DURBAN – IPv6 Workshop
Wednesday, July 17, 2013 – 15:00 to 16:30
ICANN – Durban, South Africa

FIONA ASONGA: Good afternoon, everyone. If we can settle down, we want to start on the IPv6 session.

This is the IPv6 workshop of ICANN 47 meeting in Durban, South Africa. For those online, it's taking place in Room 3C, Hall 3C. For this session, the agenda is going to be as follows: We have shall a brief update on the ASO and the NRO processes, then we shall have our presentation from Hisham Ibrahim, who handles IPv6 issues in the AfriNIC office. He will present remotely. Then Jama Boba from the Cameroon government will share with us the IPv6 initiative, carried out by the Cameroonian government, followed by Mark Elkins on the South African experience on IPv6 deployment. Then Andrew Alston will present remotely on IPv6 in research and education sector. We will start off with Wilbar, who shall present on behalf of the ASO and the NRO on the policy development process.

UNIDENTIFIED MALE: Are the slides available on the ICANN website?

CARLOS REYES: This is Carlos. The slides are available on the Adobe Connect Room. They are not yet available on the website. I just received them.

UNIDENTIFIED MALE: Thank you.

FIONA ASONGA: We will have Wilbar run us through this, please. Wilbar Woeber.

WILFRIED WOEBER: Thank you Fiona for the introduction. Thank you for inviting us as a group, us being the Address Council, and while I myself personally have been involved in IPv6 things since more than a decade, this presentation is not really specific to IPv6, technology-wise, but we thought that it would be very useful for the community being interested in IPv6 to get some input and some guidance regarding the policy development processes that are applicable to IPv6 address distribution as they are to IPv4 address distribution.

This is mostly a brief background summary of why the Address Council does exist, what its main objectives are, and then I'm going to rush through a couple of slides that you may want to read up on at your leisure offline, and then I'm going to put the focus on to how you can get involved and how the policy development processes are working.

I've got just some ten minutes for this presentation, and as I know that I'm well known for extending across each and every time-wise boundary, I would ask Fiona to try to keep me within those ten or twelve minutes. Next slide, please.

Why does the Address Supporting Organization exist? It does exist because there is a Memorandum of Understanding between the community of Regional Internet Registries and ICANN. The most recent

version of that was signed on October 21, 2004, so next year we can actually celebrate the ten year anniversary.

The Address Supporting Organization, or the Address Council in particular, has two basic jobs on their shoulders. One of them is to oversee the logistics of global policy development processes in the regions that lead to a global policy, and we are going to see what the definition for a global policy is.

The other major function that has an influence on ICANN's dealings, ICANN's existence, is that this body elects two members of the Board of ICANN. We just went again through this process and re-elected one of the directors.

So what is a PDP? PDP is the abbreviation for Policy Development Process, and it's the framework within the community. Let me emphasize that the community actually flocks together and comes up with an idea, comes up with a proposal, walks through discussions and eventually agrees on a consensus point of view on a particular issue, and in each and every region, this is to start out a regional policy.

There are lots and lots of them, and there are different sets of regional policies in the five regions, but there is a special version of those, and this is the situation where the same thing, the same issue, the same goal, is pursued in each and every one of the five regions, and the five regions actually agree on the same text within their framework and within their region. This is one of the requirements, so the text has to be the same in all the five regions, and in all the five regions, there has to be consensus. That's one requirement.

The other one is that the policy actually has to have some sort of influence on the interaction with IANA or the services offered by IANA, or any other input or influx on the behavior of ICANN to report to other bodies. This is the background and framework. Can you please go to the next slide?

On this one, you can find the formal definition of what the global policy is. That's just the documentation version of what I tried to explain to you. And to emphasize here again, "Requires specific actions or outcomes on the part of IANA," and IANA is this part of the ICANN organization that deals with numbers, in particular of interest to the address supporting organization. Next one, please.

So what does this thing look like? There are five regional Internet registry service regions, and each of those regions put three individuals into the pool of 15 elected and appointed persons on the Address Council. Usually in the current version for a region, two out of three per region are elected by the community, and the third one is appointed by the management of the Regional Internet Registry.

Global policy development oversight, ICANN Board of Directors election, I talked about this one already, but there are other duties which are put on our shoulders on a more individual basis, and that's, for example, that someone usually has to serve on the Nomination Committee that we have been and currently are involved in various review teams. For example, I was on the WHOIS Policy Review Team, RD4, that was concluded last year, Fiona at the moment is at the ATRT-2, and there is also another colleague or mine, actually two, being on the meeting, whatever the abbreviation is – the Future Meeting Planning, whatever.

On sort of a sideline, we also have the job of answering the ICANN Board's questions, should they come up with regards to number resources. This is sort of in parallel to the formal policy development process. If the Board has any open issues or any questions regarding number management, then we may receive a formal question to which we then do have to formally answer, to the best of our knowledge. The next one, please.

Coming back to the policy development process, or the policy development principles, the cornerstone of the thing is policy development is done in an open forum environment. This open environment is put together by two components. One of the components is the mailing lists per region. Of course, this technology, this tool, offers the capability to interact at any point in time, and asynchronously. And then there are open policy meetings. Usually, almost always, they are in the framework of the regional meetings.

The frequency of these meetings in the five regions is potentially different and they are not synchronized on a timeline, so if you start out to do a global policy development, we have to deal with the logistics that the meeting times of the five regions are not aligned, and there are different numbers per year, so sometimes the members of the team – us – we have to go and we need to go other region's meetings to participate in the discussion and to actually get this thing going. But everyone is invited to join in here.

The second thing is transparency. There is a documented policy development process, both in each and every one of the five regions, as well as there is a formal description, formal documentation, how to deal

with global policies. The policies that are agreed on eventually are documented and published, and also the meetings which leads to consensus and lead to those policies are documented.

The third cornerstone here is the bottom-up process, so everyone is invited to join in. It's consensus based and it's important to note here that the regional registries themselves or the staff members of regional registries do not come forward actively and propose policy or dictate policy, but they rather help this process along by way of participating in the discussion, contributing their assessment of effect or difficulties, and as soon as the policy has become policy, then the regional registries are expected to, as soon as possible, implement them. Next, please.

