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LEO VEGODA: The figures aren't in here, but are really more to the left and what you see that's after progressing being prepared for employing IPv6. The last year, this is not where the emphasis is, they seen to be at the kind of stable phase. Obviously if you download this logic, you can read it even.

For instance the bottom two that's within the year from now all responding ISPs will be offering IPv6 services to businesses and in 75% of the cases and 70% to consumers.

What we now see is that move is really also on really using IPv6 collectivity. Where we see that in 2010, 60% still didn't. That's rental 44% in 2011 and even 35% in 2012.

So we see that really more and more ISPs are now confronted with the requests to offer IPv6 collectivity even when the percentages of users are still fairly low. The presence is there, this is the statistical full respondents to day to day stuff, not only ISPs but also others.

Where 36% has had no presence at all in 2010 it's getting smaller, that group. Getting to 23%, and again it's low numbers in the real presence, yet what we also see is that the 81% said in 2010 it's insignificant.

In 2011 it's just a very slight growth where people said it's insignificant, only 78% said that. And you see that they're really the beginning off a curve that seems inclined to becoming steeper.

I think that is really what the outcome reflected of respondents who are working on offering services and using services, rather than the statistics of real use. Biggest problems remain like a few of the demands, technical problems in production.

One of the statistics that hasn't changed over time is that already in 2009 60% said venders are the main problem. In fact, and it's not on this question, but in fact we still see that over the years that has been consistent.

Apparently venders are still the problem, according to the respondents to this study. So without expounding too much on that we all know that the real percentage of IPv6 usage, for instance like reflected by the statistics over Internet exchange, like M6, is still low.

Not getting up very close over the last year and average is 2.5 megabits. Sorry, gigabits per second of course. It's now up to 4, which means in a way from 0.3% up to 0.4%, 0.25% to 0.4%.

So also there you see the beginning of the uptake. Preparedness is there, my impression is that this will facilitate uptake, when the pressure for really doing it picks up.

PAUL ANDERSEN: Thanks, I have just one last data point before we get into discussion. This is from CIRA, just to show you at least In Canada some of the analysis they've done to show how many .ca sites are reachable by IPv6.

So the top line is the available number of sites and you can see there's a large jump in June, which obviously translated to the launch day, World IPv6 Launch Day, World IPv6 Launch Day.

The difference between the red and the blue is that the ones that are in red, that little gap up there are the ones that are natively reachable, Canadian websites reachable by Canadian providers.

Whereas the blue is Canadian .ca websites but they're reachable through non-Canadian providers. So we look at that, we look at the survey that still shows that we've been trying to deploy this technology since 1999. And we still have 90% of customer basis potential, not on it.

So with that I'd like to jump right into our discussion and just a last quick ground rule, that's the end of the slides. We're now going to open up to have a discussion between our panels who are going to jump in. And I also invite anyone in the audience.

If you hear anything that you'd like to ask a question or make a comment, there are two mics on the side and we also have remote participation, which Leo will give us the signal if anything comes in.

So with that I'd like to just start off with the opening question to each of the panelists is we've had it this long, we're still not seeing wide deployment. What are some of the challenges each of you are seeing in your organization deploying IPv6. I'll start with Victor here from Rogers.

VICTOR KUARSINGH: Well, some of the problems we've faced we still face. We've resolved some of them. We mentioned the one up top which is the vendors' base

in terms of being able to get the right functions and features out of our devices for V6.

Now that challenge is kind of spread across a lot of different areas within the operator's base meaning on a coordinate working side of things, things are pretty straight forward.

We really do that efficiently a number of years ago, where we've had to spend a lot more time and effort was really around our access edge, towards our customer.

And there's a complication there because obviously that space doesn't just end with our equipment and it starts, goes into the home networking and whatever the customer might have in their home.

And then there's obviously where we inflect services and we offer our traditional data centers. And where we have our own operator service getting that edge to work and there're a number of other topics I guess the other folks will comment on as well.

They might include our provision systems and a lot of tools and other components we had to get going for v6, and overall organizational challenges.

We've had to spend many years planning out training, making sure that training lines up to when the folks internally will actually be able to experience V6, whether that be in our coordinate working operations folks or engineering folks.

There are areas within our network. That's just a highlight of some of the main items. Maybe some of the other folks have different experiences.

PAUL ANDERSEN: Nima, press your button there on the…

NIMA SALEHI: Aside from a lack of business driver or demand from customers we should kind of, is one of the biggest challenges to invest more money or time into the deployment of IPv6.

As Victor hinted the core side is the easiest part to kind of catch up. When it comes to system and tools and assurance to tools, that's the area that we see a lot of challenges for the adoption of IPv6.

In particular some of the venders that we have or they're in the industry for assurance or provisionary tools, they are not yet even started to kind of, looking atyIPv6 a portion of their service portfolio or product portfolio.

Learning curve across the organization is kind of a slope, because especially on the enterprise site, on the customer we see a demand, we see a demand of kind of educate the customers. That's one of the challenges that we have specifically around this topic.

PAUL ANDERSEN: Jacques?

JACQUES LATOUR: Well, we look at it from two ways. The first way we look at deployment, deploying IPv6, is from the enterprise point of view so the challenge is around that. So when we did the IPv6 world day in Canada the biggest challenge was getting transit. That was number one, so it was very rare and that was our number one issue.

Number two, we had issues with finding good resource and training and all of that stuff, just a general availability of plans, how to take infrastructure from v4 and adopt v6 on top of it.

So that was getting to learn v6, to use it that was the biggest issue. Today we operate an entire infrastructure with v6 and it works well. The other thing we do, we do good for the Canadian Internet and I'd like to touch on that.

On one point is end users want to have Internet access and the Internet is v4 and v6. So they asked for Internet, that means by default now, they asked for both so the demand like my mother's not going to ask forIPv66 so when you want the Internet it's both.

PAUL ANDERSEN: So to Nima and Victor, we have a consumer or an organization that's asking for IPv6 but we constantly, at least I've heart that customers are not deploying it quickly or faster because there's not demand. Is there no demand from what you're seeing?

