me inIGF 2010
VILNIUS, LITHUANIA
13 SEPTEMBER 10
SESSION 17
1415
MANAGING THE NETWORK

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Note: The following is the output of the real-time captioning taken during Fifth Meeting of the IGF, in Vilnius subsequently treated to a language edit.
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VLADIMIR RADUNOVIC: Good afternoon, everyone. Welcome to the workshop on *Managing the Network*, as the title says in the programme. Basically, this workshop came about as a result of a continuous cooperation between the DiploFoundation and technology policies and discussions about network neutrality. There is a lot of debate about what it [network neutrality] means, what it stands for. Is it the right term? We will try not to focus on the term this time but rather on what it means to all of us and what might be some of the aspects involved.

The background to this discussion, when it comes to the IGF, starts in 2008 in Hyderabad, when we did the first joint session. We did the next one last year in Sharm El Sheikh. The results of this debate ...or at least what we had in Sharm El Sheikh... or rather the conclusion we could make, was the understanding that some people might think open Internet and openness are better than net neutrality. Besides that, we did agree on certain things, I believe.

We did agree that not all packages on the network can be equally effective, simply because – I'll use one of the analogies our colleague, Ginger, uses – when you send an email, it can be delayed for five seconds or five milliseconds, and you won't really notice. If you have a video that you stream in real-time and you have a delay, then.... you.... will.... have.... some....kind..... of.....cuts. And that's something we cannot stand when we have videos, right? And the traffic has been managed.

To come to some quality of service, to fight with congestion and latency (which we will hear later on), the concerns, however, of most of the users in civil society is what happens when the operators decide to prioritise a package and manage the traffic based on business needs, and in that sense, give priority to certain partner companies and give less priority, slow down the traffic, or even ban the traffic of someone else. And ultimately, the concerns are about freedom of choice. We have discussed a number of principles that most of the experts, business, civil society, and regulators could agree upon, which mention transparency as the first one, and non-discrimination as to the origin, the type of application, and so on. We'll mention some of them also today.

What has happened since 2009 to date? (While we are repeating this session, we are not going to repeat the same things we agreed last year.) In the meantime, we have had network neutrality or kind of a policy framework suggested by Google and Verizon jointly. And it caused some confusion within the user groups because those two, Google and Verizon, have been perceived as being on different sides. And [today] we have, fortunately, both Google and Verizon here with us. Of course, this is, to some extent, a US aspect of the debate. However, this policy framework outlined not only the principles that have been discussed previously even with Norwegian guidelines, but also suggested some of the differences when it comes to managing the network, such as advanced services and managed services on the Internet, the mobile Internet as a different entity from the fixed one, etc. Then they suggest the role of the regulator and the way to solve potential problems. We'll use this policy framework as a kind of support for this panel today. I will certainly try to emphasise what impact of this debate has on developing all of this as well; we know that the next billion users will mostly connect to wireless connections. And we'll also try to bring a little bit of perspective from Europe and beyond.

Now, what is the format of the session? We have several speakers; as you can see we have quite a long list of very distinguished speakers, and we could hardly go all around. But the speakers are not just here [on the panel]. They are also over there [in the audience]. And we are sure that you are as distinguished as those sitting here. So the idea is that they [the panel] will have an open discussion without statements, without long

presentations, jumping in here, jumping in there. Whenever you feel like it, raise your hands and jump in.

Now, before I give the floor to our panellists, I'll give an example of managing the network within managing this workshop, and that's what we mentioned this morning. Obviously, the debate is huge. All of us have something to say. And if this debate is not managed, then it might be a problem because we would all be speaking at the same time. So the workshop has to be managed. Now, the question is should I, as the moderator, give them [the panellists] priority? Or should I not? And probably that's going to depend on you and on them.