Within this policy development framework, there are a couple of functionalities, couple of roles, and of course the most important one is the role of the community because it is the community which has to submit proposals which has to participate in the discussions and which has to converge eventually to consensus or not.

Then there is the role of observing the discussion, maybe helping the discussion along, and eventually determining whether there is consensus. This consensus evaluator role is implemented differently in the five regions, so in one or the other, it is an advisory council taking up that responsibility. It is the head or coordinator of a policy SIG (Special Interest Group) or like in our RIPE region in Europe, it is the collective of all the working group chairs. That's a pretty big group.

Then there is the board functionality, and this is the role of guiding the thing along and trying to make sure that this converges one way or

another, either into a consensus or into abandoning a particular proposal.

Then there is staff involvement, and this is staff from the regional registries, and they are involved during the discussion period, or close to the period when consensus is expected in the role of assessing the impact of the proposed proposal, the proposed policy, and to give feedback about difficulties about, for example, financial aspects or about inconsistencies with other boundary conditions and frameworks that might already exist. This is before consensus is declared, and then afterwards of course the RIR staff has to implement the policies, the decisions. Next, please.

Let's have a closer look at the steps that are involved when it comes to global policy or also to regional policy. There is slight variations, but this is the major workflow, so someone has to submit the proposal, then we have to go through a community discussion phase, and the discussion has to take place on mailing lists and potentially on open forum meeting. Then there has to be an evaluation where a consensus has been achieved, and consensus in that sense here is very close to what the IETF defines as consensus, so this is not necessarily unanimous support, but sort of a reasonably big, major majority being in favor.

Then there is usually a last call function, and that's sort of a safety belt feature here to alert people that unless you speak up right now, you are not going to be heard if you are against a particular proposal.

Then there is the adoption and ratification phase, and there is the implementation phase. That's the regular, the general flow of things. Next, please.

The global policy process is pretty similar to that, with regard to the fact that each and every global policy initially starts within the framework of a regional policy development, and the Address Council members are expected to join in if nobody else turns up or shows their hands to submit a particular proposal to the regional forum. Of course we as the AC members, we also do an interest to get the process aligned on the timeline as good as possible, because there is no point in trying to have a global policy and then we end up with consensus in four of the five regions, and the fifth one didn't even start the discussion, so we need to try to align the processes on the timeline.

This is one of the things, this is before there is consensus in all the five regions, was the goal to achieve consensus in the five regions. Next slide, please.

We are going to get back into the loop because as soon as the five regions have agreed on a common text, this common text is forwarded to the NRO (the Number Resource Organization) and it comes back by that route to the ASO AC and during this phase, our responsibility is to review the formal environment, the logistics whether everyone has been heard, and whether arguments or contributions in favor or against a proposal have been taken care of and considered.

If this is the case, then there is a formal decision in the Address Council to propagate this policy to the ICANN Board for adoption. The usual reaction to that is that the Board ratifies this proposed global policy, and by that it becomes global policy, and then the Internet Assigned Names and Numbers Authority and the RAS go ahead and implement this global policy.

On the slides and probably by my expectations looks and sounds more difficult and more complex than it is in real life. If you are interested, just begin to join in. Read a couple of discussions about policies, regional ones or global ones, and try to get involved in that. Next slide, please.

This is actually the focus and the real reason why I'm talking to you in this room here is to advertise to you and to entice you to get involved. How can you do that? First of all, you can watch the news, you can watch the mailing lists. There is in all of the regions usually a particular mechanism or mailing list to distribute the announcement that work is about to start on a particular issue, so this is one of the things.

The other things that I would urge you to consider is to participate in your regional policy discussion environment, and your region here is not necessarily just the one you are physically living in, or your business or technical interest is focused in, because there is no formal membership in these discussion groups. Wherever you are living around this world or on the moon, you are welcome to join in. Even if you are based in Africa, for example, you are welcome to join in in the European discussions, and the other way around.

There is during the meetings, most of the time during the address policy-related meetings, there is also remote participation. In some regions and in some environments, this is not as fancy as the ICANN environment. Sometimes it's just a chubba or chat channel, but still this is one way of getting involved. Next slide, please.

Participation is easy, just try to do it. Subscribe to the Regional Internet Registry's policy lists. As I said, no formal membership. You do not need

to live or have any physical interest in that region to participate, and please attend the meetings in person or on remote technology, and we'd like to see and hear you in these environments. Next slide, please.

Which brings me to the end, and if there are any questions, I hope that I am able to answer them, or one of my fellow AC members might be in a better position to do that. Thank you. Back to Fiona.

FIONA ASONGA: Thank you Wilbar. Any questions? Well, I'm not seeing any hands coming up. In the absence of questions, or as you're thinking of your questions, I think I shall move to the next presenter, Hisham. Carlos, kindly get Hisham ready.

CARLOS REYES: This is Carlos Reyes. We have to call Hisham so that we can get his audio in. If you could just give us a few minutes, we need to pause for a short break.

FIONA ASONGA: Okay. Any questions? I will take this time to introduce then the other members of the ASO who are here representing the different regions. How many am I seeing? I'm not seeing everyone, so I'll ask those that are in, please introduce yourselves if you're near a mic, or move close to a mic and introduce yourself.

RON DASILVA: I am Ron DaSilva, from the ARIN region.

TOMOHIRO FUJISAKI: My name is Tomohiro Fujisaki from the APNIC region.

HANS PETTER HOLEN: Hans Petter Holen from the RIPE region.

DMITRY KOHMANYUK: Dmitry Kohmanyuk from the RIPE region.

FIONA ASONGA: And Wilbar is from RIPE.

HISHAM IBRAHIM: Yes, Fiona? Can you hear me? Hello?

FIONA ASONGA: Hello Hisham. We can hear you.

HISHAM IBRAHIM: I can hear you very well. Can you hear me?

FIONA ASONGA: Yes, we can.

