CR - IPv6 Deployment: Business Cases & Development Opportunities
Thursday, March 15, 2012 – 09:30 to 10:30
ICANN - San Jose, Costa Rica

Raul Echeberria: Good morning everybody, looks like we're in time to start the activity this morning. We have a workshop panel on IPv6 deployment. We will talk about some business cases on development opportunities. There is translation available. Those of you who want to use the services just have to pick up the equipment that is around the tables. We have a set of very distinguished people in the panel, so let me start on my left side.

We have Jacques Latour from CIRA, which is an organization responsible for running .ca in Canada. He will speak about IPv6 adoption experience and challenges from ccTLD operator.

Next to me is Carlos Raul Gutierrez; he's Chair of the Telecommunication Regulator from Costa Rica – SUTEL - and he will speak about IPv6 initiatives for government.

On my right side I have Arturo Seville from LACNIC. He's the CEO of LACNIC. The title of his presentation will be IPv6 Deployment Status in Latin America and the Caribbean. We are waiting for another person from Costa Rica, Carlos Watson that is not here yet.

Next to Arturo, we have Patricio Poblete. Patricio is one of the pioneers of the internet in Latin America. He's really one of the players in everything related with internet and internet governance particularly. Patricio is the CEO of NIC Chile, and he will speak about IPv6 initiatives in Chile.

At the end of the table, we have Martin Levy. Martin is the Director of IPv6 strategy of Hurricane Electric. He's our usual speaker at every meeting about

IPv6 around the world as one of the main promoters of IPv6 deployment internationally. He will speak about World IPv6 launch.

Jacques Latour: Good morning, my name is Jacques Latour; I am with CIRA and we operate .ca in Canada, and I'm going to talk about our experience deploying IPv6 from the point of view of a ccTLD. Basically last year January we learned about World IPv6 Day, and at that point we decided to get ready within six months to do IPv6 internally. Our goal was to participate on June 8, World Day.

The presentation is mostly around a business point of view; it's not an engineering presentation on v6. So we had some money allocated for an IPv6 deployment. The key thing is that we didn't know much about v6 at that point, we knew it existed, but that's about it, and so what we did is we assigned a project manager, built a plan and got it done within six months.

The objective for doing v6 is we wanted all core services for CIRA that are on the internet to be available over v6. It means that we need to have .ca secondaries reachable over v6. We wanted registrars to be able to send mid glue records for v6. The corporate website - the key thing should be available on v6, and that as part of the plan we decided that the staff would need dual IPv6 access on their desktop too with v6. So those were the main objectives.

What we did is to build a project plan and that's basically the high level bullets, there is what you need to do to adopt v6 within your infrastructure. So the first thing we did is we did a bunch of research and discovery. We developed a strategy to adopt v6 for the DNS, for the registry infrastructure, and for the corporate infrastructure. The key thing was doing an IPv6 readiness assessment. You need to look at technology, people, process, all the partners you have to see what v6 you have available today, or what works, or what doesn't work, so that was a really important thing to do. The bulk of the presentation is going to focus on the assessment portion.

We've designed the IPv6 architecture, so that was a lot of work. Went in development, testing, pilot mode, and then finally we met our deadline of June 6. So discovery and research - the biggest thing there is you need to do an assessment of the infrastructure, so the corporate side, the DNS, the registry. The biggest problem we had in Canada is finding a resource, or people that could actually do this work with us.

We found one resource; it was ITF resource in Canada that actually did some consulting services. So lessons learned there is there are very few people in Canada to help us with doing a real readiness assessment inside Europe. So what we did is we trained our staff extensively using that resource and now we're kind of self-sufficient.

We've attended a lot of IPv6 conferences. Most of them were targeted at Telco with migration technologies – it didn't really help a ccTLD or an enterprise to adopt v6. As part of our research we knew that, but two of our DNS secondaries were already v6 and they both through Anycast services. We use Anycast provider, we already add v6, so we had a little bit of that enabled.

So, as part of the readiness assessment, the key thing we wanted to do was for the registrars to be able to submit IPv6 glue records. We didn't have much to do on our side, because we did accept IPv6 glue records right there. However, most of the registrars that we deal with, very few of them accept glue record on their registrar side. So we had to go out and educate them, to take to market to adopt IPv6 to add that functionality in there too, but RAPP interface did support IPv6 glue record. So still today, not all of our registrars support IPv6.

So our .ca DNS servers, last year in January we had two of our 10 DNS secondaries and they rolled over v6. We've added two more and we're still working on making all of our DNS secondaries enable over v6.

Transit provider - obviously if you want to do v6, you would have to have access over with your Telcos. Our biggest challenge is getting v6 transit. Most of the ISPs in Canada are planning to have v6 available next year, or at the end of this year, so we had to go through our custom order services. It was kind of

painful, but we managed to get IPv6 transit on custom order for participating IPv6 World Day.

What we did also is we peered that TorIX with v6 and we had agreements with some key partners to use some of the peering for our DNS infrastructure as transit. As part of the readiness assessment, you need to look at all of the hardware, software that you have in your infrastructure. That's when we discovered that the expensive low balancers that we had don't support v6. We had to do research and buy new equipment and that was kind of stressful, because you have to buy new equipment, you need procedures for that training.

So we managed to have new equipment in place, and then the other thing is you have to do an assessment of your web presence to be part of v6. We did that, and the site, the software that we're using was IPv6 compliant, so we didn't have to change much there.

Keating is a security policy, so if you do v6 you have to develop an IPv6 security policy that should align with your IPv4 security policy, so we built one. We've actually posted on the knowledge center at CIRA a template that we use, so it's available there - you can have a look. It doesn't have all of our internal stuff in it, but it's just a couple of pages to show what to look at.

We've done a lot of training, and that's the biggest thing - training somebody that could come in and teach you about v6, and teach you how to do your assessment and all that. That was important, but the resources are scarce, there's not a lot of people that can help you with that today, so that's something we need to improve on. So the infrastructure v6 is running dual stack, so there wasn't much to do there, just implementation of whatever we had in our design.