Now, let me just briefly go through the list of the formal panellists because I don't know all of you, so sorry if I don't mention some of you. We have **Vint Cerf,** Vice President and Chief Manager of Google. We have **Alan Davidson** of America's Google. We have **Robert Guerra** from Freedom House. We were supposed to have our friend from Gambia as a representative from a developing country. Unfortunately, he had a heart attack. He is okay, but he didn't come to the IGF. Luckily, we do have a lot of people, friends, from the developing world, so I hope you'll help us with this discussion. We have **Jake Jennings**, Executive Director, Internal External Regulatory Affairs, AT&T. We have **Jens Koch**, Assistant Director, Norwegian Telecommunication Authority. (You have to raise your hands [so that the audience will know you].) We have **Jovan Kurbalija**, Director of DiploFoundation. **Marc LeBourges**, Head of European Economic Regulation. **Garland McCoy**, founder of Technology Policy Institute, is somewhere behind over there, and he is to a large extent responsible for making this panel available. **Robert Pepper**, Vice President Global Technology, Cisco. **Jacquelynn Ruff,** Vice President International Regulatory of Verizon. **Lynn St Amour,** President and CEO of ISOC. **Christoph Steck**, Policy Director at Telefonica. And **Scott Wallsten,** Vice President for Research Technology Policies.
Now, with this long -- sorry, **Jeremy Malcolm**. I forgot about you. Should I represent you as IG focus or Consumers International? Consumers International? Okay.

So as you can see, the number of panellists and the diversity of stakeholders is big. Now, as I said, we are not going to start with statements but rather some questions. Last year we were discussing the need to manage the network. And we said, there are certain needs when it comes to congestion. What has changed from last year, and why has it been suggested that wireless should be treated differently? I will ask **Robert Pepper** from Cisco to give us a little bit of a technical explanation as to why this is needed. Robert.

ROBERT PEPPER: Thank you. I think what Vint was referring to in terms of managing networks is the ambient noise in the room.

VINT CERF: That would be you, Rob. I'm sorry.

ROBERT PEPPER: I'm just ambient. Very briefly, in terms of the technical requirements for managing networks. Of course, networks have always been managed. The question is how. As a matter of fact, one of the things we know is that networks have multiple characteristics. And if you think about it as networks not in an abstract form but as networks fit for purpose; networks that will actually support the demands of users and also the content of providers and also support different kinds of applications. Different kinds of applications have different characteristics that require different characteristics of networks.

The one example that we've already had is the difference between e-mail and streaming video, but a more relevant one is email and voice over IP, both very low speed requirements. One is one-way essentially: e-mail. It's insensitive to latency and jitter. Whereas, of course, a 64-kilobit voice over IP communication requires not only 64 kilobits, but it requires it be symmetric, 64 kilobits, low latency, low jitter. Otherwise, your voice over IP communications won't work.

So in some respects, sort of top line, you can say it's a 64-kilobit service, but it's very, very different. So you have different kinds and types of applications, and you have different kinds of network architectures. The ability of fibre to premises to what they call a 'midpoint split' so that you have multi-megabit – 100 megabit symmetric in each direction –I'm fortunate that I have fibre to the home from Jackie's company in Washington, so I now have a 15-megabit down, I think it's 8 megabit up, not quite symmetric, but it can do a lot of things and it has very low latency characteristics. That's very different than, for example, a DSL network, and it's an ADSL, asymmetric network, so the ability to do upstream versus downstream is difficult. The traditional cable TV

network is very constrained in terms of up versus download. The DOCSIS 3.0 technologies that are being employed by companies are essentially overcoming most but not all the disparity in symmetry between upstream and downstream. There are these different characteristics and needs of different kinds of applications. There are the different characteristics and architectures of different types of network.

So in the wireless world, there are even more constraints because depending upon where the wireless networks are being built, which generation of wireless technology we're talking about – and especially in emerging markets, emerging economies, most of the wireless networks have undergone a fabulous revolution in the extension of mobile voice to now approaching 5 billion people, that's really been optimised for narrowband voice. That's still GSM. It's not even 3G. They have huge limitations in terms of the ability to carry data...barely being able to; texting is about as good as it gets.