HISHAM IBRAHIM: Okay, perfect. Can I get my sides up?

FIONA ASONGA: Slides are going up shortly.

HISHAM IBRAHIM: So until they go up, good afternoon everyone. My name is Hisham Ibrahim. I am the IPv6 Program Manager at AfriNIC. I will try to be brief because I know how painful remote presentations are. We are already facing some technical difficulties here.

Let me first talk about AfriNIC for those who do not know what AfriNIC is. AfriNIC is the regional Internet registry that serves the African region. We provide Internet from various sources as well as other services. For the purpose of these slides, I will only focus on IPv6 in Africa and AfriNIC. Are the slides up yet? Until the slides are up – okay, the slides are up. Great. Next slide, please.

These are some of the registration services trends that we have been seeing over the past couple of years. As you may have noticed that all the way up to 2010, we were only giving out handfuls of assignments of IPv6. But in the year 2010, that number increased dramatically, simply because of all of the communication that was being made then about global IPv4 depletion.

As you can see as well in 2011, that spike really went up because that was the year of the global IANA IPv4 buyouts. You can see the numbers going down a bit in 2012 and 2013. We had hoped the trends kept on going up, but it's understandable. You will probably see similar graphs from other regional Internet registries, as well. Next slide, please.

Some of these trends as I was mentioning, the increase of number of requests in 2011, as you saw. Today, we have almost 54% of the new members that are registering at AfriNIC and in the year 2013 that have requested an IPv6 suffix by themselves, without us needing to tell them, "Are you interested in IPv6 and do you know what IPv6 is?" That

actually shows now, the African community now, is more aware of what IPv6 is, the issues then, and they want to actually start deploying it from day one as soon as they get there Internet resources.

We also have in our New Members Guidebook that I also have information about all the relative AfriNIC services, including IPv6. Next slide, please.

The next slide will be trends of IPv6 as advertisements globally. I still haven't seen the slide move yet, so I am going to continue speaking unless told otherwise. The graph you will be seeing is the percentage of economist assisted numbers that are globally seen over IPv6 and you can see over time, since 2005 we had around from 5% it grew in the beginning of 2011 to 6. During 2011, you can see the slope getting really steep and we had a 200% increase, so we were at 11.2%. Now we're almost at 14% visibility.

I'm sorry, can I get an indication that you can hear me? Because the slides aren't moving.

FIONA ASONGA: Hisham, we can hear you clearly and everyone is paying attention to what you're saying and to the slides.

HISHAM IBRAHIM: Okay, perfect. I just couldn't see the slides moving on the remote. If you can see the slides, I am actually on slide five that has all the five regional RIRs and the percentage of their IPv6 global visibility. As expected, the top two ones are APNIC and RIPE NCC. These two RIRs are the two RIRs

that actually reached their final /8, and as was mentioned in the previous presentation, each region has policies that are developed regionally of how to deal with the last /8 assignment, which is called Soft Landing Policy. These two regions now can only allocate small blocks of IPv4 to their members, and this is why IPv6 deployment is taking off more, and that's what makes it so logical for the first two RIRs to be APNIC, the one that first ran out, and RIPE NCC at 20% and 18%. The other three RIRs that we can see, 16.7% for LACNIC, AfriNIC almost 14% and the ARIN region around 12%, 12.4%.

The next slide has the AfriNIC IPv6 initiates. I just have this slide for purposes that you can actually go back and look at these links. I'll just run through them really quick. We have the IPv6 trainings that AfriNIC does. We have the website, you can go visit that. It has the next upcoming AfriNIC training schedule and the modules that we teach. There's the AfriNIC IPv6 Task Force, that has the IPv6 webinars that AfriNIC does in cooperation with ISOC and [inaudible] telecom. You can see the archives of the past previous webinars on that website. They are in both English and French.

There is the IPv6 program page that has information from how to start and frequently asked questions about IPv6 to transition mechanisms and more advanced topics in the African region and from the NRO perspective, as well.

There is the Ting'a Ting'a project, which is Tunnel Broker service that AfriNIC offers in southern and western Africa. You can read more about it at the URL there, I won't take too much time talking about this now.

And there is the IPv6 statistics as well. All these URLs you can find on the presentation afterwards.

My final slide has the NRO IPv6 survey. If you go to www.AfriNIC.net, you would find on the main page these two indications of the NRO survey, and I request everybody in the room to take three to five minutes to fill the survey. This is a global survey that the NRO which is the [inaudible] organization for the five RIRs has conducted for the past four years. We use that information to know how IPv6 is viewed and monitored at hand from a global perspective and on a regional perspective, as well. If you please could take three to five minutes, go to www.AfriNIC.net and fill that survey, it will really help. We will put that information to good use. Thank you very much. I won't take too much time. That was my slides. I'm here for questions.

FIONA ASONGA: Thank you very much Hisham. Any questions from the floor for Hisham? Hello? Any questions for Hisham? Okay, Hisham, turns out you're very clear, and well understood, and there are no questions.

HISHAM IBRAHIM: Thank you very much. I'll be on the remote chat if anything comes up. Thank you.

FIONA ASONGA: That will be great, Hisham. Thank you. We shall move on to our next speaker, who is Jama Boba, to share with us the Cameroonian experience on IPv6 deployment. The floor is yours, Boba.

JAMA BOBA: Thank you, Chair. Before coming to IPv6, let me briefly highlight some ICT environment in Cameroon. The ICT situation in Cameroon, the government is in charge of definition of policies strategies, so the topics like e-government analog to digital TV global plans, how to reach rural area and to guarantee access to Internet with cheap prices. In this case concerning e-government and transition from analog to digital TV, now the government has already developed a strategy to move on, and we are implementing that strategy.

In the field of developing access to Internet for locals, the Telecom Development Fund was established to support development of access, particularly in rural areas, with the contribution of telcos and ISPs about 1.5% of their turnovers.