NIMA SALEHI: In the consumer market Ipv6 or IPv4 is a kind of transparent type of technology to them. So they really don't ask for IPv6 in a specific as you mentioned. They're more asking for Internet in general.

But when it comes to enterprises and big organizations or government bodies, that's the area that we would kind of expect more specific demands about IPv6 readiness or IPv6 services and that's the area that I was trying to kind of hint on.

That there are some demands but most of the stuff is either in the very pilot or on the stages and it doesn't really work around that much of resources for us or investment for us to really push it forward in terms of the actual deployment or delivering the services.

They were kind of, there have been some minor demands or internal demands and all of them have been kind of satisfied so far but in terms of a massive market of demand, we haven't seen it yet.

VICTOR KUARSINGH: We have similar experiences. I mean in the consumer market they have a few people a lot of people like me who specifically asked for v6 and we see in our blogs etc.

But the majority of customers don't actually specifically ask for v6 today. We would like that to change. Potentially that would help move things along.

That's kind of the nature of things. They don't, customers don't necessarily ask for things other than speeds and I want WiFi or something like that.

But effectively from a IP address perspective they don't really ask for it. We have seen a difference in trend on the business side. It used to be such that enterprises would ask for v6 on an RP. We suggest you support this.

It was more like a cursory item. It's a checkmark we'll put on there. What we've seen a trend in or a change in trend is that then they are specific, asking more detailed questions. We're asking about address types.

Are you bringing your addresses are we assigning ours? So that tends to show us that not only are they more interested in getting the v6 but they seem to know how to use it. Now it's still not as many customers as we would like, but we've seen that trend start to build.

And we've seen into this year versus previous years. Whether the IPv6 world day last year or the v6 launch this year helps spawn those organizations alone. It's hard to say but that has been one of the trend changes on the business side.

PAUL ANDERSEN: So that gives us a bit of a command perspective. Before I go to the remote questions I'd just like to ask so Owen, has Hurricane Electric as a US provider. Are you having any challenges in deploying IPv6?

OWEN DELONG: No we've fully deployed IPv6 to our entire network. We have IPv6 everywhere including all of our Canadian points of presence. However I

do want to make a comment about the residential thing where they said that it's transparent and the users aren't really demanding it.

We have an awful lot of tunnel broker customers even in Canada that would tend to say that users do actively want IPv6 connectivity even in Canada.

And so I think the users I think that are aware of the difference between IPv4 and IPv6 are asking for IPv6. They may not be coming to their ISPs because they think that's futile but they are coming and getting it from us through the tunnel broker service.

So there's demand there that's definitely evident. There's also the opportunity here that I think is being lost for ISPs to really take a leadership role here.

Even if your users don't know that they need IPv6 this is your opportunity to provide it and make it available to them. And take kind of a leader ship role in advancing the Internet.

This really needs to be a situation that we view as a shared fate for the entire Internet. And it's a migration that we need to advance as an industry or we're really going to suffer globally in general as an industry for failing to do so.

And we're already pretty late to the party as it is and so I would challenge and encourage especially residential ISPs to take on that leadership role.

Get IPv6 deployed to your end users and start running at least customer trials and learning about how to do this and what the challenges are and moving forward with it.

PAUL ANDERSEN: With that let's go to our participation questions.

LEO VEGODA: I've got one comment and about three questions so I don't know how would you?

PAUL ANDERSEN: Let's have the comment and the first question then we'll go because I now have a line up so.

LEO VEGODA: Okay so the comment is that from guest. I think he means transit before routing table. And then the question from Sandy Chadee, what are some of the security considerations when implementing IPv6?

PAUL ANDERSEN: Jacques did you want to take a stab at that because I know that CIRA's done some work and published some documentation on that.

JACQUES LATOUR: IPv4 and IPv6 are completely different in terms of security so you need to re-do the security differently.

If you go to cra.c website slash IPv6, you'll find a bunch of resource in there including a template for security policy for an enterprise for a business.

And you need to overcome a basic challenge of you don't match anymore with v6. So once you've got that covered then you can actually adopt v6.

PAUL ANDERSEN: Anyone else want to jump in on that one? Owen?

OWEN DELONG: I don't know that I would call the lack of NAD a challenge I think that from a security perspective. It's an educational problem.

There're a lot of people who believe NAD is a security tool when in fact NAD is antithetical to security. And it only does damage to security.

The thing that's beneficial to security that a lot of people conflate with NAT is the stateful inspection and you can still have stateful inspection in IPv6. You just don't have to mangle the packet header in the process.

MALE: Yeah and the way we approach security with our v6 plan was we didn't forget what we did in v4 and we tried to use a lot of the common practices and certain kinds of filtering and certain rules we have in place.

Again, the security differs between the customer edge and our own core network, etc. but we also approached it differently in that we

understood there were differences between v6 and there was new phenomenon

And that is everywhere right from how we set up our protocol, how we wrote, how we protect our nodes. Then we broke down security, things we know, which has been what's established so far in the industry and what people have found.

We realize there're some things we don't know so we were trying to be as diligent and try to understand what's going on in our network to be able to make changes moving forward.

And there's the scary part of those things we think we know and hopefully there's not too much of that and we're willing to change.

PAUL ANDERSEN: If you could, give your name and affiliation as a reminder.

MARK: Mark from Microsoft. I was hearing that there wasn't much business case for IPv6. But on September 30th of this year, the United States governments, their mandate from NIST I think was that all federal agencies be IPv6 capable at the edge and that they only procure software and services that are IPv6 capable.

And as a result, Microsoft has greatly accelerated the ability of IPv6, for example, in our Azure and our Office 365 services, the ones that are targeted for governments at least.

So first I was surprised to hear that this is not driving any demand that you're seeing. I would think that enterprises would certainly be driving ahead their plans for IPv6 to be able to do what the US government does or to interact with them.

And then the related question is when do you think Canada will mandate the same thing? I know there's been some talk of it. When do you think that will happen and how do you think that will drive demand for you?

