprofit member organizations with the responsibility to manage and distribute IP addresses, IPv4 and IPv6 addresses in our region.

So we're very interested in IPv6. We take our guidance from APNIC members, and APNIC members have stressed that they want us to help with IPv6 to help to get our region deploying IPv6.

Now, what's the reason? Well, the reason's pretty simple. The early architecture of the Internet specified -- Internet addresses specified a new America address that was to be used by every device, and every device under that model should have one unique address for every device on the Internet, and that allows those devices to be reached, allows global connectivity from device to device wherever they are on the Internet, so that was actually a very powerful thing at the time, and it's one of the reason -- excuse me -- it's one reason for the internet's great success, the fact that it had this global addressing system, but the IP system, IP protocol that was introduced at the time, IPv4 was introduced in 1983, and it allows a total of four billion

different addresses, so in 1983 that seemed like a lot, no problem at all, this will last forever, but of course, these days we have billions of people on the Internet and more billions of devices, and so we don't actually have enough IPv4 addresses to do that, we can't allocate a unique address to every device. It's not possible anymore, so effectively IPv4 is exhausted, there's no more addresses needed -- no more addresses available, and something else is needed.

So this was actually a moan. It was known that this would happen by about sometime in the early 1990s, and so it was way back then that IPv6, version 6 of the Internet protocol was developed specifically and mostly to give more address space, so instead of being a 32 bit, 32 binary digit number, it's a 128-digit number, which gives 340 billion, billion, billion addresses which is enough to last the Internet, we think, for a long time. We might be proven wrong sometime in the future, but at this stage, it looks like enough addresses to last effectively forever.

Now -- so IPv6 has been available for a long time, and it's not yet being used, and I'd like to discuss why not, but perhaps I'll leave that for a bit later in the discussion.

You might ask how the Internet is still running if IPv4 has been exhausted, and that's because we're using various different technical techniques on the Internet to share addresses between collections of devices, so if you're at home and you've got a wireless hub in your house, then that's actually performing -- it's not only connecting you, but it's performing the role of what's called a network address, and it's sharing a single address amongst multiple devices. That works well, but there are limitations to the way that can keep on being used more and more throughout the Internet, so if the Internet was to grow for another ten years and we were relying on this Network Address Translation system, then the Internet would be much less efficient than it is today. It would become more complicated. We would lose the critical factor that we started the Internet with, which is the ability to connect any one point to any other point, so, you know, the final justification, then, the key reason for IPv6 is precisely so that we can go on on the Internet for decades to come. While restoring that, it allows the Internet to connect to every point on the Internet. It's referred to restoring the original Internet model, so I'll leave it at that. That's the motivation for IPv6, and there's plenty more to be discussed about how we're doing it, whether we're doing it, when we'll do it, et cetera, et cetera. Thank you.

>> IZUMI OKUTANI: Thank you very much, Paul. That was a very good understanding and opening of why we want to encourage IPv6 deployment. For the Internet to keep growing in the way we do to maintain the nature of the Internet, it's important that we encourage v6 deployment.

So the next -- I'd like to see if people have one or two questions or comments, and if you have any questions or comments on this introduction, please raise your hands, and you might also have, like, later opportunity to join the discussions as well. Then I'd like to move to Professor Tseng, and he'll be sharing the statistics and the

measurement on the deployment, both globally, regionally, and perhaps pick up some of the notable economies on -- oh, thank you.

>> SHIAN SHYONG TSENG: Good afternoon, everyone. It's my great pleasure to be able to talk about the current status of IPv6 readiness measurements. Three years ago, initiated the IPv6 readiness measurements in the conference, and now there are 30 presentations, and the -- almost all of them introduced the current status of the IPv6 deployment in a country and organization or a region, and that was different kind of the measuring criteria.

So among all the different kind of measuring criteria, there are three common criteria, and the first one is the IPv6 allocation and BGP advertisement and the second one is service availability, and the third is the user availability.

And according to the RIPE NCC survey, as you can see in this graph, the BGP advertisement is growing steadily all over the world, yeah.

And we can find the average -- the worldwide average is about 26%. Let's drill down into the data.

As you can see, in Asia Pacific region, Japan, Taiwan, Singapore are all above 40%, and Malaysia, New Zealand, Hong Kong, Thailand are over -- above 30%.

So next let me briefly introduce the service availability. The service availability usually includes web service availability, email service availability, and the other service availability. So at this mobile home, let me take the web service availability as an example.

So as you can see, in this figure the average -- the average of the web service availability of the Alexa top one million websites is about 5.8%. It is quite low; it is quite very low. It means that the -- most of the Internet content providers fall behind to provide IPv6 accessibility, so let's take a look at the Asia Pacific region, so Hong Kong, Singapore, Thailand, Indonesia, India, and the Taiwan are above the average, so let's take a look at these figures.

If we choose the fixed data site, fixed sample site, for example, as 500, so this column is 500, you can find the service availability, the web service availability is getting higher. Every country for the 500 is higher than the one million Alexa websites, so it means the more popular the website, the more the IPv6 accessibility.

So let me show you the user availabilities. It is very hard to measure the user availability, but it can be estimated by calculating the users who can access the popular and famous websites. For example, Google, YouTube, Facebook, okay, over the IPv6.

So as you can see in this graph, the Google user availability has 1%, has 1% growth -- 1% increase every three months in last year, so up to now the total -- the average number of the user availability is over 10%, okay, so let's take a look of the leader board.

As you can see, in this table, most of the European countries, United States, and Japan are in the leader board, so -- but the -- you know, the Google as well as APNIC also provides user availability statistics, but APNIC uses a different way. APNIC uses the data processing method to eliminate the outlier, so they get a weighted average. The weighted average increases almost half of the Google

index, okay.

Let's take a look at Asia Pacific region. According to the APNIC user availability as you can see Japan, Malaysia, Singapore, Australia are above the average, so that's -- that's the IPv6 readiness criterias. Thank you very much. Thank you.