So this is a picture of our infrastructure. So basically on the left side we have our DNS secondaries, so we have four today that are available. The key thing is if you're going to do v6, you have to understand that you don't do anything over v6 from an enterprise or like at CIRA. We decided that we wanted our (inaudible) services to run on v4, and probably will for a while, but if you want

to participate in V6, that's a good way to start, and you can reach it at [AV6 Zeron] over v6.

This is just a summary. As part of the architecture we've designed guidelines so we want to keep v4 as is, I'll just go quickly. The key thing was dual stack, so we want to make sure that all the systems that are v6 have dual stack with native IP access, no tunneling whatsoever so we've disabled tunneling everywhere inside the infrastructure one host, one IP. No network address translation; that means the IP address that we have inside on my desktop at CIRA is the IP address that can access the website, so there's no translation mechanism for v6.

We've put in good security firewall rules to protect ourselves and that thing is not a security mechanism, so that was a bigger load to get over. We've built an IP address plan – I'll talk about that. Since you don't map you want to do address privacy mechanism, so you don't want to always have the same address on your desktop that connects to the sites.

Security management was a challenge, because a lot of the login doesn't work well with v6 – some issues around that, so we've managed that. And then login, monitoring - we have to find monitoring tools that monitor the infrastructure over v6, so we got all of that done within pretty much six months.

So we built a lab, a full lab where we tested all of our web applications, the cookies - cookies write IPv4 addresses - you have to make sure it supports v6. Application, login, you have to make sure that it's all normalized IP addresses. We tested in the lab all of the load balancers, routers, firewall.

We tested our security policies also. Log analysis - we have to learn how to do troubleshooting with v6 - it's different than v4. All the IDS or IPS, or SIEM infrastructure. - we had to make sure it supports v6, and so on. So we built the lab, we tested our infrastructure - once it was ready, we deployed in the production.

The conclusion is we participated in World IPv6 Day, so we have enabled IPv6 on all of the infrastructures that I've talked about. The only difference is that we

left it on; we didn't do a 24-hour pilot that day. We've been IPv6 ever since. I'd say overall difficulty was medium; it wasn't rocket science. Once you get the training and you find a resource like ISOC as a deploy 360 program to help you manage your way through IPv6, then it's not that difficult, it's that you need to learn a new protocol.

Cost-wise, it might look like a lot of money for a ccTLD, but we have high availability resilient infrastructure. We have a primary site, a backup site, we have two load balancers at our primary site, two load balancers as a backup, plus a corporate infrastructure, so we have a large infrastructure so that's why the costs are high. We needed money for new hardware for consulting, for training, and unfortunately, we had to buy new transit to do v6, so that was an additional expense that we're going to keep for a while until all the needs of transit providers support v6.

We have a partial development of IPv6 on our DNS secondary servers. I expect within a year to have all of our servers available over v6. Lessons learned - so when ARIN assigned us an IPv6 block, they assigned us a critical micro allocation block for all of our secondaries, so that's the address you use for your DNS presence.

We've used that block for our internal network, which meant that we had to get another block for our corporate infrastructure, and then we address our network using the right IPv6 block. So if you're a ccTLD and you ask for IPv6, you've got to understand there's address for your DNS infrastructure; it's a different subset most likely for your corporate infrastructure.

IPv6 address plan - there's multiple ways to do IPv6 addressing plan. The first time we tried to do it like v4, and it didn't work out. We had to renumber everything with a new strategy, a new plan. So if you go to our knowledge center at CIRA, there's slides that explain how you do our best practice for doing IP address within your infrastructure, and the last thing is that you need to train your people, so train, train, train, and more training.

Raul Echeberria: Thank you very much. Really a very interesting presentation. Very detailed information about everything that you did in.ca. It's very interesting. I think that we will open a round of questions and answers after all the panel has completed their presentations, so we move to the next speaker. Our next speaker is Carlos Raul Gutierrez, the President of the Telecommunication of Costa Rica, SUTEL.

Carlos Raul Gutierrez: Thank you very much. We have been approached a year ago by Arturo during one of his trainings in Costa Rica of what government could do to promote a new IPv6. This is interesting to be a guinea pig in these days for various reasons. The Costa Rican government, although it opened a telecom market, still is the incumbent operator, [EC], and particularly Raxa. One of his subsidiaries are telecom operators, they have IPv6 blocks already assigned. We don't know if they are using it, but we want to work together with them - not as a regulator of course, but in the development of a greenfield project the regulator has a large plan for universal access and service in Costa Rica that should be starting this year.

We are using the monies from the spectrum auctions - we did last year - so we have reasonable amount of money and the government has asked us to help them provide connectivity to all areas of the country t don't have connectivity and to all the people who cannot pay for broadband connectivity, but not on an open basis. They have asked us to provide connectivity so that they can access different government services, and whatever it is, health, education, banking. The banking sector in Costa Rica is also mainly state owned banking.

So we are in the process of developing this system, of course based on individual login of users for government services, and we will require that the projects can be only assigned to operators, to regulated operators who contribute to the fund, of course. They are required to be enabled, and since we're offering the connectivity free for government services, we will require that the

government entities that offer services online will be addressed through the IPv6 system.

The reason we think is necessary is because what we want to track specifically is this traffic - this subsidized traffic of individual users to government portals to each government services so as not to distort the private traffic, the private demand for broadband. So we want to do targeted demand promotion for broadband, and we hope that if the government has an advantage over the other services, particularly in the beginning, we will be able to track very neatly the different usage of broadband access in the country. This is basically what we are proposing, and we are going to work just as a requirement, as a condition for the projects that we will be developing this year.

Raul Echeberria: Thank you very much, Carlos. Several questions have come to my mind to you, but I will wait until the end of the speaker round. Carlos, are you ready to speak? We have your presentation. Carlos Watson is a person that has been involved in internet development in Costa Rica for many years and currently he is serving as the President of Internet Society Chapter in Costa Rica.

Carlos Watson: Hello everybody. I'm going to speak in Spanish.

Carlos Raul Gutierrez: No problem. There is translation.

Carlos Watson: Good morning everybody, here you have my personal data if you want to contact me and this is the agenda for the day. So please raise your hand, those of you that have a cell phone right now or a tablet in your hands. Okay. I have one and most of you have one, so now you can get into Twitter, Facebook or

your email, because there is not IP address. So this is my first thought before beginning my presentation.