PAUL ANDERSEN: I think I'll turn that over to Ed if he wanted to comment from the government of Canada perspective.

ED JUSKEVICIUS: I want to start off my saying I did not pay Mark off to ask that question. But it's one of my personal favorite ones and it's on the topics of discussion. This is perhaps a well-kept secret.

But if you Google IPv6 and the acronym TBS for Treasury Board Secretariat and 2012, Google will actually point you to a document called The Government of Canada IPv6 Adoption Strategy.

That was published, missed it by that much, two days after World IPv6 Launch this year. And in that document it outlines what the Government of Canada's timetable is to adopt v6.

So we're currently into something that entitled the enabling phase. So essentially all federal departments, agencies, and credit corporations are in the planning stages of v6 undergoing readiness assessments to

identify what's going to be required in the way of resources, training, products, and infrastructure to adopt v6.

All departments have until the end of September next year to complete its readiness and enablement. Then the first day after that, the deployment phase begins.

The first tangible milestone there is that all citizen and public facing Web pages of the Government of Canada, and there are a lot of those; have to be fully v6 addressable and reachable within 18 months.

So that's March of 2015. Any new website that's put up, any new e-government service, any new anything application that's developed for the Government of Canada that goes live starting the first of April 2015 has to be v6 capable from day one.

So that's actually something that's taken a few years. We were working at usual government speed to get organized and get published.

But that has been published now. Except for one blogger that writes in Canada, I don't think anybody else in the media picked up on that whatsoever.

PAUL ANDERSEN: Ed, so I would like to hear how government mandates, how you'd be adjusting to that. Also, point out that you could also find that document by binging it too.

ED JUSKEVICIUS: The Government of Canada doesn't actually mandate an awful lot that the private industry should do when it comes to Internet Technology adoption.

We're very much the same onset as a lot of the GA countries and the US in that we regulate telecoms and spectrum for telecommunications in this country but we don't tell ISPs what technologies they have to deploy for consumers or for businesses.

We basically leave it to the market to decide what's the right move to move forward. That being said, the Federal Public Service of Canada is the largest single employer in this country and we basically have roughly 400,000 employees, contractors, and other staff that have to have access to the core network.

So the Government of Canada, 43 Federal departments, agencies, and all the rest of it connect into that. It's potentially the largest single enterprise network in this country.

So we're hoping that by coming up with our timetable and driving all of our folks to adopt that will provide enough of a demand for services.

We rarely single source all of our poring and transit and other capabilities to support v6 which then hopefully they won't be reluctant to offer up to the rest of the industries in this country.

PAUL ANDERSEN: Thanks, Ed. We have two more or is it queuing up?

LEO VEGODA: I've got quite a few here. I'll do them in whatever order you want.

PAUL ANDERSEN: Why don't you give us the next two or three?

LEO VEGODA: Okay, I've got from Douglas Onyanyo. Canada seems to have cashed in well on this June IPv6 launch. There was a large spike and since then there has been some stability based on the slide.

Is it possible that other events like IPv6 launch date will be required to continue pushing usage upwards? Scrolling down, from Sudheer Krishna K., how is synchronization of IPv4 sites and IPv6 sites will be done, will there be any problem?

And I think there's another down below. From Kevin Otte, since most people don't want to change until they're forced to, perhaps there would be some benefit from establishing an IPv4 shut down timeline.

I know it's not really enforceable but if there is some that people can take up the chain might be necessary to kick in the pants.

I'm thinking of the digital television cutover happened here in the US. Then the next line was, the deadline slipped once but only once.

PAUL ANDERSEN: I'll come back to the IPv6 spike question in a bit because we'll be getting into some of the business case. I don't know if Owen wanted to comment on, or any of the panel, thoughts on the IPv4 drop dead date to turn it all off.

OWEN DELONG: Well actually I wanted to first talk to the question about synchronization of IPv4 and IPv6 websites. The gentleman that asked that question, I think that's very simple for the most part.

People are handling that by having one set of content on a server that runs dual stack or is front ended by a dual stack load balancer. Such that it's the same content whether it's delivered over v4 or delivered over v6.

It's the same content sitting on the same servers so there's really nothing to the synchronization between the two because it's not a different websites per say. It's just two different transports for the same website.

In terms of the drop dead date, I don't think the drop dead date idea is really going to work all that well in this particular case. Yes, in some ways it would be nice to have a flag day we can point to and give that to management and tell them, "Look, everybody's going to turn v4 off on this day."

But the reality is there's no credible way we could actually issue that such that anybody would actually believe it or take it seriously. What I think is going to happen instead is we're just going to watch the cost of maintaining v4 escalate to the point that it becomes untenable. That's when people will start turning it off.

PAUL ANDERSEN: Any comment on here on the concept of having an IPv4 off day, about how well that would be received by your management if that was proposed?

MALE: I would probably tend to agree with Owen. I think that nobody what we declare it won't match up to what the demand for the remaining v4 resources will be.

We're looking for a term that came up earlier when we were talking was dominance. We're looking for when most stuff will be v6. But in terms of trying to figure out when they're going to turn off v4, there are a lot of drivers there.

If I were to take the consumers home as an example, the consumer will dictate how long they need v4 because they're going to get rid of some of their devices when they get rid of those devices. Some people tend to hold on to things for a really long time.

JACQUES LATOUR: I got the date, 4/4/2024. But from another price point of view, there's definitely a cost of running dual stack on everything. You need to have security policies for v4 and for v6. You need to have different configs for v4 and v6. So there is an additional cost. Over time, I think v4 is going to disappear like Owen said.

PAUL ANDERSEN: Question over there?

BILL SANFORD: Yeah I have a question. It's Bill Sanford TeleNet Communications. I have a question for the gentleman from Rogers.

We heard you speak earlier about Rogers' deployment into IPv6 which is good to see from one of Canada's largest cable carriers.

What can you tell us or update us on what progress, if any, has been made on the deployment of v6 on the mandated TPIA framework?