(Applause)

>> IZUMI OKUTANI: Thank you very much, Professor Tseng. I think that really gave a general picture of the v6 readiness per service as well as comparison with the overall global and some of the notable economies in the -- in the world, within the region, how we're doing compared to the rest of the world.

So I think it's -- it was actually personally quite encouraging more than I thought, especially to know that if you actually break down to top 500, the bigger websites with user accessibility, the more ready it is, so that would be quite efficient in terms of, like, the number of users being able to view v6 websites.

Maybe -- I'm open -- I'll open up for one or two questions again before I move to another speaker on this presentation, if anybody has anything to say. Any comments or questions, observations?

If not, again, I think you can actually come back later when we have the open general Q&A sessions, so I'd like to move now for individual case studies per different countries, so we have a speaker from India, Japan, and Korea, so first from India, Rajesh will be sharing the situation in India.

>> RAJESH CHHARIA: Thank you, Izumi. India. We are a great country, and after the change of government two years back, the government has got a lot of targets, and to fulfill that target, they are lean in the infrastructure. We have got the target of 600 million broadband connection under fiber to India by end of 2020, and 250,000 villages has to be connected with the optical fiber network.

These all figures can be achieved only when we will be converting ourselves or we will be doing the QL state for IPv6 because IPv4 is not there, and buying from the market and using it to the network is not going to make a business case.

You asked one question, why IPv6. The question is now there is no IPv4 left, and if we want to go and if you want to get your -- you should go with the broadband penetration, you have to convert to your IPv6.

Also, the security monitoring agencies are also finding problem in that developing country like India. To monitor individual users, and if the service provider has the capacity of taking the port number of each individual by -- doing a netting on the IPv4, that's up to them, but IPv6 comes first.

In future also, when each of your device, whether it's microwave oven, fridge, AC, will be on the network, and if you want to enjoy the cool food or the hot food, you require IPv6. IPv6 is the solution.

The problem in India right now, presently what we are facing, while the service providers are -- the encouragement is not coming from the user set as well as the government -- government has come out with a road map one and two, but in the time practically, they

will not convert all their application, all their service to IPv6. The requirement from the user will not come, and if once the government will take that banking site, airline site, and the payment sites are to be converted to the IPv6, (Inaudible) of IPv4 and IPv6, you will find the penetration of IPv6 will start a lot.

In a democratic country, maintaining anything is very impossible, and that includes the democratic country of India.

Apart from that, from the user side, lifeline of our equipment is very long. We are using equipment in the last breed of the equipment. We believe in the maintenance, and when the maintenance guy says get it now, it is impossible to repair this equipment, then only we change.

India has got 65 (Inaudible) population, and will is a cycle of the equipment, the equipment starts from the metro city, goes to the city, and then the same equipment finally goes to the rural country. That's why the IPv4 cannot be immediately converted to the IPv6 on the fly, because the whole cycle has to change, and then the whole cycle will get changed automatically and things will get better.

They still make in India -- (Inaudible) and under this program, when we will be achieving towards a 600 million broadband connection, we will be able to get these things. One good thing from the government side is coming, that the Smart City Project, they are trying to maintain into the IPv6 because this will be an application into the city.

Our next smart city has already been adopted, and the government is on the way to deploy the Smart City Project into the city, and this is the good thing that is coming from the government side, they are mandating that the smart city will be another IPv6 project.

Apart from that, 2017 is the deadline for all the websites of government, whether it's an eGovernment application or service application, all those websites have to be converted on (Inaudible) IPv4 and IPv6, and same is with the mandating to the service provider January 1st, 2017, you will not locate IPv4, you will locate only IPv6, and to the present customer, we have to give the stake of IPv4 and IPv6 so that they should also start using IPv6. This is the story, I will not say better, the network is so complicated, until the time the mobile network is not getting converted to the IPv6, we will not be able to see the good things into IPv6. We are the largest mobile network, and we have got one of the largest mobile users into our system. Some have a smartphone. Some are using the old technology smartphone which is not good with IPv6, but slowly the user perception is changing and they are coming to the smartphone, and the new smartphone, and we hope once the users we will be getting ready with the IPv6, the provider will be forced to change to the network to provide IPv6.

>> IZUMI OKUTANI: Rajesh, it was the first time I heard this level of detail into India, so we think you've been really helpful in summarizing the notion behind it. Paul mentioned now that IPv6 is an existing possible solution but then there are issues around it about how do you identify user for law enforcement agencies when it comes to -- when there's large needs to -- to assign IP addresses for Internet of Things, maybe IPv4 may not be able to accommodate it, and I think you've really listed a good balance of challenges as well as a way

forward in the fact that while there are no strong needs for the users, but then you also want to be respectful of the business needs, and then I think you've raised a very interesting point that I -- that maybe -- I don't know if it's only unique to India, but certainly not a case that I've heard in Japan where the equipment gets recycled, so, you know, once you use it in, like, big cities and it gets redistributed to, like, rural areas, so even if the cities get upgrade equipment that's v6 ready, maybe in the urban areas, people will be using the legacy v4-based equipment. I think that's an interesting challenge that you face.

I think mobile is another area that's -- I think that's a common challenge, you know, not just in India, and I believe Billy will be sharing a case of SK Telecom in Korea later. Smart City Project, that's another thing. One of the European cities that has IPv6 deployment, they have high rate of v6 deployment, and I think that's one of the countries that has the v6 for the Smart City Project, so thank you for many insightful information.

I'd like to see again if people have any comments or questions from Rajesh's statements. Any questions or comments from the panel are welcome as well, if you have any. Anyone?