IPv6, as we know, we in the technical field, knows that it is a protocol that has been around for some several years; it is not a new protocol. The problem of the protocol is that it did not talk to IP before, so we have this in the same computer, in the same box, in the same content, we cannot get into IPv6 world or IPv4 world, so it's like two worlds living in parallel. This is a big problem for the implementation of this protocol right now.

When we talk about IPv6, we are focused on two phases. IPv4 will be exhausted and IPv6 will be implemented in 10 years or even more. The problem of implementing IPv6 has been as two concepts, we are not focused on conceptualization and in deployment of the protocol, but in the problems we have right now to implement the protocol.

These statistics are quite interesting. We have seven billion human beings around the world - 61% of them use a cell phone and 37% of them have internet access. So to conclude with my idea, we have 4.3 billion IPv4 and IPv6 addresses.

If we analyze the behavior, the performance of all these valuables, and we add the growing market from the mobile market, we can see that there is a network trend. If we gather all these valuables and we multiply them through the devices we currently have, 4.3 billion IPv4 addresses are not enough to connect among ourselves, including VPS, web pages, email and any service that needs to have an IP address or the protocol port as such.

At the level of ISOC Costa Rica, our message to the government agency and to the municipality says if we implement IPv6 at the early stages, we will have a lot of emergent markets that we are not forecasting right now. We are just focused on the problem of implementation, and many of the ISPs that we have around the world are saying that if we implement IPv6, their costs will increase and the costs will [limit] over time. Why? You can see the tablet market - it has grown in two years and it will keep on growing, so those of us who are here, you

all have a laptop, or mobile phone, a smart phone and a tablet. So we have three devices.

When the internet was launching in the 70s, you just had a few computers around the world. The emerging markets, like the Asian markets, the European markets and the American markets, but mostly the Asian markets - APNIC for instance - they have a problem of a supply of IP before, because it's exhausted. So if the region and these sides of the world have the strongest commercial contracts with our Asian partners and our Asian partners are implementing IPv6, why are we going to deny the trade partners, the communications that are the breach to close our transactions?

This is basically the presentation and the approach we are taking to our local government and ISP friends. This part, I guess Arturo already explained it, but you can see IPv6, or the delegation around the world.

In Latin America you have the smallest portion in the pie including the African area, but take a look at APNIC - 38.7% of the deployment of the IPv6 delegation, so I think that the economies of Latin American really has to migrate the IPv6 little by little.

I know there are lots of problems associated to the implementation, including the update to the various devices and the training for our engineers, but we have to take a look not at that small problem, but at the emerging markets, how they are exponentially growing month after month all around the world. Thank you very much.

Raul Echeberria: Thank you very much. Very awesome presentation with very clear recommendations to the regional community. Thank you very much. Our next speaker is Arturo Servin from LACNIC.

Arturo Servin: I love the advantage to be here next to the computer that you can change the slides. I'm going to switch to Spanish following the example of Raul in other presentations, so if you have your handsets, well keep your handsets; I'm going to switch to Spanish.

This presentation is related to the initiatives in Latin America, and I will show you the status of IPv6 from various points of view - from the point of view of the assignments we do at LACNIC and the use of IPv6 that we are observing in Latin America and how ICPs and ccTLDs are developing, as well as ISP, and I will speak about the status of IPv6 in Latin America.

In this chart you can see the whole world. It is very clear that RIPE, Europe, Asia Pacific and the United States has the largest numbers of IPv4/IPv6 in the middle, the pie at the bottom you can see that /8 is the allocation. Every /8 is 16 million addresses, so you can make your math about a number of addresses in IPv4, and even though the assignment in the IPv4 and IPv6 are on the top left, you can see that they are quite similar – RIPE, APNIC, ARIN - they have the largest amount and then the other regions.

This data as of December, 2011, they have changed and I will mention those changes from these pies. And in IPv6, you can see that the numbers are really large, so we're taking to account assignation, but also in the /32s, because in /32, or in the /48, you have 65/64 that is the minimum allocation, or minimum assignment for a user. So in the /32 we may have 16 million minimum assignments for an ISP, and well, you know that the space in IPv6 there is a lot; there's room to grow.

In the chart you can see that LACNIC has a lower allocation; our assignments are a bit lower. This is why you can see there that the assignment changes for our LACNIC space.

What have we done in Latin America? We have done lots of training - 6,000, 7,000 people have been trained not only LACNIC, but also there have been significant efforts for some ccTLDs, and national registries, NICBR, NIC Chile. They have trained lots of people, and we are speaking about thousands of people

that have been trained through tours or webinars we have in LACNIC platform for certain webinars.

We have found that this is quite a good tool to reach lots of people at the same time, and also technical workshop and we have carried out some technical workshops with respect to outreach. We have talked to ISP, to governments, to internet content providers and to universities, and large end users as banks, universities, large corporations, and we have made the great effort so that everybody understands the significance of IPv6 in the development of internet, not only in Latin America, but in the rest of the world.

But what have been the results? This has been the assignments at LACNIC. You can see there has been a significant growth after 2010. Before that date we have a leaner growth, but in mid-2010 we can see how the curves started growing in a peek. Some weeks ago, we reached 1,000 assignments in Latin America, it was very good, so we have 1,000 assignments in Latin America and growth keeps at the same pace.

With respect to the countries, you can see there, the allocations at country level there is an algorithmic scale so that you may understand the big differences. Otherwise were if it were a linear scales, you will see that Brazil is much, much bigger and the rest of the countries would be much slower, this is why I chose an algorithmic scale. And we can see Brazil over there with a very high implementation of IPv6, followed by Argentina, Chile, Mexico and Columbia. What other country can we see in this chart? Well, let's say the largest countries.

We can see how IPv6 have been assigned by country. Then we have also another chart by region, because these are the members that we have in LACNIC, of the members in LACNIC who have deployed IPv6.

We have broken down this data because it was easy to break down the data in that way for the presentation. So we have Brazil and Mexico national registries, because it was easy, and the rest of the countries are included in LACNIC. We have 775 members in country, and 310; 40% have implemented have been

assigned IPv6. In Brazil is 46% of its members, and in Mexico we can see a large drop to 16%, but it's not only in Mexico.