MALE: That's a good question. One of the things we have in Canada that doesn't necessarily exist in other places, and I'll quote the US as a market that is important to us because we purchase very similar equipment, we have very similar vendors, as other places in the world as well.

We have to do additional things in Canada that are not indicative of what our US counterparts have to do in terms of supporting certain features and functions on the same equipment.

Which meant that although we've gone to the same vendors years ago and set up a plan to be able to have certain features available for the timelines that match the rollout of v6, that's cue to a certain preference and it shows up on their builds at certain times.

It takes a while for them to build those. We've had to wait a little longer to be able to support those third part environments because of the additional things we have to ask for from the same equipment.

And v6, this kind of goes to the challenge of v6, is asking a vendor to support v6 on a platform is not just about can you please turn on this additional knob. It's reinventing or recoding a lot of functions and features on the platform.

What we've noticed, without outing specific examples, what we've noticed is they'll turn a few things on and a few things were missed. You have to go back to the next code rep and get that put in. so it was just an experience for the vendors.

They learned to code what was effectively a whole new set, they had to go back to all their features and get them all working. So like I said, the large challenge we had was effectively ask for something that the rest of the markets weren't asking for to support functions that we require in Canada to be able to support TPAs.

[background conversation]

PAUL ANDERSEN: So the question is, because there wasn't a mic for the remote, is there a timeline on that?

ED JUSKEVICIUS: Yeah, so those timelines are being communicated to the TPAs to the business folks at Rogers. So that's not my communication path, but those timelines are developed and they're being communicated directly to the TPAs.

PAUL ANDERSEN: So I'd like to pick up a bit on that on the concept of maybe go down the table to Jacques and Nima on. What kind of issues are you seeing with vendors?

We've also heard the classic thing; the ISPs say that the users aren't asking for it. The vendors say the ISPs and the companies aren't asking for it. What kind of challenges are you seeing in terms of vendor hardware to fall on?

JACQUES LATOUR: So, the first time we did IPv6, we decided to do a permanent implementation of that. So we did a sort of an analysis of all the equipment we had. It turned out that the low balance servers that we had from Cisco didn't support the IPv6. So we had to replace that.

Then we had to bring a bunch of subsequence we bought equipment from Cisco again, which is a switch, a fairly recent switch. It has the IPv6 logo on it, just like on that laptop we support. But the only thing you can do on the switch is bring the port that went forward IPv6 traffic.

Stuff like that is still happening when you don't expect it to happen. It's challenging for us because we're pretty IPv6 aware. Then, we need to have a better way of having IPv6 compliance. That's our perception.

PAUL ANDERSEN: Nima?

NIMA SALEHI: One of the main challenges is that we do not see yet the features and functions compared to the different IPv4 and IPv6. Other than a simple packet transfer, the required features such as QOS and fancy route and portal features, they are not yet provided on IPv6 protocol as stocked by most of the vendors.

On the core side the situation is a little better and more in line with IPv6 adoption. But as we get closer to the edge and to the access, you would notice that there are many critical functions that are not yet provided.

If you go back to the vendor and ask for those features, they normally answer that we hear it's not really demanded by many service providers and telecoms. So that's number one challenge that we have around this topic.

MALE: Actually I have a follow up thought and I forgot to mention earlier on the TBA question. Is one of the points of guidance we have or we sent out, this is something that we've done internally is for the other challenges in the cable environment anyhow.

Like modem support for v6 and it has to be not all 2.0 modems actually support v6 services. And technically not even all 3.0 modems support v6 services believe it or not. Is being able to use things like 6RD onto the customer base in the internal modem, it's not the most optimal way.

Dual stack or native delivery of v6 is definitely a preference. Both us and any of the third parties are able to utilize 6RD as a technology which is being used by AT&T on cell for a lot of their DSL deployment.

It's definitely a workable technology. It definitely works in production. It can be used to at least extend v6 in the interim until native v6 is available.

PAUL ANDERSEN: So I'd like to move on a bit here and just start on another item you quite a bit which is, what's the business case? For a lot of ISPs and providers, their commercial businesses, they're always looking for a motivation on why they should even offer this service.

I guess the question you hear a lot is, is there a killer app for IPv6. Should the February 2011 IANA depletion be business case? I'd like to start with Owen since your organization has pretty much made an entire business case out of IPv6.

OWEN DELONG: So I think the biggest business case for IPv6 is staying in business. Two thirds of the world isn't on the Internet yet and they're going to come on IPv6 because there's no v4 to bring them on to.

We're running out of v4 addresses, guys. Forty percent of the world is essentially out of v4 addresses already and the other 60% isn't going to be that far behind at this point.

So, the Internet is moving to IPv6. The sooner we all embrace that reality and start making it happen the better off we're all going to be and the better it's going to be for everyone. If you want to continue having an Internet,

If you want to continue doing business on the Internet, it's going to have to be something that at least includes if not predominantly moves over to IP version 6.

Because it's the only way we can continue to scale the network and if we don't continue scaling the network, it isn't going to be as valuable as it is today even in five years.

PAUL ANDERSEN: Victor and Nima, what is the business case you guys have been building for what you can discuss? Are there revenue opportunities? Is there a killer app? We hear a lot about the growth of mobile, millions of phones coming online.

Your toaster will be plugged in. my thermostat is now plugged in. yet, we still don't see a lot of deployment. Is the "everything connected" going to be the motivator for this?

VICTOR KUARSINGH: I'll start off. I think both of those. Both the mobile environment and its growth are an important component, as well as the home eco-system. In both of those environments, when we look at the engineering challenges and the technology challenges of trying to make new things work in both of those environments utilizing v4, especially in the home eco-system.

It's becoming very difficult. We sit down and we figure out what do we actually have to do to make v4 work and how do we get management systems to talk to things behind this firewall, NAT box, etc.

And we think about it in the before space and it just seems a lot simpler to solve the problems in v6. Sorry I meant to say v6 there. So at some point we believe that these problems will just be so much simpler to solve in v6.

It'll push us away as the costs continue to increase for us to figure out how we make v4 work. And v4, we won't be able to extend it indefinitely, even under a care grade NAT phenomenon some folks believe that's an answer for a period of time.