>> AUDIENCE MEMBER: I'm (Inaudible) from Sri Lanka. We have a task force established to check the readiness of ISPs or IPv6. It is a regulated commission, and we are part of the task force, so what most ISPs are ready to deploy IPv6, but the problem is the customer brings us things where they're not ready to deploy the service to be customers, so from ISP point of view, they don't have budget to replace all the customers that brings us things which is compatible with IPv6, but I think in future they will spend money (Inaudible) and we will be deploying IPv6 in Sri Lanka.

>> IZUMI OKUTANI: Thank you so much. I also didn't know this readiness situation in Sri Lanka, so that was really interesting to hear, your infrastructure is ready, but customer CPE is not ready. Maybe the case in Sri Lanka. Paul?

>> AUDIENCE MEMBER: (Inaudible)

>> PAUL WILSON: I think the thing to bear in mind is the Internet is growing. We know there are new users coming all the time. This is what life is on the Internet, it doesn't stay the same. The question is what is the equipment being installed, because there's a lot of new equipment being installed. It may not be just the CPE but it will be the equipment that serves the CPE, and that's clear, but the point is that whether it's new users coming on or upgrades to services and so on, this is happening quite often, services being upgraded, we're going from to fiber in many cases, and what needs to happen is enough advanced planning from the ISPs to actually know when time comes to do an upgrade, they've got to make sure it's IPv6 compatible.

I saw a brilliant example of this last week in Vietnam where the overall deployment rate reached 1% in a very, very quick jump, and it came from one service provider decided that they would start deploying IPv6 cable connections for their new cable connections, and they've gone to the extent of 80,000 connections. They've stopped right there

for the time being because they're testing and making sure that it works, but it was a very good example that just by simply making the plan, doing it in a staged way and with that testing -- because you don't want to assume that everything's going to work, particularly not when you're delivering services to end users, but it shows on the stats that you've got a jump that contributed to Vietnam's deployment now going to 1% because this (Inaudible) so 80,000 customers they're pushing or they're pulling 25 gigabits of traffic on IPv6 from the major service providers like Google and Facebook, so they're right now in the process of making sure that's all working before they keep rolling it out. It's just a very good case, an example of a deployment in progress being done in a way that's working very well.

>> IZUMI OKUTANI: Thank you, Paul. I think that was good to hear a successful case within our region, and I understood your point that by planning it well, we can actually make this happen, and maybe the new joint -- people who are actually joining this initiative new has more advantage of it because you can actually plan it well in advance and in a more structured way, so thank you very much. That was something that we can all keep in mind.

Let's see if anybody else any comments around this.

If not, let's move to the presentation from the MIC from Japan, Mr. Akagawa.

>> TATSUYA AKAGAWA: Hello. I'm Tatsuya Akagawa. I will talk about IPv6 implement in Japan and an example of the law of government.

First, why does the Japanese government promote IPv6? The key point is, of course, the development of the Internet. The Internet on the issue of -- development of the Internet leads to improved convenience in daily life for our nation, and development of the industries in Japan as a whole. There are -- IPv4 at its exhaustion is (Inaudible)

MIC established a study group in 2009 to consider the measures for promoting IPv6. Various players participated in the group such as carriers, Internet service providers, network equipment vendors, corporate users, academic experts, and so on. This study group has contributed to IPv6 deployment in Japan through discussing the solution to some issues and developing action plans.

The study group released a report four times. MIC has been citing the importance of IPv6 actively.

And the study group also conducts follow-up for the report by interviewing each player, such as carriers, about implementation status or reviewing action plans and discussing new issues.

These results are published as a progress report. This follow-up process is important in ensuring the effectiveness of the report because if there are some remaining issues, it was discussed among participant on how they could be addressed. It will be a motivation for players to make progress.

So I want to have the point for the latest report of the study group. MIC published the 4th report in January 2016. One of the basic thinking is IoT, Internet of the things. Now, we recognize the load on IPv6 is changing from a measure against IPv4 exhaustion to

indispensable use to the IoT era.

And -- the IoT era, mobile communication has important goal in directly connecting these devices.

But mobile network operators have mostly not deployed IPv6 in Japan, so we decided to include achieving a situation where IPv6 is provided by default to smartphone users with no additional burden by -- to 2017.

Mobile operators express their intention in the process of discussion at the study group, and continuing follow-up is also important.

At the end of my speech, I'd like to summarize the role and involvement of the Japanese government for IPv6 deployment.

There are other industry initiated activities in Japan. Of course, the IPv6 deployment should be private-sector driven because it is a management issue for each company.

Japanese government have a mind to support their private sector's activities, so we consider any activities which have synergies with such activities.

Concretely speaking, for example, awareness raising to key stakeholders, publishing discussions among various key industry players, at meetings to follow-up from the report, and other activities which are challenging to conduct in private sector.

That's all. Thank you.

>> IZUMI OKUTANI: Thank you very much. This actually, you touched upon a couple of points that was also mentioned by Rajesh, so I think Rajesh mentioned it was a bit difficult for governments to regulate things, being a democratic country, so I think it's the Japanese government is taking basically this policy that you don't force or regulate theirs and you tolerate the initiatives by the private sectors, but the government played a role -- a place for facilitating discussions and then they produced a report, and what's interesting about the case of Japan is they don't just produce the report, they actually do the follow-up to confirm -- gather stakeholders to see the progress, and if there is a particular stakeholder that is not making a progress, you discuss it among others, so if there's anything other stakeholders can do, that helped in providing an environment that would consider a way forward as -- all together as well as I think it's a bit of a peer pressure that if you don't actually address your own part, it's a bit embarrassing. I don't know if it works in all cultures, but it certainly worked in Japan as you see from the rate of deployment.

Another thing I thought was interesting -- so after producing the report and I think this really high rate of deloyalty by access line providers, the government now produced a next step report focusing on the IoT and mobile and I think as a result of the report, the mobile phone providers have actually -- I don't know if the word "agreed" would be too strong or not, but I think they're conscious and are basically willing to move forward to have all the users to be v6 ready by 2017, so let's show things will go on this collaborative measure and the progress after this report is published, and I think this really provides a good segue to the next speaker, but before I go, let's see if people

have any questions or comments about Mr. Akagawa's presentation.