If you analyze the figures in the previous chart I've shown, you can see that some countries will increase the presentation LACNIC as Chile and Argentina because they have a large percentage. It's not as big Brazil, but quite close to 40%, or even above the 40% that Paraguay, Bolivia, and some other countries have a very low presentation. So that 40% that you can see in LACNIC has a significant variance inside, because some countries have over 40% as the ones that I mentioned, and some other countries like Mexico, Bolivia, and Paraguay that are below that 40%.

So some countries have a large deployment of IPv6, while some others need more work to be done in terms of assignment. With respect to this assignment, this is what we give the ISP so the ISP may work with IPv6. But, how are we deploying IPv6, because we have just talked about assignment? Well, we have seen the assignments and the growth can bear with the prefix of the global routing table.

You can see that in the routing and the growth has been much lower than the one in the assignments, so I have none of the figures right here, but I think it's 27.5% percent. Thank you Raul, 27.5% - the percentage of prefixes that we have assigned to the routing table. This is quite a way from the 78-80% that we have in IPv4. So even though we have done a very good job in assigning the resources in IPv6, there's a lot work to do in the deployment of IPv6. This is just routers in the routing table. We have to take a look at the figures of IPv6 that is really deployed for end users in the ISP networks.

This following chart, this is from peer dv and here we can see the peering dv that is a database to consider the exchange of traffic. We can see the percentage that have IPv6, have document saying that they have IPv6, and we can see that we are close to 60% depending on the region. LACNIC is around 60%, and this is information in the database. So the ISPs are working in the deployment of IPv6 that IPv6 has to be shown in the routing table, so it's not there yet.

Now moving to the end users, this is the data. We have www.vyncke org that considers the top 50 websites in Alexa and measures from the 50 websites how much IPv6 we have implemented. So we can see the Latin American chart and I think that we should compare it with the top 50 global websites.

So for the next presentation I will prepare the chart, but here we can see that from the top 50 websites, in Brazil only 10 have four ace registries, and then you can see Columbia, México, Peru, but one Chile, one and then, well, I don't know why México is there twice, there is a problem here. But from the rest of the countries from the top 50 websites, none of them have a four ace registry.

We are very far away from the implementation from the point of view of the end users and IPv6. In the DNS we can see that most of the countries have at least some records, glue records from their top 50 websites. So the DNS has an IPv6 enabled. In email is Brazil and Venezuela where we can see that some of the top 50 websites where only one of them has IPv6 enabled. So when we take a look at the routes and the infrastructure that is enabling IPv6 for the end user, we can see that the growth is not that much, and we have to do something in that perspective.

We also had IPv6 Week within the region. This was an effort led by NICBR, NICBrazil, and ISOC and LACNIC added to that effort, so we had a contest to raffle an iPad for IPv6 people, so they would have to have a check-in to IPv6. If you have an IPv4, they will say, well we are very sorry, you only have IPv4, so you can only participate if you have IPv6. So we try to identify where the hits was coming from, who were those who had an IPv6 enabled. So we wanted to move from the route and from the DNSs and from the 4A records to see how many people were really using IPv6.

So we had approximately 3,000 hits, I don't have the exact figure now, but it was a significant number. Most of the hits came from Brazil, as you can imagine. We also had a lot from the U.S., from Argentina and here we have all the information about the source of those hits.

So this gave us a good idea in terms of where IPv6 is really deployed and where we still need to work to deploy it. So you will see very little amount of hits in some cases and it is there where we should focus more efforts with ISPs in order to be able to develop IPv6 access.

And just to give you an idea of the companies that have implemented IPv6, these are the ones that exceeded 100 hits. You had the Brazilian Central Telecom, they had free tunnels so that people could connect to them through a tunnel, so they had a good number of hits; [RAFCA] from Costa Rica also had a significant number of hits. Carlos helped us promote with [RAFCA] users this kind of connection; MD from Brazil and the National Research Network, TVNet Corporation and Telefonica from Brazil were also among the companies with the greatest number of hits. Below 100 hits, we had (inaudible), which also had free tunnels and we also have a number of ISPs, and we were also able to identify which ISPs really have IPv6 when they claim that they do have IPv6 enabled. In many cases some of them claim to have IPv6, and we couldn't tell in the check-ins, and we had some surprises and that's in the case of one in Brazil where we found more hits than we expected.

But we also have some good news. This is a chart for the PTT of Brazil for traffic exchange, and I would like to highlight different aspects here. We can see a significant increase in traffic in the world IPv6. There's around 20 mega, and we have a significant jump and this is what we had with the national IPv6 Week.

We also see that traffic becomes sequential or [sinosidal] wave when it is daytime traffic and then there is a reduction at night. In the past, we used to have flat traffic usually from service, so now we are seeing end users' traffic and that is good.

Some conclusions - we still have a lot of work to do, although we are assigning a lot of IPv6 addresses, we need to take IPv6 to users' homes. We need to increase IPv6 traffic and connections. We also learned that dates are very important, they really matter. When an ISP or a company has a certain goal

with a certain date for deploying IPv6, they start working hard and they succeed. That is why we saw the increased traffic within the IPv6 Week and the National IPv6 Week, and probably we will also see that with the World IPv6 Launch.

In some cases we didn't have any hard dates, so maybe that is not the best approach when you don't choose a specific date as a target date for the implementation of IPv6. We also realize that we need to reach beyond technical people. We need to make business decisions in the ISPs, and with people that are in charge of device and strategies because some of them think that IPv6 is too expensive, that we don't need it and those are the people who need to be persuaded of the fact that IPv6 is important and probably is not as expensive as they expect.

Finally, we believe that this should be the IPv6 year. This should be the year in which IPv6 takes off. If we don't have a mass scale IPv6 deployment this year, we will see that other technologies may have a strong influence on the internet, and the internet that is free today and transparent where we can innovate and do a lot of things will change, and that internet will become something different from what we know today, and probably we won't like that internet as much as we do today when we have an open and transparent internet. Thank you.

Raul Echeberria: I think that you should apologize with the translators.

Arturo Servin: Yes, I'm sorry, and pardon me.