But you can't extend that indefinitely. There're limits there. Both from the public side, in terms of the number of actors you have, but even the private side, there's not an infinite number of addresses you can use to assign before you get to a translator in your environment.

Then there are all kinds of very expensive things you have to do to segment your network if you want to continue to reuse address base. That becomes just a very large set of technological problems that at the end of the day just solve, just buy a little bit more time.

They just buy a little bit more time. It costs a lot of money, buy a little more time. So we definitely see the advantage of supporting v6 from that respect.

PAUL ANDERSEN: Nima?

NIMA SALEHI: I would say business continuity is the number one driver for IPv6, that option, at least one of the main ones, if not the number one. In fact the

growth in both homeland consumer market and mobile market that we see really demands well planned service provider environment, specifically in IP and connectivity.

IPv4 simply cannot be that answer or solution. For the very obvious fact that it's limited, it's almost gone. We should really not invest a lot of money or resources on retrofitting our network or working on carry grade NATs, things that are not going to be sustainable long term.

IPv6 is going to be an easier answer. The learning curve is going to be a little bit harder and probably is going to take time for everybody to understand all of the challenges we have in IPv6.

But in the long run, definitely IPv6 is going to be a simpler, more clear, and less costly way to go to answer the market demands in terms of number of devices, either at the mobile market or at the homeland, for the home users.

PAUL ANDERSEN: Maarten?

MAARTEN BOTTERMAN: If you consider what the response to the surveys say and please keep in mind that these are people interested in the RAR work, so it's likely technical.

They see that not having customers should become less of a threshold. At the same time what hasn't changed is to make a business case, the non-technical business decision makers. That continues to be a big threshold.

PAUL ANDERSEN: Ed, before you go for some questions, you already talked about the government mandating for their own services. But is there any other role that the government or governments should see in creating a business case? Is it time for the cash for clunker routers?

ED JUSKEVICIUS: I'm not sure that's going to happen in the current economic climate. Let me talk for a minute more though about why the government of Canada, part of the business case for adopting v6 for the government.

The government doesn't just provide services for Canadians within the borders of our country. We also have embassies and consulates in basically every country on the planet Earth, as do most other countries and governments.

We need to maintain connectivity and communications with all of those outposts everywhere else and we recognize with the depletion of the registries and ARIN now in Europe.

It will not be much longer, certainly not many more years before just having an ability to send and exchange data via IPv4 will not be reliable from Canada to other parts of the world.

And given that it takes a little while from once you decide you're going to adopt v6 to actually know what you're doing, to actually get it to work, and knowing how governments are sometimes best in class examples of how not to do things.

We have decided we need to start now to have this all up and running when we're absolutely going to need it. and that day is not going to be that much far into the future.

PAUL ANDERSEN: Okay, on that we'll open the floor to questions. Please come to the mic if you have a question. I believe we have some remote participation question or questions.

LEO VEGODA: It's a comment and the comment comes from Kevin Otte. He says, "Follow up to venders. Show them RFC 6540 and people aren't going to want their gear until they have feature parity. And RFC 6540, just for information, is IPv6 support required for all IP capable nodes."

PAUL ANDERSEN: Anyone? Nima, go ahead.

NIMA SALEHI: In fact those RFCs and technical requirements, they have been always around us and always on the table when we are negotiating with vendors. But again, it's a matter of timeline.

What vendor can do in a short period of time or near future to catch up or fill the gap between IPv6 and v4, which is very significant by the way? We can do some just very simple examples.

The management protocols, such as TelNet or many of the management functions, they have not even been considered by many of the vendors

in IPv6 so far. For the simple reason, the backend system is not even ready to accept those types of functionalities under network use.

So the RFCs are always there and have been there, but it's a matter of global demand and demand from service providers and users to drive the vendor to the right direction under the shortest timeline.

MALE: Yeah, I would tend to agree and I would say that one of the other things we can do as an operator, we have those RFCs and in fact that was one I, when it was in draft stages, commented on and helped progress. But the issue here is that we'll put in production.

We're going to take the equipment for a run. Things will break. We'll get the vendors to fix it. But there are a lot of things in all this equipment, a lot of things that were missed and we just have to actually put it in production. We have to actually take it for a run.

That is when we're going to find what needs to be fixed and how we're going to progress v6 in our environments. I think that these documents definitely are helpful in leading discussion with vendors.

But nothing is going to replace experience at this point in time. There's a time when you just have to move forward and get it out into the network.

MALE: So there are a couple of very interesting phenomenon here at work. First of all, when you say feature parity it sounds like a really great concept. I want v6 to do all the same things v4 did, simple right?

The problem is when you start looking at the devil in the details, feature parity means a different thing to every single ISP you ask. So the vendors are faced with all of these demands for v6 feature parity.

And of course over 30 years, 40 years of doing v4, they've developed quite a lot of very arcane and strange v4 features, many of them designed to work around the address shortage problem in v4. And they are not particularly relevant to IPv6.

So embarking on the road to feature parity becomes a very interesting and difficult to define concept from a vendor perspective. The other problem we're facing that's really kind of interesting is IPv4 started out as a lab experiment for a very limited audience.

It kind of escaped from the laboratory one day when someone invented the Web. We've been on this road to running out of addresses ever since.

Nobody really expected it to work in the early days. Sometimes it did and sometimes it didn't and we just sort of lived with that, and cajoled it and mutated it.

Eventually we got to where it's remarkably reliable in spite of itself which kind of amazes me every day that the Internet actually continues to work.

Because I know enough about the inner details of how it works to be amazed by the fact that it actually does, and yet in v6 we sort of expect it to all be fully developed and formed and functional and production grade on day one.

We somehow expect to be able to bypass this 30 years of experience that it took us to get v4 to the "mature" state it's in today and have v6 be there when we just start using it. I think that's kind of an unrealistic expectation.

I think that it's unfair to the vendors. It's unfair to ourselves to expect that we can just turn on this completely new protocol and have it be at the same stage as a 30 year mature protocol the day we turn it on. We need to accept that this is a protocol transition.