>> AUDIENCE MEMBER: I think that in Japan we have accessibility deployed IPv6 and we have tactical experience running it for fast periods, so have you found any IPv6 specific segregations, and how did you work on that?

>> IZUMI OKUTANI: Very good question.

He will explain in Japanese so I can translate.

So based on the research by the Japanese government, they consider there is actually no IPv6 specific security issue, so there are common security issues for both v4 and v6 but there's no fundamental security issue that is caused by IPv6, and of course, there are some products that is not ready in IPv6 in certain security features, but many of the products are today IPv6 ready, so they don't think that this will -- this certain products not being ready for IPv6 for security will be a big enough barrier for deployment, and I think -- just switching my hat to someone from -- as someone from Japan, I think the Japanese government provided some experiment and published a support and security testing for IPv6 in collaboration with a public sector, and this is published on the website. Maybe it's only in Japanese. Is it available -- okay. Unfortunately, it's only in Japanese, but I don't know, maybe you can use Google translation or something, so if you're interested, please feel free to reach out to Mr. Akagawa, and maybe it can translate to English or your own language, so that was a very good question. Thank you.

Anyone else? If not, let's go to Billy. Billy.

>> BILLY MOOHO CHEON: Thank you. My name is Billy Mooho Cheon with Korea Internet & Security Agency. We are working very closely with Korean government in the area of Internet promotion and security. IPv6 is one of the important issues we're following, so I'm here to share general pictures of where we are standing in terms of IPv6 and also, we attended the RIPE NCC meeting, and we met a major IS piece from a European region, and we did comparative research, and I wanted to share the findings that is important to share with you, so first let me tell you a little bit about general picture of our status, basic status.

v6 was introduced in 1995, and we started early, actually relatively early. The first IPv6 location to Korea was made in 1999. It's for research network, and currently Korea has a fairly good amount of IPv6 address. We have more than about 5,032 which is quite enough for next generations, I believe; however, in terms of actual usage, we have kept quite a low profile regarding our multifaceted efforts to deploy IPv6 for the last -- for the last years, and this morning I checked Google website, and IPv6 usage website, and it shows Korea is -- it turned out results, Korea's usage is 3.58%, which is not much figure, but in terms of IPv6, I think it -- we started -- we just take off, fly.

And also, one thing notable is that we can -- I can find a search of IPv6 usage in '13-'14, so let me -- so here I want to tell you more about what has been done, what was our effort behind the -- these figures.

From first public -- the public sector, the Korean government,

we set up a three-year plan to support IPv6 transition at national scale, and the government -- the government -- the Korean government made from -- we also made all government ministries procure IPv6 compatible implements by law since 2014 and also the government exempted income and cooperate text in IPv6 purchase, that's 3% for large companies and 7% for SMEs, and also we recommend -- we are recommending SIPs and CSPs to deploy IPv6 on their commercial services. While we just focused on IPv4 legacy, we're trying to be more practical these days.

And Korea -- I mean KISA is also operating IPv6 deployment center since 2014. Through this center, KISA is providing a help desk service and trainings and also test bed for IPv6 transition, especially with the test bed, we are planning to upgrade the test bed to the level of their security where the mobilities can be tested.

And we also host IPv6 workshops and also published guidelines for -- to share technical and managerial know-hows.

This is -- know-hows. This is highlighted things that has made from public sector, and now I would like to tell you a little bit more about private sector. Like was mentioned in the mobile, SKP, that's the first ISP which deployed IPv6 on their commercial services.

They deployed IPv6 on the voice and data of commercial LTE networks in September of 2014. Followed by this, in December 20 -- in December, through collaboration with KISA and major PACB operators such as CL Television and CNN and HCN also deployed IPv6 on their commercial services, and this year, (Inaudible) also commenced IPv6 by the commercial services. Now, IPv6 services being provided for 11 regions with about 60,000 subscribers in Korea. And I think -- I hope this explains certain IPv6 traffics on Google website for Korea and gives some general pictures of where we are standing, and I also have some maybe interesting or already -- you already know -- findings from interview with European ISP, so should I go -- should I save this discussion for later?

>> IZUMI OKUTANI: Yeah, I think that's a very great way to move on to the discussions, which I was planning to do for the Q&A on observation on the successful cases and successful cases and what would be any trend. I think that would be excellent if you can share, but before you go, maybe people have questions to what Billy has shared so far, any comments or observation about the situation in Korea? Thank you, Billy, for sharing both the public- and private-sector initiatives.

So I think we have a question from the floor. Can anyone pass the microphone?

>> AUDIENCE MEMBER: Hello. I'm (Inaudible) from the energy team from the Japanese (Inaudible) but the security of the mobile, so in Japan's case, the wired ISP, CPE (Off microphone) but in the mobile case, the smartphone will be connected directly to the Internet, so in the SK case, how does the securities -- how secure they are, devices? Is there any firewall or something? I just want to ask the security about the mobile device.

>> BILLY MOOHO CHEON: That's the question I don't want to get because I'm -- I don't have certain expertise in particular area, but

like I said, KISA is operating test bed, and I think they're -- we, you know, study on those problems, but I cannot give you details -- I mean, I cannot give a detailed explanation for that.

>> AUDIENCE MEMBER: Okay. So if you have any idea --

>> BILLY MOOHO CHEON: Yes, yes, yes, I will probably let you know the right contact for that, yes.

>> AUDIENCE MEMBER: Yeah. Thank you so much.

>> IZUMI OKUTANI: Thank you for the question. I think that was an interesting observation that from -- there may be additional security information needed on the connection side compared to the connection with the CPE because users will be using their smartphone, mobile to connect to the v6 Internet, which may not have the same functionality as the CPE, so yeah, I think it would be useful if -- well, it might be a bit sensitive, but individually can share, I know that might be very helpful, so thank you for this question.