Let me highlight the new regulation. In Cameroon we have some [inaudible], the Ministry of Telecommunication who is responsible as I said for vision, policies, regulations and ICT strategies. We have also one national advisory for competition to regulate the agencies, telecom regulatory body and national agency for ICTs who is the root CA and also national [inaudible] response team and managing also the ccTLD of Cameroon. We have also four telcos, one in [inaudible] and three mobile operators and about 50 ISPs.

The telecom regulate the market [constant] telecommunication on the basis of an existing regulation and the national agency for ICTs, [inaudible] feel responsible as I said before, managing the ccTLD.

Since 2012, INT organized several meetings with the telcos and ISPs to even with the Civil Societies and international development partners such as ITU and UNDP to solve problems related to the development of

the Internet in Cameroon. We discussed about the establishment of Internet exchange points. As a result, the Cameroon Internet Exchange Association has been created to manage ISPs and once the ISP is operational, we intend to contact AfriNIC in order to get a copy of a root server.

Now we come to IPv6. This year, the National Agency for ICT put a multi-stakeholder committee to develop a strategy for migration from IPv4 to IPv6. This committee includes government agencies, ministries related to the Soviet, academia, telcos, ISPs and ISO Cameroon chapter, and even AfriNIC. This committee is in charge of developing the strategy and follow up its implementation in Cameroon.

As I said, this is a bit [inaudible]. So before finish I my presentation, let me highlight [inaudible] concerning IPv6 and ISPs. Last week, ISO and African union held a training in Yaoundé, the Cameroon capital, an Internet exchange point. The National Agency for ICTs organized some training concerning security of the competence of the response team with the support of [inaudible] this year, 2003 and in [Beijing] and some training are progressing even now, today, there is training concerning IPv6 in Yaoundé by AfriNIC and also training concerning security audit with the support of IMPACT, International Multilateral partnership against cyber threats of ITU. It's ongoing training now.

And finally, Cameroon has set up a root CA and government CA platforms using PKI. Thank you for your kind attention.

FIONA ASONGA: Thank you so much, Boba. Any questions? Yes, introduce yourself.

[UNIDENTIFIED FEMALE]: I am [inaudible]. I work for the [inaudible] Africa, an ICT perception management organization. We are into IPv6 creation, but most of the time the problem I have when questions come up like, "What's the implication for the end user?"

In my country, I know we have about 29 allocations but I don't know if [inaudible] deployed. I know of only one now, and I know of at least three telecoms that have deployed [inaudible], which my company organized on creation for IPv6.

But the question has always been, "How does it affect us, the end users?" That is the question that is asked all the time, because we tell them that it's an improvement from 4 – Internet Protocol Version 4 – and we still tell that Africa has 4, and that is probably why some have not deployed. But the question still remains, what is the implication as an end user? How does it affect me? I would like the question answered. Thank you.

FIONA ASGONA: Thank you so much, Kim. I think that will be answered by Hisham if he's still online? Okay, we will reserve it for him. Any other questions? Then we will move on to our next speaker, Mark Elkins, who will share with us the South African experience on IPv6 deployment. Mark, the floor is yours.

MARK ELKINS: Good afternoon. I do have a slide set there. Great. My name is Mark Elkins. I wear a number of hats. One of my hats is I'm a member of the Board of AfriNIC. I gave a presentation two year ago in Dakar in 2011.

And so what a lot of these slides do is compare the situation in 2011 to where we are today. There's another section on an update on our IPv6 [peering], and one of my other hats is I'm also very involved in the ccTLD, so I can or have drawn some stats from that. Can we go on please?

Difficult to see, but the blue bit on the left hand side would be members by country, and about 45% of AfriNIC members are actually from South Africa, so we do make up a fair amount. That was in 2011, and I have a number five, three, four people; 534 people.

If we go to the next slide the format is slightly different, after Nick has changed things, but again the total number is now five, four, seven. So the number of members increase in South Africa from an African point of view, it's very, very small marginal change. So no great differences there. If we go onto the next slide we have IPv4 resources from South Africa, which makes up about 46% of IPv4 set in South Africa and there is a number – anyway, yeah. So it's about 46%.

Moving onto the next slide that number more or less stays the same, the color percentage of the pie chart is more or less the same. Moving onto the next slide which is the first IPv6 slide, we'll see that 25% of addresses in Africa are sitting in South Africa. Here we have 158 I think it is, should be about 158, 25%. So how is that moved? If we move to the next slide it really has not changed at all except it went from 58 to 89 allocations. So South Africa is growing as quickly or as slowly as any other part of Africa and it's maintaining its percentages. So growth, I would say, is consistent and no great changes there.

If we move to the next slide, in 2013 some exact figures here; SixXS said we had 68 allocations, 32 which are visible. The numbers do seem to differ from the pie charts on AfriNIC and I cannot explain that. On the other hand, in 2013 we seem to have had a lot more allocations brought out to us and there is something like three times more people now visible on IPv6. So in two years we've tripled which I think is reasonably good growth.

If we move onto the next slide. Back in 2011 – these are figures from research I've been doing on the exchange point, in 2011 we had 58 devices connected which basically accounted for 32 different people or organization peering at the Johannesburg Internet exchange point. At that point eight people were using IPv6. Today the figure looks much healthier. We have 72 devices, which is now 58 members of which 27 are using IPv6. So what I can definitely state is that more and more ISPs are certainly using IPv6, more people are connecting at the exchange point which is core six and a greater percentage of them are definitely using IPv6. Generally speaking there is reasonable growth. Should I take this question?

FIONA ASONGA: Are you done?

MARK ELKINS: No.

FIONA ASONGA: Could you please wait until.

MARK: Okay, you want us to wait. And then the last slide. I went and had a good look because I have access to this information at the – if we move up to the next slide, thank you. The last slide shows, if your name server has IPv6 glue, how many domains are sitting on that name server? Unfortunatly, I seem to [peer] quite often because I like playing with IPv6 but essentially this shows us that we have seven different ISPs. That there is the ones through to six and the seventh would be myself. There are a fair amount of domains using IPv6 glued name servers.

There are obviously a whole bunch of other name servers sitting in South Africa which do not have glue records because they're not in bailiwick or they're not talking, describing themselves with their address. So this is just the view that I have.