It's not the first protocol transition many of us have been through. Many of us went through the transition from Bangyen and Archnet and all these other strange things, and TechNet, to IP.

We went through the transition or from those things to Novelle and from Novelle to IP in some cases. So this is yet another protocol transition we're going to have to go through.

Frankly, it probably won't be the last. I don't expect that v6 will run out of addresses and force us to do another transition, but I do expect that some other problem will confront us that v6 will not handle well.

And we'll end up having to do another protocol transition probably in another ten, fifteen, twenty, or thirty years. I don't know when that will be or what that issue will be, but it's a network and it's evolving.

It's a living, breathing entity. It's not some static carefully engineered design sitting on a whiteboard somewhere that pops out perfect and fully formed when we actually call it done.

It's a living, breathing, organic entity run by a lot of different people in a lot of different circumstances with a lot of different goals. We need to accept that reality and just move forward.

PAUL ANDERSEN: Okay, speaking of moving forward so when we were just having the panel discussing topics that were brought up, we were kind of brainstorming. We got onto the promotion or the outreach of IPv6. And this ended up being one of the more controversial topics because strangely enough.

I encourage the audience to weigh in on this as well with their views, should my parents know what IPv6 is? Should somebody be explaining, like there was the digital television transition has been noted, there was large public outreach.

Who should be targeted with that kind of outreach and who should be doing that targeting? I'll start with my panel coming from down there and come over quickly. But I would encourage if anyone has some views on this to approach the mics, Nima?

NIMA SALEHI: There will be definitely a learning curve for consumer market, (Inaudible) for example. They need to be educated on IPv6 as an alternative way of reachability to the Internet for today and probably the most, or the only available means in the very near future.

That learning curve has to happen in terms of when they're purchasing equipment and also to kind of encourage them to adopt this new

technology. But I personally do not believe that there's going to be a forceful fashion that we can enforce the market to go to v6 by saying that we are going to cut off your v4 service next day.

That isn't going to happen in probably ten years or even more. But certainly service providers and all the other sectors, they can educate the customer.

JACQUES LATOUR: I'll answer your question very simply. My mom doesn't know about v4. So she wants Internet. She doesn't need to know about v6 either.

MALE: Yeah, my perspective on that is there's two ways, maybe there's more than that. But I looked at two basic ways of making this work. One was go and tell everyone that you really, go want this.

Go want this protocol. Go ask for it. Or the avenue to take is, make sure that they need it. There are work groups like one of our veterans down south, Shawn [Verzesky] with the CEA Working Group.

He's going off into the industry and helping vendors and the consumer electronics world build v6 into their products and make it just available so the consumer doesn't really have to ask for it per se.

We as an operator make it available to the end customer's connection. It becomes available within their home eco-system. The (inaudible) providers, gaming vendors, whoever they may be see it as it's out there, it's available, we can utilize it.

It's easier to work with. And just make it a natural progression that seems to me to be an easier way. I'm not sure if getting people to care about it is going to necessarily work.

It's not one of those shiny knobs or bells or whistles that they would tend to look for. And kind of along the sentiment over here, they didn't really know what v4 was in the first place and they probably don't care. I can't even get my wife to care about v4.

MALE: Open! So, the problem with that theory, yeah most of them don't know what v4 is. Most of them just want Internet and the reality is complete Internet today and forward includes v6 whether we like it or not.

It isn't complete Internet anymore without v6. There are an increasing number of things on the Internet that don't have v4 capability and that's going to continue to increase.

But the problem is that if I walk into random consumer electronic shop or random computer shop today and just buy a router off the shelf, I have a less than 50% chance of getting a router that will do v6.

So consumers need to be made aware of this fact and need to be made aware that if they purchase a router that doesn't have a v6 ready logo on it or some other indication that it actually has IPv6 capabilities, and ideally the IPv6 capabilities that they need in order to be compatible with their particular service provider's idea of how to implement v6.

Because there's unfortunately some variation there as well, they're buying equipment that might get obsoleted quite prematurely from

their perspective. So they're going to resent that and it's going to make the transition harder.

We owe it to the consumers and we owe it to ourselves to do the kind of educational outreach that's necessary to prevent that from happening in my opinion.

So I think it is actually important to start trying to educate the consumers on the choices that they need to make in order not to get stuck on the short end of this transition by making ill-informed purchasing decisions just because some of the vendors haven't gotten around to doing the right things yet.

MALE: Well the question was who is responsible for the promotion of IPv6. The government is in some way. There's European Action Plan on IPv6, promoted by European Commission in collaboration with the member states.

And I see their role mainly as raising awareness and lead by example. If government fulfills those two roles, it is very useful. Now they found collaboration with NCC because also their belief is by talking about it with people and making your own decisions, people will speed up and be prepared. This is true for all RARs I guess.

I think a good focus of ISPs in being ready for the IP transition, once the pressure is building up because more and more constants will be automatically available for everybody that is coming.

Now one question, in the survey to ISP was, do you consider promoting IPv6 to your customers? And 63% said yes and 27% said maybe so that means 90% thinks it's also their responsibility to inform their customers.

MALE: So I mentioned earlier that finally the Government of Canada has announced its timeline for adoption of IPv6 and just about nobody noticed.

So we to some extent could say we're trying to follow in the footsteps of what the European governments have done, lead by example, but if nobody's paying attention, how do you…?

You can lead the horse to water but how do you actually get him to take a drink of it. There's something missing right now in the system we have over here to get people to actually take an interest in v6.

I question what it is so if anyone out in the audience has some suggestions for what's missing or what, I'll give you the bottle and you rub it and the genie will pop up and you make three wishes. But what would you ask for or what would you suggest?

PAUL ANDERSEN: Right mic, what would you ask for?

CARY BROWN: Cary Brown, with CIRA but I'm speaking as a consumer. I recently set up a v6 tunnel at home and my wife immediately said, "What's wrong with Netflix? All of a sudden there are different movies on here."