And I think it was interesting how Naver, that's a big application service provider.

>> BILLY MOOHO CHEON: Yes, content provider. First in the tangible size, yes, first content provider.

>> IZUMI OKUTANI: Okay. Yeah. So we hear a lot from the global players that their contents are v6 ready, but I don't hear much from localized content service providers that they're v6 ready, so I think it will be -- that's an interesting case to share, and I think if something can be shared for the global IGF Best Practices, I think that would be, like a case -- good example case for others, not just within the region but then globally as well if they don't mind sharing the motivation behind it, so thank you, Billy.

And so if there are no other comments or questions, I think we can move to the discussions part where I'd like to have discussions with everybody here, not just the panelists, on do you -- from the presentations or from your own experience and observations, do you see any commonalities and trend on the successful or unsuccessful cases in v6 deployment? What do you see as the remaining challenges and how can we address them?

I think some have been touched through the Q&As, and what are the rolls the different stakeholders can play? So I think -- sorry, did you want to make a comment? I'll go to you, Billy, for sure.

>> AUDIENCE MEMBER: Okay. Thank you very much for the very informative presentation. This is Zakur. I am from a country which is not having very good status in terms of IPv6, yes, Pakistan.

You see, it is very interesting -- I mean, interestingly when you are sitting in a forum in Taipei that is all about IPv6 and you -- all of a sudden you see your cell phone not an IPv6 network. I just did the testing. We're on IPv6 -- IPv4 here. As -- as we just saw, the commonalities and the trends about IPv6 deployments, and you know, certain parts of the -- and you know, certain parts of the world are not doing good in terms of IPv6 deployment.

What I have seen in my observation is that's probably because the end user is least interested if he or she is on IPv6 or IPv4 because what they need is good, fast, and reliable Internet connectivity, so

probably that is one of the major reasons of -- I mean, the slow deployment in countries like India, Pakistan, or Bangladesh, and on top of that equipment, as well, I mean -- I have been working in the telecommunications industry, and there is a similar problem in telecom deployment or Internet deployment or access. I mean, there have been operators using access technology like ADSL or GSM or 3G or 4G or LTE. What the end user needs is fast and high and speedy bandwidth. They don't care if it's CDM 450 or YMX or ADL, right? So, I mean, there are international regulations and restrictions from institutions like ITU that -- I mean, countries actually have to utilize certain forms that they call universal services obligations which are being used for deploying telecommunication networks in the rural and remote areas so as to make sure that everybody gets equal access to Internet, so do you feel the need for such an initiative or maybe probably Paul can comment on this -- the need for such an initiative that -- I mean, governments, you know, organizations like APNIC should give rise to such an initiative whereby funds like USOs are utilized -- I mean specified and governments and regulatory bodies ensure that ISPs should contribute to these funds and those funds should be too used for deploying IPv6 in these markets, because in the majority of the markets across the globe, the Internet industries with the private sector and their eyes are always on the, you know, return on investment and their economies of scales and stuff like that, so, I mean, they don't see -- literally, they don't see any financial gain of moving to IPv6, a financial gain; right?

They're always reluctant to investing on infrastructure, IPv6, and stuff like that, so funds like USOs can maybe contribute to ensure the IPv6 numbers.

Plus, as Rajesh was mentioning, a 600 million target of broadband, that's huge, almost twice the population of United States, so if we probably are able to, you know, having at least 50% of these new broadband connection in India on IPv6, so that will be, you know, an exponential growth in IPv6 numbers.

So these things can be tackled from policy and regulatory point of view more than talking directly to the end user or to the network owner.

>> PANELIST: As was pointed out, the customer needs the fast Internet and reliable Internet, but at the same time, the customer needs a lot of -- lot of new applications also, and when they will be seeking the new application, automatically sometime they have to change, like earlier we were using the feature phone, the moment smartphone came, we adopted the smartphone because the smartphone was very close to our lifeline.

The same way IPv4 will require to be changed to the IPv6, then at your home you will be putting a lot of devices and you will demanding from the service provider that I want the IP address for all those devices to run, and that's a real IP address. Automatically you have to change your CPE at that time. Can you not rely on the service provider only that he should invest -- he or she should invest into the network of the CPE also because my duty is to provide you the Internet, and

if you want to use Internet for your daily life or your older devices, then you have to invest from your side also.

This is the thing. Regarding the penetration, I already told that we don't have any IPv4 and new network is coming and 600 million broadband can be achieved on IPv6, not on IPv4 because our law enforcement agency's very clear that from 2017 onwards, they want the IP record of every user, and if you will be doing netting, then it will be the responsibility of the service provider to provide the port of each and every individual. I don't think we are able to do that.

>> PAUL WILSON: Can I just answer in terms of what governments are doing. I think we should be very cautious about asking governments to specify technology. I think we might regret that down the track as a general principle, but it is -- I think it's important to link and has been important to link IPv6 as a special case with other governmental programs and visions, so, for instance, in APNIC's work with APEC Tele, we found some uses ago they had adopted a grand vision for deployment around countries, they wanted to have a comprehensive broadband deployment by about now, actually, and we found it was a good way to link to that to say that -- and to convince that that was not going to happen without certain things being in place, and we successfully had IPv6 adopted as one of the conditions that they were going to promote as a very special case as an enabler for that vision. I think it was very important to link the technology to the vision, which is what the governments should be setting the policy and the direction for the future, and that was one case where I think we successfully were able to do that.

What I understood from a visit to Vietnam last week was the government had taken a carrot approach, not a stick approach, and there are tax incentives for IPv6 in that IPv6 has been categorized as being a member of one class of special technologies that receive, what do you say, a beneficial treatment or beneficial treatment in a tax sense, so there's a relief of VAT and there was a relief of import tax for certain classes of technology, and IPv6 has been adopted as part of that.