Raul Echeberria: This speaker is Patricio Poblete. As for those that were not in the room when the meeting started, Patricio is the CO of NIC.cl. Besides that, he's a very known person in the region and one of the most outstanding people involved in the internet community in Latin America. Patricio will speak about IPv6 initiatives in Chile.

Patricio Poblete: Thank you. I will speak in English; I don't know if that will be better, or worse for the translators. So when I was asked to give this talk about what is happening with IPv6 in Chile, I realized that as the CO of NIC Chile, I'm not exactly aware of everything technical that is going on. So this was a good challenge for me to find out and also, having to talk about something that I'm not totally familiar with - being a university professor, that hasn't been a problem for me in the past. So I hope it goes well today.

We started a number of years ago working on IPv6. Really the academic network was the first to obtain an IPv6 prefix in 2004. NIC Chile obtained one in 2005 and we operate a number of secondary servers ourselves, plus we've hired service from commercial providers, and some of them started already back in 2005 to get IPv6 addresses for their servers.

That was the year when we hosted the first IPv6 tour training workshop in Santiago that was a tour organized by LACNIC and we were happy to have them visit Chile and have for the first, the technical community in Chile exposed to this. And also, that year we received the first request from a customer to put a record in our zone, which, of course we were not prepared to do. So that set us working on it. We were able to do that in the next year, and also, that year we obtained experimental native IPv6 service for one of DNS servers from Net Global, is a provider.

We have second version of the IPv6 tour, and then one of the local ISPs took the task of providing experimental connectivity with dual task for the workshop, and it was very good because they started working on that, and were actually the first service provider to be able to offer that to their customers a little down the road.

In 2007 we tried to purchase IPv6 connectivity. NIC Chile is part of the University of Chile which is a public university, so we have to go through a process for this, which includes issuing RFP, and there were no bidders. At that time none of the ISPs were able to provide this, so we have to go into next year

of a second round of RFP, and then this GTD provider who had participated in the second version of the IPv6 tour was able to do that, so we purchased connectivity for our systems.

In 2009 we participated in Google's IPv6 test, and we had started a laboratory NIC Chile Research Labs, and that is a group that we setup to work on various projects that are an interest to us and that are not necessarily related to our day-to-day operations. They obtained a government grant to try to assist and somehow lead local ISPs to implement IPv6. That was named the IPv6 Project. Currently all the ISPs are participating there, except GTD, because they feel that have already done that, and I will tell you a little about that.

Now what I've said has been centered mostly on what we've done, so that is basically accurate in the sense of not much else has been happening in Chile, but it's fair to mention that the University Federico Santa Maria in Valparaiso, also were working on this at the time and they implemented dual stack with global crossing.

In the end of 2009 our servers were accessible - the IPv6 from Chile and globally. This is the web page for the IPv6 Project. It is basically a portal of information that they try to keep up-to-date on news items, general information, manuals and courses. The aim of this is that this will be a focal point for IPv6 resources in Chile. They also have a Twitter account where they are all the time broadcasting information for the community. They don't have a whole lot of followers though; it's about 600, so that number somehow tells a little more of how widespread this; is which is not much.

In 2010 this project offered training courses for local ISPs. Some of them obtained IPv6 blocks, and some of them started offering IPv6 connectivity to some chosen customers, test web customers.

In 2011 we activated IPv6 addresses for one of our Anycast clouds. I'm going to show you where those servers are, and we participated in IPv6 World Day enabled access IPv6 for our web server www.nic.cl, and for our WHOIS server.

These are the locations of our b clouds; we have several clouds and that's the one that's currently enabled for IPv6.

This map shows our connectivity. The central circle is basically our own operation, our main offices are located in middle Miraflores. We have a contingency site at FCFM, which is a university campus. On our data center is at Adexus. These three are connected and we purchased commercial connectivity from Claro, Orange, Entel and Adexus - those are the four blue circles at the top. We also have GTD back at the left, so we have a lot of redundancy in our providers.

We host three copies of route servers and we also have servers of our own located in México, Brazil, Czech Republican and Peru. We have exchanged deals with them. We host one of their servers; they host one of our servers. So those are located abroad, and there's also the site for a laboratory at the left.

The links that remain in solid black are those that are IPv6 enabled. So that shows that as commercial providers, for instance, GTD is providing us service here at the bottoms left; Adexus at the top. Claro, Orange and Entel are not currently able to provide the IPv6 connectivity, and all the route servers have IPv6 connectivity and only the server located in the Czech Republic has IPv6 connectivity with us.

In trying to find what's exactly happening, we tried to get some numbers and the numbers really paint a picture that say that there's been a lot of activity, but not a lot of progress. This graph shows the number of IPv6 glue records in our zone, and it has gone up, but it also has gone down in recent months. If you look at the absolute numbers, they are really very low. At the best, we had nine glue records in the .CL zone, and about three of them were ours.

So there's a lot of activity outside NIC Chile currently. These are the total number of DNS queries that we see in our b cloud that come from IPv6 addresses, and you can see that there is a big increase from 2010 to 2011, from nothing to something. And so far in the first two or three months of the year,

we've already seen numbers that allow us to project an interesting growth from 2011 to 2012.

Now this is what we see from the entire world coming into our cloud, which means that in the world this is growing. These are queries that we see that ask for IPv6 addresses and there is growth, but really not very fast, as you can see.

What's the current status? We allow IPv6 records in our zone, we have IPv6 access for our website if we use our DNS. We are going to have IPv6 for our mail server and enable all our clouds with IPv6 and the IPv6 Project currently is focusing on outreach, trying to get more important institutions in Chile onboard. They are going through a cycle of talks, mostly advocacy talks and some technical for El Mercurio, which is the largest newspaper, airlines, a big airline, several of the banks - the local branch of Citibank, Corpbanca, Coopeuch, and also for Transbank, which is the credit card transaction provider for point of sale in all of the country, and also for Redbanc that operates all the ATMs in Chile. So if we get Transbank, or Redbanc onboard that will be a significant relief, and that's all I have to say, thanks.

Raul Echeberria: Thank you, Patricio. Really impressive goal that you are doing in there in Chile. In fact I have learned that some things that you are doing that I didn't know. It's good to be surprised in that sense. Our next Ralph in this table is Martin Levy. Martin works for Hurricane Electric and is one of the main IPv6 promoters around the world. So welcome, Martin. Please go ahead.