And because they now think I'm in the US. She saw a benefit. As soon as she saw a benefit, she wanted to know more about v6.

PAUL ANDERSEN: Any other… are there any remote questions out here? I'll take it since he's typing furiously over there. Oh, we have a question left side.

EDUARDO: Hi. I'm Eduardo from Brazil. We are working right now with several kilometers there to try to push IPv6 on the market but the many of the operators there are thinking to using (inaudible) because as you told the customer wants to have access to the Internet.

I'm a part of the Brazilian ISPS association and we are trying to push IPv6 on the end. We found the same problem, the routers, the Wi-Fi equipment are not ready for IPv6.

This is the problem I believe everybody has found right now. So do you think the industry will have some enforcement to have this equipment ready? Of course we can go to the continent and have these in stock and everything.

But if you go to the end, then this is the problem. The back burner will be IPv6 and stocked and ready. The problem is the end. Just tell me what do you think in your region what you think should be better? We are not compliant about the carry grade NATs there. Thank you.

PAUL ANDERSEN: Nima?

NIMA SALEHI: It's good that you bring up the carry grade NAT here because one of the main drivers why we can encourage. Or one of the ways we can encourage the consumers to move toward v6 version of the sites or content would be quality of experience.

As soon as we start turning up carry grade NAT and they become a little bit congested, a customer would notice some difference in terms of latency and quality of the service.

But if there is the same content over IPv6, obviously it is a free way to the content. That customer experience at the end may encourage them to watch Netflix on IPv6 or Google on IPv6. That's number one.

Number two is that from the service provider perspective again the deployment of carry grade NAT and CGN could be a short term costly way, but we cannot sustain it in the long run.

At one point it's going to break and the (inaudible) or business case is going to be justified. It's that simple.

PAUL ANDERSEN: Thank you, next question?

[SESRJUS HIFAVICK]: Yeah, [Serjus Hifavick], Xellerant Corporation. I'll echo Jacques' comment that people don't really know a lot about IPv4 today and they don't really care about IPv6. That's on the consumers' level. However, depending where you are in the food chain, your responsibility differs.

If I'm a consumer, I care about IPv6 if I get some applications that I didn't have before. So it's really content, etc. if I'm a router manufacturer, I care when people start to ask for it. As a commercial company, they usually react pretty quickly when clients ask for it.

If I'm CIRA or I'm a government agency, I have to have it before they ask for it. Because when they ask for it and they find that they can't get it because CIRA didn't do it or the government didn't implement its plans, then they get a little upset and want to figure out why.

So the fact that you've made it available or made an announcement and nobody's listening, that's probably natural. But when they're ready for it, they're going to say why and when.

PAUL ANDERSEN: Thank you, next question or comment?

PAUL VIXIE: Paul Vixie ARIN Board of Trustees. So I was in France in February. There was a v6 meeting there. To me one of the most compelling presentations was from a guy who made a slide show out of all of the different IPv6 to IPv4 transition technologies which had been invented, proposed, deployed, whatever.

And after he got to the end of explaining what each one was, he made an impassioned plea. He said, "Please no more. Please do not invent any more transition technologies. We've now spent more time on transition technologies than we spent developing v6. We should just deploy it."

Everybody laughed, but ultimately our children inherit the world from us and they look at the way we were doing things and say that's nuts. They throw most of our stuff away and do things the way that makes sense to them.

We have the problem, we in the industry today, of an existing v4 network. I say we have that as a problem because it's in the way of v6. If we could just deploy a v6 native network and everything would still work and our customers would still get work done, we would do that and we'd be happy.

But we can't because there's an existing v4 network that those people have to talk to. But we're the only ones with that problem. History doesn't have that problem. V6 doesn't have that problem. We have that problem. I just want to urge, yeah carry grade NAD is going to happen.

And then it will blow over eventually all of this becomes native. Applications take advantage of it. We know what the future looks like. We don't know how we are going to get from here to there, but we certainly know what there looks like and we know that it's inevitable.

So just as argument about v4 policy address allocation policy at the RAR level makes less and less sense now that there isn't a lot of v4 left to give out. It is that arguing about which v6 transition technology is better is not even fun anymore. It's a waste of time.

PAUL ANDERSEN: Victor, do you think we're spending too much time arguing about which transition technology to use and we should just be adopting?

VICTOR KUARSINGH: Interesting question. Yeah, I think if you look at the IATF a lot of time has been spent on it. I think some of it was out of necessity, at least in the beginning. Probably in the last little while some people are incented to invent things and make things work.

From an operative standpoint I think that there's enough out there that we should be able to deploy something. There are a lot of technologies available. Start with deploying v6.

I think if you haven't done that already you should do so and find whichever way is most community possible to make v6 available to your customers.

That's what you should do. If you can get it out there natively, do it. If you can't, if you need to tunnel it for now, do so. But get it out there to the customer. Make it available to the customer.

Because I think that making it available to the customer will probably be one of the best contributors to demand. When people are using it, that drives demand. People will code against it.

People will make applications available for it. That will, to me that is the best way of promoting v6, just make it an actual part of the environment as soon as possible.

PAUL ANDERSEN: Nima, quickly.

NIMA SALEHI: I would definitely agree with Victor that the best way to promote this is to facilitate the service and provide the service. Once customers start using and noticing a difference, again back to that carrier NAT example, quality of experience.

It would definitely be a good chance for us to win this game and have deployment faster. On the other side the service provider can do some collaboration with the content provider.

A very small banner on Google, "Are you v6 ready?" can make a huge difference in customer awareness about this. So at one point I agree we really should have those kinds of collaborations with content providers to encourage the customers to walk the right direction.

PAUL ANDERSEN: And Owen, quickly.

OWEN DELONG: What Paul said, the transition technologies are mostly destructive. It's time to get on with v6, deploying native v6 where you can. Do what you have to when you have to to keep things running and provide services to your customers. But keep your eye on the prize.

The prize is getting to an all native, all v6 network and getting the croft that is v4 anymore, and the cost of maintaining it out of our way and move forward when we can.