Once you move into 3G networks, the 3G networks, the networks are still optimised for voice even though they can do higher-speed data. But depending upon the wireless network – I like to joke that if you want broadband wireless, you actually need broadband – if you want broadband, you need broadbands, and in a lot of countries, the way the spectrum has been allocated and licensed, it's still sliced and diced. So you have constraints on the ability to actually provide true broadband, even over a 3G network. It's not going to be until you get to LTE or WiMax with 4G networks that are essentially flat IP technology networks that you're going to be able to scale in ways you can begin to approximate fixed wireless. In addition, there are constraints on the radio links, so that depending upon how many antennae and how it's sectorised, how many cells there are, there are constraints on the throughput for high-speed data.

And that's important, given the need for investment to upgrade networks. People talk about mobile networks. I don't know what that means. In my mind, with one minor exception with satellites, there is no such thing as a mobile network. The network is not mobile. I am. My device is. The network is fixed. And if you think about it, that's why the trend in the wireless networks is to take the traffic, especially data traffic, off the wireless network as rapidly as possible and put it into the fixed network. Femtocell – the ability to use a hybrid network that's a complementarity of the network or the high-speed network with the wireless radio access and get it into the fixed network quickly.

If you think about it, if you are working in your traditional mobile network, it might have – in this part of the world, they call them E1s. In the USA, it's a T1, a 1.5-megabit line going to the tower and the antenna, to the base station. If I am going to have a wireless broadband that's going to be supporting multi-megabit symmetric or even just multi-megabit asymmetric for each customer, each user on that network can't be supported by a 1.5-megabit backhaul. So eventually, it's going to need fibre to every tour. That's another important point that's a constraint on some of the wireless technologies.

Last thing, let me just make a point about some data that we've collected. As part of what we call our 'visual networking index', which tracks traffic and traffic projections over the Internet and over broadband networks globally and then regionally, we look at data that's actually in networks. This is real data. These are not, you know, approximations. But what we then do is, based upon the types of traffic, is to make five-year projections. So we've looked at and recently released data, looking at 2009 data with projections out to 2014. And on the global traffic, what we're seeing is a compounded annual growth rate of 34%, compounded annual growth rate on networks growing by a factor of 4.3 between 2009 and 2014. In North America, the compounded annual growth rate is only 30%, but when you take a look, for example, at this region, sort of central eastern Europe, it's a growth rate of 38%. Asia Pacific is 35%. And in Latin America, there's a compounded annual growth rate in the network on traffic of 51%. That's global and mostly fixed.

If you look at the wireless networks, it's much more dramatic. Globally, what we see is 108% compounded annual growth rate of data traffic across wireless networks. That means that between 2009 and 2014, the traffic on wireless networks is going to grow by 39 times. In central eastern Europe, it's a 114% compounded annual growth rate. Asia PAC, 116%. Latin America, 111%. Europe, 106%. North America, 100%. What we are seeing is that it's also being driven by video.

In North America, for example, we project that 66% of the wireless broadband traffic by 2014 will be video. Completely different than the characteristics we have today. And in fact, the traffic on wireless networks is growing more than three times the traffic, the growth rate, on the fixed networks. So (1) demand is growing and

growing dramatically and in some ways not unpredicted from just a few years ago. Services are still growing. We don't actually know what all the applications are going to be. There's huge uncertainty about what the applications will be and what the business models will be for those applications. In fact, all you have to do is to take a look at how the android phone has completely, you know, upset what people's projections were from a year ago, where it was going to be the iPhone that was going to dominate all the new applications; now we see Android phones surpassing iPhones and share of market for smart phones.

So those are growing, and in my mind, it's too early to make sufficient certain predictions about what the future is going to be to say that we know what types of network management are going to be needed a year from now, let alone five years from now.

VLADIMIR RADUNOVIC: Thank you. I'll play devil's advocate, as I suggested earlier. You suggested that the need for management in wireless networks, mobile networks, hopefully we will see around the world. This is not the case in terms of developing countries. I recently had a chance to visit the Pacific Islands. They are paying like $60 for a 52-kilobits connection. The satellite ones. So I can understand this one. Now I have the question for the providers. If we need technical management – which is a greater need than wireless networks – does it mean that we need different business models as well? Does it mean that we need to introduce different ways of managed traffic in a business sense for commercial purposes? Or is it just on a technical level?