Martin Levy: Thank you Raul. If you sit at the end of table you never know if you're first or last, until this point, but it's actually good to be last in this case. I have some numbers as well, but I'm going to address one really key important point.

NIC Chile said that they only had a very few number of quad A glue records of people coming to them for v6 - but very few is greater than zero, and even if it's

only one, it was obviously very important for at least one player to be v6 capable with inside that domain, and that's a key point here.

I'll show some great numbers, maybe a little of an overlap, but the key point here is that even if it's one packet, one name server, it's still important, because we're looking at an internet that must work, and must continue to work as we go through various transitions, this one of course being v6.

So I'll give you a quick history, but the quick history is that he meant to make it important to understand that a lot of what we've all talked about here today has already been done. The complexity of learning how to enable v6 inside an internet environment, or inside a DNS environment. If you haven't done it, then listen to the experiences out of Canada, out of Chile and realize it is doable, even from scratch.

The Canadian experience which was first talked about in Singapore, I believe, was a very good example of doing v6 from scratch. But for some of us, my company, we've been doing this for an awful long time, and although ten or eleven years ago, there was nothing commercially viable for v6. You couldn't do what we're doing today eleven years ago. But over the last five or six years, the ability to roll out commercially available v6 services, with SLAs, with the ability to be equivalent to v4 - that's what's really happened. So we're in a great position, so from a history lesson, just realize if you're new to this v6 stuff, a lot of us have been doing this work for quite some time.

This year 2012 ends up with v6 Launch, which is what I'm going to talk about, but a little bit of history as to again, why we can do something as ambitious as launch this year. So let's run through some metrics and look at these basically very positive trends. I can be quick with these numbers only because they've already been well handled by Arturo and others.

A couple of key points - every graph is going up and to the right; every graph is showing a positive trend for v6. The number of countries - that middle area of information - the number of countries that have enabled v6 inside some form of

internet service has increased, and it's increased quite well. When you hit 149 countries, you're doing well. I'll talk about DNS and TLD stats in a second.

The next graph is really what's happened globally on the BGP tables, and there are two key time points on that graph, which show an interesting human effect. First of all IANA run out over a year ago now when it was official and the press took on the story when we had run out of v4 addresses, and the interest in v6 jumped. This is because humans like a deadline. We like to, say, get ready well ahead of time, but in reality that deadline kicked off a lot of interest in v6.

World v6 Day in June was the great "get ready for that date." Some people dealt with this a Y2K issue. It wasn't, but I wasn't going to correct them, and no one else was as well. People got ready for that date, but things slowed down a little bit after that, and that's not surprising. That again is human nature, but the bottom line is these v6-enabled networks there's more of them globally than there was, although we still have a long way to go.

I'll hit the next two graphs again, up and to the right. This is the same information broken out over many years, and the reality here is that we've actually come a long way and again every graph up into the right.

So let's talk about World v6 Day from last year. World v6 Day was a 24-hour test to enable v6 on key websites. We heard about Facebook, Google, Yahoo, CDMs, such as Akamai and Limelight, which actually provide quite a large amount of data to the rest of the world, and also many other sites jumped onboard for that one 24-hour test.

So let's look at the graphs for what happened and there's some fantastic stuff that we saw and we were meant to see. We saw traffic levels jump, meaning that if you enable v6, there is a user base sitting ready to go today. This point was known, but no one had ever done this, no one had every turned on this much in one step.

So instantly we saw a 3X jump in traffic and then after that we saw a 5X peek during the day. And after the day was finished, the World v6 Day was setup as

a 24-hour test, but after the 24 hours, some of those websites decided things have worked really well. We can leave some of the traffic, some of the Quad A records in place, and continue to provide v6 services. That's why the graph did not go back to zero. And if we hit the next page, then you'll notice over time, here's a two-year graph that World v6 Day was a significant jump in v6 traffic globally.

Now this is just measured as traffic off of our backbone; other backbones would compound and add to this, but the bottom line is that if v6 really had issues, some of the major websites would have had to have turned off that service. They didn't, and that's a good thing as well.

Okay, there were a couple of takeaways about World v6 Day. It was predominantly about web traffic, it was about enabling websites. Keep that in mind, because, although we think of that as what the human interaction is with the web, the reality is that obviously it takes more than that to get a website to show up for a user.

So let's hit the next two slides and I'm going to do a quick review through Singapore, ICANN-41 and ICANN-43, and look at some of the history at the TLD level with v6.

Now the graph here is two scales. The blue line is the number of TLDs that exist in the route zone. It has obviously increased over time; it's about to increase even more. But those increases, including IDNs and a few gTLDs that have shown up, have been a nice steady increase, but the green line and red line, are the lines you want to focus on. The green line is the number of glue records in the root zone. Those are the name servers to which people have managed to get IANA to include a quad-a record, such that a top level domain can be reached from a v6 native host.

Now we all know DNS works, so you could say it's not a problem because we know all these TLDs work quite well, and the answer is this - we 're looking at the ability for everything to work in both a v6 and a v4 world. The reality is that a clean path through v6, even at the TLD DNS level will be important as

broadband networks grow globally, as mobile networks grow, and they become more and more dependent on v6.

So the difference between the green line and the red line is very subtle and by the way, it's very good that they are converging. The difference is, the red line says that a name server is v6 enabled. We saw that from Chile, we saw that from Canada, enabling a name server and getting routing, global routing to work for v6. But unless you finish the IANA process and get the v6, that quad-a record into the IANA files and into the root zone, no one will use it. So there's a little ways to go. You've really only got about 10 or 15% of the last set of domains.

We'll hit the next page. Let's call out some names, because we can do that, next slide. So a few of those name records, it's only about six or seven of them are just missing that last final step with IANA, so we know that's good. But then we look at a bunch of other domains that just don't have anything v6 - they don't have primary or secondary name servers. And if you're on that list, feel free to talk to me or to talk to anybody about getting that last step of v6 capability, whether it's on a primary or onto secondary. Sometimes those secondaries are everywhere.