To confirm that, if we have a look on the right hand side there, at the time of this presentation being prepared, there were 295 customers coming in with EPP into the CO Dodzeray system. Of those 295, 90 were using IPv6 transport to get in which would suggest that about one-third of all ISPs in South Africa are using IPv6 in reality, to get across the exchange point and into the EPP system. The figures are very badly skewed though because 83 of those are from our one large ICANN accredited registrar which is data matrix, but it does mean that people are using IPv6 to do everyday business within South Africa itself. The other funny on that is the last name server on there, after me playing around with Jekyll and Hyde, is xn-kafff-dma, so we are allowing people to sneak IDN into South Africa even if it's not meant to be there. The only other thing I can mention is we do have a presentation by [Polessa] from the South African government or not?

FIONA ASONGA: We have from the official network.

MARK ELKINS: Okay, I understood that the DOC was going to give a presentation. As they're not I can also state that there is a South African IPv6 task force to the government that's been running for the last two years and we kind of gave the first paperwork over to the South African government a couple of months ago so they hopefully do have a clear idea of what is necessary to migrate over to IPv6. We're still expecting feedback from that paper. So the government is certainly involved in the move toward IPv6 in South Africa. Thank you very much.

UNIDENTIED FEMALE: Thank you, Mark. Dan, you have a question?

DAN: Mark, if you could go back a slide up here, to the slides that you were comparing, these right here where you're comparing the number of devices and members. When you say 27 people peer with IPv6 is that 27 of the 72 devices or the 58 members? Just curious.

MARK ELKINS: That's of the 58 members.

DAN: Okay, thank you.

FIONA ASONGA: Okay, Wilbar, you have a question?

WILFRIED WOEBER: Yeah. I'd like to come back briefly to the statements about the EPP usage of IPv6 as a transport because this looks like a success story. And on the other hand to the issue of glue records and in particular the glue records for the delegated [inaudible], did you do any investigation whether the parent zone was at that point in time supporting IPv6 glue records or whether there was a situation that the authoritative name servers themselves were already capable of IPv6 transport [inaudible] because one of the parent zones was not supporting that either technically or by way of provisioning through the registrar.

MARK ELKINS: We didn't do too much research on this. It's simply people who have put in IPv6 glue. So they are advertising the fact that those people can get to those names using IPv6 transport. They weren't all checked at. I can say that the ones I'm running are certainly reachable and advertising on IPv6. I presume others do the same.

FIONA ASONGA: Yes, Graham?

GRAHAM BENEKE: Hi. Graham Bneke here. One of those obfuscated servers is mine so they're also working on V6. The question I have for Mark was you mentioned the IPv6 task force. On the ground, I haven't seen anything

that the IPv6 task force is doing for. The industry, is it only feeding back into the element at this stage?

MARK ELKINS: The paper that's been prepared is a preliminary paper and it's been given to [Polessa] who eventually discovered was the person who was asking for the paper before handing it over to the minister. So it's confidential at this point I guess you could say. But I'm assuming the government will share the findings as that's one of the things we put into the paper.

FIONA ASONGA: Kim?

KIM: Please forgive me, I'm asking as a lay person because I'm not a technical person when it comes to [inaudible] I'm just curious is there anything you do specifically in terms of awareness also? Because a lot of ISPs deployed IPv6 here in South Africa, but compared to my country, I'd really like to know if there are certain things you are doing things or not. I mean the difference in the deployment [inaudible] South Africa, IPv6 in Nigeria. I'd really like to know if there are things you are doing differently, why the ISPs are actually deploying this and why the ISPs in my country are not taking that? Thank you.

MARK ELKINS: I'm going to take that question as "Why are South African ISPs deploying IPv6 and why are not Nigerian IPs doing the same too?" What are we

doing special? I have no idea why we are special. We have been talking about IPv6 at our meetings, our regional meetings. We've been pushing down people's throats that it's a good idea to change. We are well aware of the fact that AfriNIC, yes, does have two or three years to go before potentially, at its current run rate, will run out. But there was some policy at the last AfriNIC meeting in [Musaka] where educational establishments may find it easier all around Africa to get IPv6 and if every educational establishment was to run on this, then it would mean that we would actually move into – we would basically run out of IPv4. And I hope that happens. I hope that happens because maybe that can be a wake up for Africa.

I've always been a supporter of the fact that if the whole world went over this waterfall at the same time then it would force everyone clearly to look at deploying IPv6. The problem is if other parts of the world are moving over and always deploying IPv6 then there's potentially IPv6 only customers out there. But if we're happy in our little IPv4 islands we're not going to be reached by these people. Neither are we going to be able to reach those other people. There is a potential, I guess, for the Internet to become sort of split – those who have only IPv4 and those who only have IPv6. So I don't want to see that.

FIONA ASONGA: Actually, Kim, you can him time to share his presentation, you can get more insights on the issue from that.

KIM: Sorry, this talk because [inaudible] that there is the likelihood when others deploy 6 and we are still in 4 it may not be compatible. We may not be able to – That was what we talked about when we did the first IPv6 workshop in 2010. That was the idea we had. We thought that there was this IPv6 test. Am I mistaken? That was to take place in 2010, was it June the 8th? That was the impression that people had, that it turned out that people were still accessing even websites that were running on 6 so it didn't really matter to the end user. Thank you.

FIONA ASONGA: Okay, let me just help you understand what's happened. In 2010 and 2011 the ISOC and a lot of the industry had a drive to test IPv6. So it was the sixth of July? June 2010 when there was the first trial and it was pretty much a trial in 2010 to see and also be able to collect data on how many, for example how many networks were IPv6 ready, how much content was IPv6 ready, to check the level or preparedness globally on IPv6 readiness. So that was a test.

And then in 2012 there was an agreement now to switch over the networks and the contents that were IPv6 ready to now to be turned on and continue running on 6. So that has happened, yes? And yes, networks are still accessing content because for the time being a lot of those who are IPv6 ready are doing it in a dual stack mode.