So again, it's a case of IPv6 recognized in an existing government program, and I think that becomes quite feasible as a policy movement. Thanks.

>> IZUMI OKUTANI: First the speaker from Thailand, and afterwards, we go to you, Kenny.

>> AUDIENCE MEMBER: Yes. (Inaudible) from Thailand. I speak on the capacity of the -- just to update. During the policy forums in Helsinki in 1956 is ISAC, it's a security and stability advisor of ICANN, come to GAC. If you you're interested you can search the words like SAC 79. It's the paper that led to the changing of IPv6. This provides a very good executive summary, so I think they brief the government what are the implications if you let the industry to decide whether to go (off microphone) or not.

I agree with Paul, but it raises a public concern. For example, on the application design problems that would create, you could not go to the v6. The law enforcement at 4 and 6 that you already mentioned

is a concern for the government too. The last one is the data retention policy. We create a huge cost. That finally pushed back to the end user. They keep a record on advisory points and provide recommendation and responsible for making the report back to 184 countries we have to coming up with a recommended public policy standpoint that we don't know how GAC react to this, so there's a movement on government to help the industry, and it seems to me that the -- trying to find the financial justification for them to go on or you have to use this kind of peer to control, but I do see there might be a public policy standpoint for government which direction we'll go for v6, and I'll keep you update. Thanks for inviting me to the IPv6 group already. I will keep update through that working group then. Thank you.

>> IZUMI OKUTANI: Thank you very much for sharing this update and what you see from the GAC perspective. I think that was interesting, and I think we see a commonality that -- the point that Rajesh mentioned and I think earlier Paul as well about it will be challenging and impose additional cost by having a system that you need to keep record of who -- who the user was by adopting a natting, but you think v6's costs, but natting might cost as well. So let's go to Kenny.

>> KENNY HUANG: Yes, Kenny Huang, a current member of APNIC. (Inaudible) without IPv6 because it was sponsored by local carrier, and that's what I explain. They have difficulty to provision IPv6 service within such a short period of time. That's why -- they explain their results.

And also I checked the Google website up to today. The Google IPv6 adoption in Taiwan is only 0.29, so it's quite a shame, so that probably explains because the local carrier are reluctant to provision that kind of service. That's why we only have IPv4 today. And the other excuse I just realized and a reason they -- (Inaudible) it doesn't support IPv6 well, so they recommend all users switch from IPv6 to IPv4, so I would suggest we can play Pokemon Go very well here.

(Laughter)

>> IZUMI OKUTANI: Thank you, Kenny, for sharing the situation and the background behind the network here locally.

I want to add a really quick point. You know -- about the speaker, the observation which was made that the end user actually don't care whether they're use v6 or v4, and they just care about the stability of the Internet, the speed. I think this is very true, and in case of Japan, what ISPs have decided is that they don't let the end users care -- you know, so they don't need to subscribe we want v6 network or not. It's going to be the ISP side that they will have all the end users ready as default, and they made that decision because it's their service benefit for the long-term sustained stability for their service, user growth, as well as I think the cost factors being mentioned about additional cost and natting to keep the record, as well if you update the equipment, then most of the updated equipment are v6 ready, so it's not -- conceptually you might think v6 is additional cost, but you can actually be v6 ready by simply updating your equipment.

So that was a quick comment from my perspective from Japan. Then let's go to Billy for -- or actually, there's one question for remote.

Sorry for keeping you -- this is very much in sync with your comment. This is a question from remote. It would be -- from Roger. It would be interesting to summarize similarities and differences between countries' v6 strategies and also opportunities for synergies in corporation. As a suggestion, perhaps the board can consider an independent subcommittee to address the security concerns. They can study each country's approach to enabling v6 -- deploying v6, then provide their finding and recommendation to APrIGF board. So I think the idea is maybe we have -- we share the common practices and observations and share information including some of the security concerns, so I think that was a good and interesting suggestions. So thank you so much for your patience, Billy. We were very interested to hear your comparison and observation on the European ISPs.

>> BILLY MOOHO CHEON: As I explained, we, Korea, and also other countries have a lot of efforts with the resources but are still struggling with challenging issues in IPv6 transition. We -- I mean, the cost burden for IPv6 transition is still high, especially for SMEs and also, there is a fear and uneasiness from v6 from a security perspective. There is merry-go-round from companies in moving to IPv6. Companies switch liability to each other. The infrastructure is not ready for the region. They are hesitant to move. So KISA, we -- we try how to -- so to solve this kind of problem, to find a breakthrough, we think it's very important to -- just like (Inaudible) set -- important to study other cases and, you know, try to compare and find commonalities and difference, so I -- we -- KISA attended a meeting, another region, which is normally we don't because -- and we had an interview with a major ISP, so from the interview, I just want to share with you some interesting questions and answers.

So first thing we -- I mean, first we asked the why European -- Europe region is relatively ahead of other region in terms of IPv6 deployment. They said they have multinational ISPs, which led the market, so for that region the market is very competitive. And also, they -- CG -- they -- in IPv4, CGM carrier grade network cause legal problems, and another thing is if the CTO has a technical background, it's easy to make a decision to deploy IPv6. That's the question and answer.

And another thing is from government, they have a government IPv6 -- government support to moving to IPv6, and they said they don't have much -- almost none, and even there is -- I think it's not effective; however, if -- there's cases like if -- if local government start Smart City Project, and there if they need IPv6, it's needed, then it would be more efficient, so I would -- I think probably indirect approach would be needed.

Also, another thing is that they said -- they mentioned is that network operators group, no activity, was very active, discussions and sort of volunteering -- volunteers. They have so many volunteers in terms of activity.