Maybe there's no excuse for .mil not having a v6 name server, but they're there anyway. It is fundamental and it is one of those last steps that has been done by many other TLDs, and I'm hoping that going forward as we see gTLDs come out, that they never show up on the lists like this. There's no reason from this point onward to see that.

Okay let's move on to the key point here - World v6 Launch. The key point is last year we did a 24-hour test; this year we've turned it on for good. This isn't just a one-week test, this isn't a two-week test, this isn't turn it on for a month - this is turn it on full stop.

So we'll talk about what this is the next slide. It's June 6 - that has a nice number 6 around it. The URL is right there, feel free to go to it right now, feel free to remember it, feel free to test it, but do spend some time looking at this.

The goal is turn it on, leave it on and have some success for this. We've proved that a year ago, and now we're going to go do it for real. The other thing is the pitch here is if you're a registry, if you're a registrar, then look at what you need to do to enable v6, to enable glue records to be entered through your system, to do your part for this more than anything else.

Hit the next slide and I picked out two statements. There's a couple of them out there from different players, but Google and Facebook - these are two big players. Both of these statements, even if you don't read the whole statements that are on their websites, or their blogs, look at this one word. This is permanently enabling – permanently - and for these sites to do this permanently means that they have enough faith in all of the infrastructure, in all of the issues involved around v6. All of the testing that we've done for the years to the point now when it can be turned it, left on, and that this is ready for prime time.

Now another subtlety is both of these companies have an enormous amount of revenue, based upon their internet services, and that means that they know they're not going to lose revenue, because of doing v6 - a key point.

So let's hit the next slide. What can we do? What can you do today? What can you do in the summer, and what's the value afterwards? Well today, it's a case of educating customers; it's a case of looking at the outreach that has been done by ISOC, by many different players to get the requirements for v6 understood. You can go today and look at your support sites if you're doing parked domains. You can do the type of process that's been talked about on the panel today and enable v6.

But the big plus is going to come in the summer, and we saw this last year, and we know we're going to see this again this year, and that is the press is going to take this event and write it about it. It's going to write about it in the technical press, in the popular press, in the business press, and all of that gives many people an ability to jump on that band wagon and talk about v6 to their advantage. Take advantage of this and use the event as a launch pad for you

own v6 services, and get the appropriate press in whichever geography you're in.

And then finally after that don't just use this deadline and then forget about it. Make sure that you're pushing for v6 services after that date, and forever more after that, because the internet as we all know is growing, and growing significantly. And really that's my pitch. The rest of this is about just about what we do, that's uninteresting. We're doing v6; we've been providing v6 transit services. If only we were in Chile - although we are in Canada - and you know, as I've said a few other places to my competitors, feel free to get on the band wagon. This v6 thing is a good thing, but anyway thank you, that's all I need time for.

Raul Echeberria: Thank you Marty, really a very good presentation. We have 12 minutes; we have time for some interventions, or questions from the audience. If you could raise your hand I can give you the worm and a good appreciate, please very short, comment or questions within 30 seconds and one minute so we can have more people speaking. Please, the lady in the second row.

Martha Fonseca: Good morning, I'm Martha Fonseca from Costa Rica. I would like to ask two questions together. For the [RASCA] representative from Costa Rica, I would like to know whether there are any limitations in terms of technical obstacles and who are the IPv6 providers in Costa Rica?

And for Mr. Arturo, the question is the following. According to your work with LACNIC in Latin America, what were the major limitations and obstacles that you see governments raise in order to work with the IPv6?

Carlos Raul Gutierrez: Technical limitations - well, we don't see as many technical limitations as political limitations. The IPv6 providers in the country are mostly all ISPs that

exist now in Costa Rica - they already have IPv6 in their networks. So in RASCA we have seen is that although for two years engineers had already been working with IPv6 and they have had workshops, people are not asking for IPv6, even when they are freely, or trained for free. So I think that this has more to do with an administrative and political issue, rather than a technical issue.

Arturo Servin: …of Carlos, we have seen a huge disconnection between the technical staff and the commercial staff in ISPs, because the networks are ready, the services are ready, but the commercial people - they don't have a clue that they have IPv6.

So I encourage as an ISP, talk to your business people and tell them that you have IPv6 and don't wait for the customer to go and ask IPv6, because they won't ask about IPv6. IPv6 is just internet, just selling internet access. Just give them the IPv4 addresses and the IPv6 addresses. If you are allocated in /29 in IPv4 allocate a 48 for IPv6, so just don't wait for them to ask you.

And about the question - I haven't seen any limitations from government in the country. I think that they are encouraging ISP to deploy IPv6, but I think it would be better that the ISPs start to plan IPv6 without the pushing of the government. So don't wait for the government to obligate you to deploy IPv6, better to start right now by your own and don't wait for a law to do that.

Raul Echeberria: Thank you very much Mr. Watson, after you we have a remote comment, please be short please.

Paul Wilson: Thank you Raul. Paul Wilson from IPNIC. Congratulations and thanks to LACNIC for this session. It's great to see the panelists and a very strong turnout in the room.

As Arturo said, we really do have a strong urgency during this year, and for a very short number of years afterwards to get IPv6 up and running. If we don't do that then we go down a path, which will be very difficult to back out of, even

just four or five years from now. That really means the need for concrete information.

I think the presentations were very good, and they were generally quite detailed in giving concrete information, but for instance in the case of CIRA, that was very interesting. I felt you were a little coy might be about the details of your experiences in terms of specific vendors, who were either not supporting, or who you found to be supporting IPv6.

So I think now is the time for naming and shaming those who are not providing IPv6 to organizations like yourselves, and also to be providing a bit of free advertising and credit to those who are. So I'd really appreciate brand names and companies, and some really concrete and hard hitting details about where things are working, and where things aren't, and so I would encourage you to include that information in future presentations. Thanks.

Raul Echeberria: Thank you. Please.

Naela Sarras: Thank you my name is Naela Sarras, I'm with ICANN staff reading a question on behalf of Rick [Tekel] from online. The question is will Google's DNS white listing on June 6?

Raul Echeberria: Marty, do you want to jump in?