PAUL ANDERSEN: Okay, we've almost come to an end. So, I'm just going to go down the table for one last final thought from each of our panelists starting from my right.

I'd ask if each panelist could give any final thoughts and ask them in an individual capacity when do they think at least that they'll see the majority of traffic; however you want to define that?

Be on IPv6. And for the Canadian companies, maybe comment on the general status of deployment in Canada. And maybe just a quick comment on where your specific organization is in its IPv6 development and its timelines, Ed.

ED JUSKEVICIUS: Well, in my spare time I've taken a look at some of the IPv4 and IPv6 delegation statistics that are published and updated daily by ARIN. Looking at organizations in Canada that have acquired blocks of v4 or v6 addresses, there are several thousand organizations that have v4.

We don't have that many ISPs so obviously some of these are large enterprises that run private networks. And as of last Friday, there were 248 organizations in Canada that had acquired one or more blocks of IPv6.

When I break that down and look at it, only 20 of those 248 are businesses whose core business is not either producing products for networks or providing Internet services or hosting a co-location.

So only 20 businesses out of the tens of thousands in this country, and out of the several thousand that still operate IPv4 private enterprise

networks have progressed far enough in their thinking to say, "Maybe it's time for us to get a block of v6 and actually start planning how we'll deploy those addresses in our network and start implementing it."

So given everything I've heard today and other places recently, I wonder what our industry is actually waiting for. Like the time is now to get started folks, let's get on with it.

The government of Canada has published its timeline for adoption. It would be a sad thing if the government was actually the lead adopter of this new technology in this country if you ask me.

We need to do it but it can't be the government doing it for everybody else. Everybody has to get on board and let's go.

PAUL ANDERSEN: Maarten and quickly if possible.

MAARTEN BOTTERMAN: That was a very nice remark. Having looked at how IPv6 is picking up over the last four years in a consistent way, what we've seen is that the emphasis has been on deployment and really being ready to offer it to your customers to be able to get going as ISP or as major business that requires the network very much.

So the readiness has been growing quite steep I think over the way. This means that the threshold to where it's really starting with IPv6 is getting smaller and smaller all the time. It's getting easier, that's one thing.

The second thing I see is now after four years for the first time in the survey it shows there is real take up. Which I think means, if you have a maturity curve that is flat, flat, flat we're at the beginning phase of going up the curve.

And I wonder how quickly it can be, my personal expectation is that it can go quicker than you think. It can go rather steep rather quickly. I think next year if you do the survey we will have a much better idea of that, how quickly we're going to be how steep on that curve.

PAUL ANDERSEN: Owen brief comment?

OWEN DELONG: My final thought is if you're not deploying v6 within your organization, certainly I think that we've given you a lot of good reasons to change your mind about that and get moving on it.

If you have deployed IPv6 in your organization, follow the example that Hurricane has set. You've got it fully deployed, great. Help everybody else get there because we all need to get there together.

The Internet is no fun when you're playing by yourself. It's all about talking to other people. So we all need get on IPv6 together to make it really valuable.

That's the main lesson I hope everybody takes away from here today, that we all need to get moving on this. We all need to work together on getting everybody there. A rising tide lifts all boats.

PAUL ANDERSEN: And to my Canadian providers if they could give a brief comment and maybe just give a quick update on their deployment internally.

VICTOR KUARSINGH: Sure. I agree 100%. We need to get v6 out there. We've worked pretty hard over a number of years now. The project seems pretty old to me now. I've been working on it for a long time.

Obviously getting to the very end point of the customer addressing side, that's where there's some additional challenges, AXE network, etc. We already have six RD deployed in our network.

There's not a customer on the network who can't get six RD service today if they so choose to want it. It's manually configured today. Information is available off our v6 website.

We will get dual stack to our line customers as soon as possible. It's about a safe deployment of v6 at this point in time. The only thing worse than not giving v6 to a customer is giving them broken v6, so we'll make sure that it's not broken when they get it.

Then moving on to the wireless network is the next big large hurdle. From there it was about devices and device support. We've seen a lot of good programs that last a while. A lot of the southern partners and other places in the world have worked hard.

A lot of devices are now showing up with v6 actually enabled in an actual interface. That will go a long way to actually having a real v6 deployment in the wireless side to help move things along on that side.

PAUL ANDERSEN: Thank you. Jacques?

JACQUES LATOUR: Okay, so I kind of with all the discussion I join in (inaudible), so with three billion people coming online I see IPv6 like a big train with a small light. It's closer than you think and it's coming fast.

So we have to make it happen. There's no question about it. Just another thought is that today the ICANN we service supplied the Internet for this. It's v4 and v6 so you can test it. It works.

PAUL ANDERSEN: And Nima, sorry, Nima the final word.

NIMA SALEHI: Yep, tell us we really take IPv6 serious is not; well it was not an option for us. It was a must. It wasn't something nice to have. We have taken this very seriously.

And if I want to share my organization experience with you, users could execute IPv6 day, or launch day, for bringing up your company up to speed and try to fastly take the deployment by using these excuses.

It's going to only give you a good timeline to follow but as well will give you good operational experience which you cannot just gain it by planning it on the paper.

We have a couple of showcases of our readiness and this year we have provided IPv6 connectivity to ARIN conference, IATF conference, and NANO conference in Vancouver. That's our business map portfolio.

On the consumer market we are targeting, or we are working, on a plan for 2013-14 to go out on IPv6. On the wireless site we have seen a lot of progress on the handsets that they are providing IPv6 feature and we're definitely willing to use those features to provide more native and better quality of service to our customers.

PAUL ANDERSEN: Okay, we're over time here, my apologies for that. A quick note, the item that was supposed to be in this room after the multi-stakeholder discussion, Legacy Internet Protocol Numbers and Current Policy Environment, that's now happening in the Harbor AB room.

Another quick plug, we'd love to continue the conversation. I invite you to the Gala tonight at the CN Tower which is hosted by CIRA the host. I'd just ask if you could all give my panelists a thank you for a great thing. Thank you very much. Thank you everyone.

[End of Transcript]