That means they are running both IPv4 and IPv6 on their networks at the same time. So for now the end users in most parts of the world are somewhat comfortable. But there are regions where the change has been felt, like in the APNIC region and I'll probably ask one of colleagues from the ASO to just share the experience from the APNIC region. So

when you ask the question on the implications on the end users it varies from region to region based on a number of factors including the speed at which the region is taking up the IPv6. Maybe Paul Wilson will be able to just add more to that.

PAUL WILSON: Sure, I'm happy to. I'm Paul. I'm from APNIC which is the IP address registry for the Asian-Pacific. And if I could give a brief plug. APNIC did get the chance to include a document in the meeting bag here which is a paper about the status of IP addressing in the 2010s in this particular time and it does talk about the dynamics of IPv6 deployment and IPv4 exhaustion.

The point of that paper is actually to be as much as possible a layman's guide so it might be useful. It talks about issues like the one you raised about the difference to end users and the trouble is by design there is no difference to an end user in having IPv6 provided to them. There's no immediate difference. IPv6 is designed to carry exactly the same services as IPv4 and to do so invisibly.

So what that creates is a useful thing because the users don't have to know any different but it also creates an un-useful thing which is the users don't demand IPv6. So they're not bashing on the door of the ISPs for IPv6 and the ISPs, of course, don't need – they've got plenty of other things to do but what they don't do is bash on the door of vendors looking for IPv6 products either. So there's sort of a vicious circle of lack of incentive at the moment.

The incentive for IPv6, in spite of what people may have been saying for the last ten years, is really about the benefits of IPv6. There's really only one incentive which it addresses, the lack of IPv4 addresses in the APNIC region and now also in the RIPE region. We don't have IPv4 addresses left except in very small rationed quantities for network deployment. So any large IP network deployment today, any new deployment, has to be based on either IPv4 in a private addressing mode with carrier grade network address translation or with IPv6 – or preferably actually both because the point is when users start, when users do notice the difference, and it can be a very big difference, is when their ISP has got no more public addresses to provide and the ISP provides a private address instead. And that can immediately create performance problems and reliability problems and it's been well studied. The technical effects have been well studied and it is definitely something that users will notice.

So what the ISP that is deploying that private address needs to do is provide IPv6 at the same time. If they're doing that then the user who then uses their connection to access an IPv6 enabled website like you actually had on quite a few of the major content providers, that user will get a perfectly good connection and will avoid the problem that they may have in accessing IPv4 sites at that time. The whole point here is about readiness on the part of the ISP.

There are many ISPs at the moment in the world who do not need to deploy IPv6 today. They won't get a benefit from doing it today but they will get a lot of benefit from being ready today. So what we're trying to impress upon the industry is that readiness for IP6 is really important. That includes planning. For some people in South Africa, for instance,

readiness seems to have allowed them to deploy IPv6. Once you're ready, in fact, in many cases you can deploy it straight away anyway. In other cases you may be ready but you know that you need certain things to be done. And that planning process is something that's really important.

Anyone who's got any reliance on the Internet today really needs to understand that they are going to be relying on IPv6 very soon and whatever their product or service is, whether they're the user of an ISP service or a user of some equipment or a user of consulting people who provide Internet related advice or use data centers or hosting services. Wherever they have an Internet service of any kind it is useful to understand when that is going to be an IPv6 [compliant] service. And depending on how valuable the Internet is to you it's really a valuable and important question in proportion with your reliance on the Internet.

So for end users at this stage they're not banging on the doors of their ISPs. But I can tell you that when an ISP – and some of them are doing this now – when an ISP decides to trial private addressing service to their users they generally find that their costs and their problems go up considerably. When it comes to large scale broadband deployment from ISPs they do not want to have to answer support calls. Every support call or every problem that is generated actually, probably sacrifices the profit margin from that particular user for six months or so, such are the margins. So an ISP does need to take them seriously and be ready and not be in a position where they don't have IPv6 readiness, they don't have IPv4 addresses, they need to do some networking deployment. They waste a bunch of money on carrier grade [NAT], create a whole

bunch of problems for themselves and that's exactly their own formula. So I hope that's helpful. I refer you to that paper that's in the ICANN packet if you'd like.

FIONA ASONGA: Thank you so much, Paul. Quickly we're just going to – there's a question from Leo to Mark which you shall take then immediately after that we will go to our next presenter. He has 20 slides. Andrew, you may need to shorten your presentation slightly so you can fit into the time and then we'll take on the rest of the discussion off-line if that is okay. Carlos, can you read out?

CARLOS REYES: This is a question from Leo Vigoda. "What proportion of traffic crossing the networks is IPv6?" And that question is for Mark.

GRAHAM BENEKE: Can I perhaps answer that one? Graham Beneke from JINX. Currently at JINX our current switch doesn't support [inaudible] flow, NIC flow, flow export or anything like that. So we unfortunately don't have statistics on that as much as we'd love to have them. So we are working on replacing our switch fabric with something that will be able to give those statistics. Anecdotally I can tell you that across the network that I run up to 10% of my traffic is IPv6. I'm not going to steal Andrew's thunder but I think he has a far more impressive figure.

FIONA ASONGA: Thank you, Graham. Is Andrew online? Please call him. Hello Andrew.

ANDREW ALSTON: Can you hear me okay?

FIONA ASONGA: Yes, we can hear you okay. We have a special request. Due to time constraints and being that the room is going to be used by a different group I'm kindly requesting if you could reduce your presentation slightly. I will give you about 15 minutes.

ANDREW ALSTON: Not a problem. There are slides that I can brush over a bit.

FIONA ASONGA: Thank you.

ANDREW ALSTON: Thanks to everybody. This presentation I'm going to give is actually one that I gave a little while back with a co-presenter from the university and it's on his behalf I'm actually presenting here. It looks as if IPv6 deployment at a university – and I think some of the things we encountered in this whole roll out actually turned out very, very interesting and slightly unexpected. Basically to start off with is how this all started was the university had a network that had a couple of problems.