Martin Levy: Yeah, the question was will Google's white listing - and I'll explain what that is - end on June 6. The white listing is a method of manually defining some network in the world as being v6 enabled, such that a DNS response will come back with a quad-a enabling IPv6. And to be honest the answer must be yes, because everybody gets v6 on June 6, whether you're white listed or not.

The answer is that anything that was done special to force one group to be enabled or disabled v6 versus another group goes away. The word permanent on June 6 means the v6 is turned on for everybody - end of story. That's a good thing to see the ending of the white listing.

Raul Echeberria: Thank you very much. Please identify yourself.

Yaovi Atohoun: Thank you very much, my name is Yaovi from AFRALO. My question is to the presenter from Canada. Since you have finished the deployment, I would like to know if you are able to know the impact, and also if the ISP will follow you. You want to make yourself ready, but I want to know if other people are following and the impact on the users' side.

Martin Levy: So, since we've done World IPv6 CIRA has been promoting IPv6 in Canada, so we've been presenting to a lot of people about IPv6. We're like train the trainer where the impact is CIRA, we've managed to get a lot of the Canadian ISP in the room and tell them that the internet is v4 and v6 - it's not v4 or v6. And the end users are not going to ask for IPv6, so the ISPs need, like Martin was saying; the ISPs need to provide v6 transit without asking, or make the offer available. So from our point of view, I guess we made a small impact. I know that pretty much that all Canadian ISPs are going to have v6 within the year, and we're kind of pushing hard on that so…

Raul Echeberria: Thank you. You, and then you.

Stefan Lackner: Good morning thank you for your presentation. My name is Stefan Lackner I am from InterNetX, Germany. We are registrar and a hosting provider. My

question regards to the end user and the end user experience. With IPv6 coming I see the threat for the end user that devices of end users could be more easily attacked directly, because with .net in IP addresses you have at least a certain level of camouflage in between.

The second point is with IPv6 introduction, which surely has to come, I see a potential for people with some criminal intention to confuse users and to make profit out of this, because there is a technical revolution going on. I would ask the panel, whoever feels addressed to comment on this question.

Raul Echeberria: We have time for very short questions. Do you want to jump in for the first question? Martin, you'll take the second?

Arturo Servin: Not really as security device, it's just open holes, and the holes have there, so you find the hole and you get into the network. So yes, we need security, but that security is through firewalls and firewalls are IP6 or IPv6, IP4 enabled. Yes, we probably will need to be more careful about security, but I don't think it's really a security device, or it's going to make a change, but yes, we need to treat IPv6 as IPv4 for security. We need as Jacques said we need very clear policies for security.

Raul Echeberria: Marty?

Martin Levy: It's an interesting question. Anything new definitely causes a lot of people to look at the level of security that they need, but whether it's something that can be taken advantage from a human engineering point of view - your second part of the question - and used for the incorrect type of profit is very questionable compared to anything else.

The reality is that v6 has no effect if you are on a v4 only network - that's the first issue. The second part is that the user base, this was said earlier, the user base in theory shouldn't be asking for v6. In other words the user base should be still looking at a URL that is of their bank, or of their social network that they're trying to access. There are many other different discussions of how to secure that. The v6 part is purely under the radar and should be deployed, and presently is deployed with the same level of security that you see in the v4 world.

Raul Echeberria: Thank you, last question? We will close this issue.

Male: I am (inaudible) from government of India. I am responsible for IPv6 implementations in the country. Of course it's a very good discussion by the panelists. I would like to ask two questions from the panelists.

No. 1 is because no operators and even commerce are pushing for IPv6 implementations, but it's still only very few participants of over end user devices are IPv6 compliant. What we are going for this IPv6 compliant (inaudible) devices, a number of them?

No. 2 question - What is the label of government? Is there any push from the government sites mandated in Latin America, Costa Rica, or Canada? Two questions out there.

Raul Echeberria: Thank you. 20 seconds for each answer. Who will take it?

Arturo Servin: If I understand one part of the question is - the basis of supporting IPv6 is almost descend bender of routers, servers, or operating systems support IPv6 so…

Male: I am talking about end user devices, like they are 95% off of them are iPhones are only IPv4 compliant, so (Inaudible) is there for the manufacturers. Who is going for IPv6 compliant end user devices? How can we push for that IPv6 technique?

Arturo Servin: Yes, there is a small percentage of mobile devices, but I think Android and Apple is pushing that part, but yes, it's a problem and well, you need some strategies there, but I think we don't have much time to discuss those.

Raul Echeberria: I think that one answer is that the life of the mobile devices is every time shorter and shorter, and I think that the manufacturers of mobile devices are moving also faster toward IPv6. So I think that's in probably the next three, four years we will be a complete renewal of the devices that are being used today, and so the percentage the devices compatible with IPv6 will be increasing all the time, that's my view.

Okay, before finishing, I have one question for Carlos. My question is what the access regulator is? Who do you think should be the role of the regulator if the ISPs don't take measures to move to IPv6 in the short time?

Carlos Raul Gutierrez: I'm afraid we're going to be making a very cynical comment. The regulators have been taught to intervene when there are scarce resources, so the worst thing I can imagine is that people stick to IPv4, because by definition it became a managed resource. And if everybody moves smoothly to IPv6, or sooner rather than later to IPv6, that preempts regulators to think about asking questions about this resource, so…

Raul Echeberria: So do you think this dialog is better than regulation industry?

Carlos Raul Gutierrez: Of course. In Costa Rica we have a problem and we should be ashamed that we still are just starting to open up the market. We still regulate rates, interconnection rates, international access rates for data, and the sole purpose of changing our regulation is to liberalize the market to open the market, and I hope the regulator doesn't become a hindrance in this sense. I hope that the [Fontelle] projects in Costa Rica become a first very big demander of IPv6 addresses.

Raul Echeberria: Thank you very much. We are three minutes after the time for finishing the session. I want to thank all the panelists for being here. I think that we have heard a set of really high level of presentations from different perspectives, different roles.

I appreciate it very much. I thank you very much for the participation of all of you. It was very good to see that the number of seats was not enough for accommodating everybody in the room, so probably in ICANN-44 we will show a graph like the one that Martin showed, but with the number of participants in the workshop. Thank you very much to ICANN for inviting us to organize this session and so thank you everybody. See you.

[End of Transcript]