And we also asked is there any benefit from IPv6 deployment? They said no, there's none from short-term view, but there is -- there is a very -- it was kind of interesting. I mean, one of the interesting

answer is that after one of ISP answers that after IPv6 complete adoption, they can sell IPv4 at high cost because this -- they said it's kind of investment, they said so, and they also -- we also asked if there's any difficulties, like additional difficulties with IPv6 network from security perspective and operation. They said -- most of them said it's same as IPv4 network.

And also, another -- what is challenge, then, we asked, and they said legacy -- changing legacy is a big challenge, especially in the (Inaudible) line, CPE is too many and it's costly to change.

And last thing we asked is that what is the main factor to influence on IPv6 measurement index, like in Google measurement site, and this he said if there's one monolithic ISP that has more than 30% device and this locates IPv6 that's the part, so then the graph -- skyrocketing, so they are from Belgium and Greece. So we concluded probably we need to encourage to have -- encourage, you know, more discussion in the network operator's groups and also maybe we need some -- we should leave more to market, should be more like market driven, not government driven. Maybe government, it's time to step back one and probably support. That's what we found in general. Thank you.

>> IZUMI OKUTANI: Thank you so much, Billy. I think that was really comprehensive and useful observation. Many of them also matched with the discussions and points being raised here, such as the -- I think, like, for example, in terms of security, I think, you know, you would think that there may be additional security issues in IPv6, but then it's basically the same with IPv4, the issue with legacy equipment on -- especially on the CPE for end user. I think that's a common issue being shared here as well. I don't know if we can actually think of a way forward rather than keep on growing the network and as we actually have all the new network, you know, the legacy equipment will no longer exist and it will not even be a legacy or not -- this maybe something that if people have any good way around that you found, it would be useful to maybe share the experiences, and I think your final sort of like summary observation that leave it to the market, it's very much consistent with the points that Rajesh made and also with the case of the Japanese government that, you know, they'd leave it to the private-sector initiative, and they just play the role of facilitating the discussions, and I think you really raised a new point about the network operator's group.

You know, they were actually -- you know, played a big role in motivating the technical people and they actually also pushed companies to be V6 ready, and that's certainly the case in Japan as well. We have what's called JANOG with over 500 participants, we do have active technical communities, so I think this collaboration with this actual technical community existing and having a place for discussion for like working in synergy. Rajesh.

>> RAJESH CHHARIA: We interviewed IS case for Europe and countries with a high IPv6 deployment, and they all have -- like Belgium, they have a BENOG and Swiss has an SWINOG, Germany BGNOC, I just wanted to comment.

>> IZUMI OKUTANI: Thank you so much. That doesn't get too

highlighted in this forum, like Internet Governance forum, so that's a good observation. So this addresses the question and suggestion from the remote participant, Roger, so if you have any additional comments, questions, please feel free to make a comment on the chat, and thank you, Robert, for your question remotely. Rajesh.

>> RAJESH CHHARIA: Isn't the difference between Europe and the Asian Pacific is the country and the population, that's why their percentage grows like this, but if we compare it with the population of our region, then we are also growing, but our percentage is not being visible so clearly, so if we compare both the things, still Asian Pacific countries are doing very fine.

>> IZUMI OKUTANI: I think that's a fair and a good observation that -- and then I think that's also in line with the point that Billy made. Maybe some of the countries, they have a -- I mean, maybe the country itself is relatively, like, small in population compared to some of the countries or economies in the Asia Pacific, and if like a big ISP becomes v6 ready, then, you know, v6 takes up; whereas, in big countries in Asia, maybe they're more competition and it's not just simple as one ISP adopting v6 and the rate raises, so it would be good if we can compare regional dins. It's certainly something that v6 Best Practices Forum this year would like to analyze and make observations, and I really encourage those of you here to provide your contribution to this global forum as well from the Asian perspective.

And I think you've raised an interesting point about the smart city, so that might also -- having governments having smart city to be v6 ready, that might be a drive for encouraging v6 deployment, not just with the situation in -- did you say Belgium in well, one of the European countries in any case. So thank you so much.

I think we have a question or a comment from the floor.

>> AUDIENCE MEMBER: So I'm Jerry, a college student from Taiwan, and I want to talk about why the readiness rate of IPv6 has a huge gap. We have 40% of readiness, but we only have, he said it, 0.3% of deployment rate. That's because unlike many Asian Pacific countries, Taiwan's provided the CPV devices so they provided cable mode else and fiber modems to houses, so basically, most recently installed Internet, like in the recent five years, their CPAs is already IPv6 enabled, but they didn't -- they did not apply for the IPv6 service.

I tried to -- as the home user, I tried to apply for IPv6 dual stacking at the first place, like two or three years ago, but, however, the transition cost was very huge. It takes -- I need to -- I used to have a static IPv4 address. That needed to be taken away from me for a week because of the transition. I don't -- they need to come to my house to change the CPE devices, and after that, after like a week or so, I finally have been enabled for IPv6, but even so, they did not configure my CPE devices to actually get IPv6 addresses. I need to configure it using -- manually by myself, so that is why --

(Laughter)

-- IPv6 adoption rate is so low and Taiwan it's hard to apply, hard to configure, and hard to set up.

For academia, I study in national university, I won't state the

name here, but I -- we cannot apply for IPv6 addresses in dorms, dormitories and labs, even though we have a /40 prefix for our school, so that's why the adoption rate is so low.

And I also have a question for Mr. Tseng. What is the government going to do, like, to improve the adoption rate, like to spread it more to the normal customers like on the CHT or what? And also, the biggest ISP in Taiwan, their ENS service is still not IPv6 enabled, but that's what most people use as default in Taiwan nowadays.

>> IZUMI OKUTANI: Thank you from sharing the real-life experience from the local country, Taiwan.

>> SHIAN SHYONG TSENG: Yes, this is a very important question, so everybody wants to know the reason why, so -- me too.