To give you an idea, we had 19,000 wide ports on that network, 450 [inaudible] [cameras], over 500 switches, loads of [inaudible] and one 516 [inaudible]. That's a pretty large network. However, what we didn't have was any routine protocols, [inaudible] segmentation, working

multi-cost, [inaudible], no IP planning, no QOS implementation. Basically it was a straight, flat network [inaudible] plugged into one giant hub. So what we really had was one [inaudible] overloaded [inaudible] tables, our switch utilization [inaudible] in excess of 90%. We were getting [inaudible] all over the place [inaudible] policy root issues.

And while this slide says it was a disaster waiting to happen, the reality it wasn't really a disaster waiting to happen – it was a disaster as it stood. So we needed to change this, and we decided we needed to make a plan and we came up with a number of steps to do this. Figure out what our objectives were, figure out how we get there. If we have prerequisites, obtain them and plan our deployment, implement extremely carefully, resolve all unforeseen issues and then critically do skills [inaudible] to the rest of the staff who have to keep maintaining this network.

Now in our objectives here, this is where the v6 actually comes in and it gets really, really interesting from this point forward because we needed a design that was scalable. Now v4 has limitations of scalability particularly in how this campus is growing even with more space. We [inaudible] for the deployment of v6. That was absolutely mandatory. We wanted the deployment of multi-[cross] technologies in both v4 and v6. We still haven't got there yet, but I'll talk about that in a little bit.

We wanted [inaudible] telephony, greater flexibility, get rid of the single [broadcaster] names. And at the same time of doing all of those, we didn't want to over complicate and we wanted to get rid of all network address translation. That was just causing way too many problems with interconnectivity and in a research environment that simply doesn't

work. We looked at what design we could choose and we [based] the network on service provider principles, basically on the theory that a university provides its students access, it provides its staff access. And typically an SP design is more flexible than a standard enterprise design.

So on the design principle we segmented the network core distribution edge. We wanted to use ISIS on this network primarily because it gives us one single protocol for v4 and v6 all the way back. I know that now with RSPF you can do v4 and v6 with one instead of running RSP at two and three, but we were kind of stuck because we couldn't do ISIS so we went with the [RSPF]. We went with BGP for the majority of the table. Unfortunately it was only for v4 because the vendor we were working with didn't support v6 under BGP. Got rid of the [VLAN] spanning and were using the multi-[crossed] routing. Again the vendor didn't support [inaudible].

Now one of the things this slide highlights is there were vendor limitations in what we could do. I mean, ideally we wanted to run the BGP on the V6 – run a single [IGP], but it just wasn't an option. That does come up in V6 deployment. Then when we looked at the problems and the prerequisites, we needed the network properly segmented before we could roll out. Normally I should mention the network was going to result in large amounts of down time due to [inaudible] loss issues and we needed some extra licenses. Now when I talked about the downtime because of [inaudible] issues this is actually a critical issue and it actually demonstrates a very interesting use of v4 that have you gone and got from your RIR.

When you typically have a single broadcast you need to segment something off. You either have to do something like proxy [up] or completely separate subnet that is not overlapping the other range [inaudible] not being able to talk to each other. So because we had a single [inaudible] there on the v4 we couldn't just randomly subnet and it created a clearly complicated issue.

So what we did was we went to AfriNIC and asked them for more IP space. We needed this anyway to get rid of [NAT] but it also made this whole transition period a lot – it really, really simplified things with the extra space. Interestingly enough we basically did get – AfriNIC will be happy to share now 100% utilized on the campus. We then looked at it, got more space and decided we were going to renumber whilst slowly reducing the size of the original broadcast and rolling out IPv6 at the same time.

It is a very, very comprehensive planning exercise and this included both the planning for the v4 and the v6, proper subnetting, proper IP deployment plan, proper VLAN planning, etc. So we put in all the planning. You'll see there's a couple furhter planning details. I'm not going to get into details, but basically the essence of these two slides is we planned and planned and planned to get this right before we did anything because we didn't want to break anything. And if you're deploying IPv6 the one piece of advice I can give to anybody – and particularly in large environments like university campuses and the academic center – that planning is so, so critical [inaudible] yourself more likely than you'll want to know the downtime and the rest of it.

You can see here this is a slide, it's the IP plan where we did our v4 planning. Most of our v6 planning was actually done on Excel spreadsheets because it [inaudible] it actually supports v6. Here's another slide of how we started doing the planning there. We used a couple management tools. This is net.dot. The nice thing about net.dot is that it does v4 and v6, it supports, it's fully integrated with DHCP and the DHCP v6. I'm going to brush over these because of time limitations but this is a tool well worth looking at if you are using v6 on a network. It also does [inaudible] things like [inaudible].

Then we got to the implementation. We decided we were going to implement this, basically created second VLANs for each distribution [inaudible] down to the cores, put the [inaudible] in place and basically step by step by step rolled this out but even overlay network without touching the production network. So we managed to build all the VLANs, all the routing, everything else without actually ever affecting production traffic. We had no downtime doing this. Then enabled the multi-[cost], make sure the DHCP scopes were right, we were using [inaudible] for IPv6 because DHCP support for V6 was not supported on all our [inaudible] devices and operating systems.

But even in all of this with the DHCP scopes and the [inaudible] and everything we still hadn't touched the production traffic which meant no down time. Then once we'd done all of that, we came back to the moment of truth. We basically came back in the dead of night, drank a lot of Red Bull over two weeks – to give you an idea I think between the three of us we spent about $1,000 on Red Bull in a week.

Then we retagged the H ports into the new VLANs we created and simply forced the ports to flap on the switches which caused a DHCP refresh, and with that the moment that is done the device gets an IPv6 address through [RA], gets a new DHCP [inaudible] and is on the new network and absolute maximum, we got it down to 30 seconds. We managed to take the network from a completely flat network to a fully dual stacked, segmented network with nobody experiencing more than 30 seconds of down time.