(Laughter)

As you may know, in Taiwan there are three different kinds of the ISP. The first one is a Taiwan academic network used for all the schools and the second one is a commercialized piece, and the third one is government, government service network, so if you can take a look at the top ten adopter of the IPv6, you can find almost all of the top ten are academic -- from academic, so that's the reason why you cannot. You know, it's not easy to get the IPv6 service from commercial, so I'd like to mention at this moment, this is a summer vacation, so a summer vacations, an IPv6 use is very low because the schools -- you know, yeah, most of the dormitory are closed, so that's the reason why. If you'll take a look at the -- maybe the March, April --

(Laughter)

-- they hey be higher. They may be a point -- maybe -- as I remember, maybe .8, okay, close to 1.0, something like that.

I'd like to mention in -- for the government, I'd like to share the story with you, so four years ago, (Inaudible) has proposed government IPv6 deployment proposal to the main street transportation, communication, but these projects -- basically it's a four-year project with no extra project budget, okay, no extra budget, okay, so in the last four years, all of the 4,500 governmental -- governmental agencies, okay, the central government, the local government departments, are all having upgraded to be IPv6 compatible but, these can only raise the availability, web service availability, not related to the user availability, so the user availability, the key is the commercial ISP, so therefore one years ago, so they've established a working -- a task force. It's a task force composed of the commercial ISP, and especially the most important thing is the chair is the president of the Hinet, so I -- I expect that this house falls, again, as mentioned, Mr. Mar is the president of Hinet. Two days ago he sat with lunch, introduced the mobile service, mobile v6 maybe by the end of this year, so perhaps it's a big break through to provide the IPv6 services for the mobile user, okay, but as you may know, in Taiwan there's an I-Taiwan project. The I-Taiwan project -- a lot of the -- more than maybe one million, okay, I don't know, so it's very -- it's a huge number of health spas, -- hotspot, so our goal is to get the hotspot IPv6 compatible maybe by the next year, so this approach can raise the user's availability, so -- I also want to encourage, okay, the point is how to encourage

the commercialized piece, the operator to deploy to upgrade their services to be IPv6 services to be compatible.

>> IZUMI OKUTANI: Thank you. I think it was good to hear the question from the local and what's being done locally in Taiwan. We are actually running short of time.

>> PANELIST: Can I have three sentence?

>> IZUMI OKUTANI: Yeah, sure.

>> PANELIST: Every household has fiber to their house and already has IPv4 readiness, but it's hard to get it enabled, but the IPv6 has already done the part. They didn't advertise that. Can you not apply for IPv6 and it's hard to apply for it?

>> IZUMI OKUTANI: Yeah, I understood your point very well. So even though, like, is service w infrastructurewise it's ready, but then it's very complicated or difficult for users to apply to IPv6 is your point, right, so I think this may be something that ISP -- I think Paul mentioned, like, preplanning and strategically might actually help a lot in deployment and it might be something that ISPs in certain parts of the world can keep notes, it's not just tech lick but then procedurally -- technically, but then procedurally making it easier for users to apply without too many hurdles or make it a default without having users to apply to it. That might be something that ISPs can consider. I think we're actually running close to the hour, but, okay, let's go to one more person from the floor, and then I'd like to wrap up with possibly, like, if any of the panelists like wants to have one last word, I'll open this up, and then we'll close the session, so thank you.

>> AUDIENCE MEMBER: Okay. I know the server from Thailand is still enabled, so you can -- the Internet is IPv6 ready.

>> IZUMI OKUTANI: Thank you for that information. There is HINET that is IPv6 ready and you can actually check. Is there anyone from the panel who would like to say one last word to wrap it up, anything that you actually missed to say or -- yeah, Paul.

>> PAUL WILSON: I think there's been a lot of talk about IPv6 for a long, long time, and people still ask why isn't it done yet and haven't we -- or even haven't we found another solution now, as though we don't need it anymore.

It's really important to understand that times are changing now because of the exhaustion of IPv4, that v6 is being deployed in huge numbers around the world. There really is no excuse for not deploying it. There's no case for saying it's not secure, it's not ready. The mobiles providers in the USA are doing it very rapidly now, and the U.S. deployment is advancing very fast. They're now at more than 30% of users in the U.S. That's more than 100 million users in the U.S. that are using IPv6 today. For anyone to say we're not ready or make excuses, it's not sustainable. It doesn't mean everyone has to deploy it tomorrow or immediately because these things need planning, as I said, and although it's urgent, it needs to be planned and done correctly, but I just think it's very important for us to understand that this can be done now. We're in a situation now where, frankly, there's a v6 divide in the world and there are countries, which courtesy of

their ISP, is not moving or lagging far behind on their v6, and I think although it is in the hands of the ISPs, there is something to be done here to avoid that v6 divide, something can be done and we just simply need to be moving and planning and not to be making sort of excuses or hiding our heads in the sand, but that's all. Thanks.

>> IZUMI OKUTANI: Words forward from thinking, so a word from Mr. Akagawa, and we'll close the session.

>> I have a comment. The IPv6 -- the use of IPv6 is increasing. According to the data by Google as was mentioned, in the process of IPv6 is increasing at the rate of two time per year, so in Japan, it is not enough IPv6 employment, especially content side as was mentioned, so we hope the private sector takes the initiative to do the IPv6 deployment with the trends, so we would like to support these activities.

>> IZUMI OKUTANI: Thank you so much about the observation about the remaining challenges, the willingness for the government to promote the private-sector initiative, and I really think that guess back to the words given by Paul, let's really be conscious and, you know, try to move forward with v6 deployment. Thank you so much, everyone, for joining. I think it was really lively discussions.

Just a reminder that this Best Practices Forum at the Global IGF v6, if you actually go to the Best Practices forum v6, you can subscribe to the mailings. Anyone can join, and I encourage you. Thank you so much.

(Applause)

(Session concluded at 3:35 p.m.)

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