We then went, and once we'd done that across the whole network, enabled IPv6 from the proxy servers and the DNS servers. This next slide – I'll talk about that traffic procedure in about two slides time, you'll get a better idea. But with the end result all aboard across the mains the switch load down from 90% to 3%. The network was more manageable, it was more flexible. We had IPv6 to every H device. You'll notice I'm saying on the slide that, yes, it can be done. I've seen a lot of v6 deployments where [inaudible] are deploying the core but not take it to the edge. It can be done to the edge and this deployment proves it. What we see is that. That is the total traffic on the Internet link for this campus and we are hitting anywhere between 60 and 70% of our traffic is IPv6. Largely Facebook, YouTube, etc., but the point is we are running well over 50% of the actual Internet traffic on v6. On the campus itself because v6 is generally preferred, that's probably closer to 90% across that campus.

With regards to what it cost us in time, the entire exercise to dual stack the network that size took three weeks. The implementation was done largely at night over a two week period. There was not down time and we spent less than$ 50,000 doing that entire deployment, most of

which was on routine licenses and consulting fees – and as I say, mass quantities of Red Bull and pizza.

Then where we're going from here, just to wrap up, we want to get a more robust multi-[cost] network on both v4 and v6. At the moment it's purely v4 based so we are working on that, we do have some vendor limitations there. We are also trying to reduce the oversubscription between H distribution and core and further MPLS implementations.

And to this end, since we actually created this presentation we did a core upgrade on the network and the core upgrade has got 100 gig technology, etc. On the following slides you actually see a design. We also, in Q1 of 2014 we're replacing the distribution layer which means we'll actually be able take a lot more v6 functionality down to the distribution instead of doing it all in the core which will keep it also in line with what we are doing with v4. You'll be able to do things like [MSDP] to the distribution, and obviously there's a vast, vast increase in bandwidth on the network to reduce the over subscription. We also wanted to support QOS or voice over IP, etc.

This is the basic slide of what the design actually looks like where you've got virtual a [chassis] consisting of two Juniper MX960s linked with a 200 gig LAD and then we run 20 gig LAD to each distribution across the virtual chassis. The net result of this is you can use an entire core router there and nothing's going to blink. You'll simply use half the bandwidth, but everything will just keep working.

The network, I'm proud to say that the network has now been running this new design for seven months and we haven't had a single minute's problem with it.

So that's a little bit about what we did and our lessons learned is that to restructure for v6 and multi-[cost] you don't need loads of down time, you don't need loads of money. You do need a vision of where you want to go. You need some very careful planning and you need some very careful documentation. If you get those three points right, it's not as difficult as it's made out to be by a lot of people and it does have its advantages. There is significant content out there on v6 as you can see by that graph. So that's pretty much what we did, and I hope people found this presentation useful. Thanks very much.

FIONA ASONGA: Thank you very much, Andrew. You did better than I thought you would do time wise. Any questions for Andrew?

UNIDENTIFIED MALE: I would like to make some comment.

FIONA ASONGA: Yes, please.

UNIDENTIFIED MALE: Good evening, everybody. Myself [Ali Manuel] from government of India, Department of Telecommunications. I've been hearing a lot of discussions regarding implementations of IPv6 in the [inaudible] region, and of course government of India has come out with two road maps as far as IPv6 implementation is concerned. Those may be useful for this region. That's why I just want to take two minutes of your time.

We have come out with our first road map in July 2010 that was just for sensitization of the industry and the government. Some thought has been given for this road map. Again we have come out second road map in March 2012 [inaudible]. And despite this road map all government organizations have to make that plan for government implementation of IPv6 in the country by December 2013 and they have to go [inaudible] manner in two years' time. All ISP providers have to be ready for IPv6 implementation and offer their services by June 2014. And all of the Internet providers and equipment manufacturers have to provide services in time [mode]. The government of India has already come out and mandated time [mode] IPv6 implementations in that country. So in that way in case of any support from government of India you're most welcome. This road map is available on our DOT website. Number one.

Number two. We have already going to installment sent off innovation for IPv6 implementation [the country]. With this, we can provide consistent services and all IPv6 related activities, number one. Number two we are taking IPv6 implementations not only for higher [inaudible] exhaustion point of view. We are taking value in the economic and social government point of view because we are coming up with smart implementation in the country. We have more than 200,000,000 [inaudible]mission to mission that cannot happen without implementation of IPv6 in that country and global.

So as far as user activities are concerned a user may not feel [defense] in IPv6 implementation immediately but definitely in case if you want implement mission to mission communication [inaudible] in so many things without IPv6 it is not possible. So I will be giving my card to you.

Anybody who is interested in IPv6 implementation of the government activities are most welcome.

FIONA ASONGA: Thank you very much for that offer. Kim had a question. You'd like Andrew to go back on his presentation?

KIM: Not quite, but, I think, as I said earlier I'm curious. On one of his outlines he said – I think in the challenges he talked about a disaster happening or waiting to happen. I would really like to know why he felt –because from what I've seen on the slides, though I'm not a technical person, I think it was all about putting in place a system for IPv6 migration. Am I mistaken? I'm just curious if that why he said it was a disaster happening or waiting to happen because I'm like, does it mean it hadn't any form of access to the Internet? because for me that is what would call for that or was it because they had not migrated to IPv6. I just wanted him to tell me why he had that in his outline? a disaster waiting to happen.

ANDREW ALSTON: The disaster waiting to happen there was primarily because the network had been very, very badly structured initially. The structure of the network was such that we were having major technical problems because of a lot of [inaudible] costs from the network, etc. and at the same time we knew that we had to start looking to adjust this network to future proof it and to do something for the future.

That meant that we had to have IPv6. We had a disaster with the current design so we need to change the design. A combination of things. But the V6 was the disaster waiting to happen, the rest of the current design was the disaster that actually existed. I hope that answers your question and that makes sense.

FIONA ASONGA: You've got your answer, Kim? Any other questions? We are more or less towards the end of our time. Any other questions? I see no hands coming up. I'd like to take this opportunity to just thank all our presenters and those who are in the room. Those who have participated remotely, thank you so much for your time. Thank you for attending this workshop and for those who are offering to team up with up to improve on IPv6 deployment we are definitely going to put you to task. Thanks a lot everyone. Have a nice evening.

[END OF AUDIO]