JAKE JENNINGS: It's always nice sitting next to Vint Cerf, one of the fathers of the Internet. And Mr Bob Kahn is with us. I think you make a good point, and in fact, I think you are already seeing business models change as a result of the growth on the wireless market. For example, AT&T announced recently that we are going to move away from flat rate pricing for the mobile network. I think another thing is ventnos cells. We have seen 4000–5000% growth in data usage in our wireless network in the United States – 4000–5000% – which requires many things. One is additional backhaul capacity, moving off of T1s in the USA to fibre. Another is opening up spectrum channels where we have spectrum.

I think you also have to look at the technical side and that wireless is different because there is much more scarcity in terms of the amount of frequency spectrum you can have, whether it's by government requirement or what the carrier is able to purchase, if there are auctions available.

The usage and technical differences exist as well. For example, with a cell tower, you could have one user, and that one user could be five, ten metres away from the tower. That user would get much more significant throughput than if, say, there were a million users on that same tower 150 kilometres away. Those types of technical characteristics are important to understand, and operators, in our view, in order to meet customer expectations, because I think you also need to look at the picture in totality. There are what I would call 'supply issues', whether it's the network or technical requirements... and then there's demands. What are the customer's expectations?

As was mentioned, a voice call would have different expectations from a customer than a YouTube video. Buffering real-time video. And the other difference is as you said, frequency. There are other wireless technologies out there, some. ZigBee is a new technology that's come out that is similar to wifi except it has hard-coded encryption available. That's a technology that a lot of companies like ourselves at AT&T are deploying for medical uses, in-home telehealth, telemedicine. We believe that those types of characteristics – again, customer expectations – may be different than, say, a normal voice.

I think we're also going to see a paradigm shift as we move from 3G to 4G, and in AT&T's case, that's LTD. Because you are going to go from a cell call, a voice call, that's going to be using the wireless frequency, more like a circuit switch, dedicated channel, to a digital channel that's going to be also competing with video download or an app if a customer is using it, and the customer's expectation is that when they make a 4G phone call, that phone call has to work. And what they're used to from the fixed network is a 99.99% reliability in throughput.

VINT CERF: So I am going to jump in for just a second. I like your point about the non-licensed frequencies. I agree that there are others. ZigBee is actually turning into – it's 802.15.4 – it's transforming itself into something called 6LoWPAN. There are applications of that particular design in the smart grid programme, for

example, in addition to the ones he mentioned. So I wanted to suggest to you that given the scarcity of available license frequencies that we may actually see an interesting counter-evolution where the unlicensed broadband access, wireless access, together with broadband dedicated access going to people's homes and offices and businesses, may pick up some of the demand. So when you have these multifuncting mobile devices that can do wireless wifi as well as 3G or 4G or LTE, you may find that when you're in a convenient location, you move over to the wireless non-licensed broadband access as an alternative.

In terms of network management, there is no doubt every net has to be managed. Everyone agrees with that, I hope. The question that comes up is what kind of management is needed. Depending on the network, you may see different needs arise. What's interesting about the Internet environment is when you try to string a whole bunch of different networks together, there isn't a uniform functionality, and you end up trying to create that which will work across all of them.

And the phrase that best describes that is 'best effort', and I guess one thing I would like to point out when people raise questions about quality of service and jitter control and everything else is that a very substantial amount of voice over IP is running quite successfully through Skype, Google Voice, and others on the open public Internet. And although one might argue that it isn't as perfect as the dedicated telephone networks, I would argue that it's often as good as or better than the mobile telephone networks in terms of quality.
I'll let it go from there. I'm sure we'll have lots of other opportunities to interact.

JAKE JENNINGS: We'll just politely disagree.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: Okay. That's all right.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: No, because I think from at least my own personal experience, where I have a – I won't say the manufacturer's name – but a VoIP service at my home with broadband, and there are cases where there is insufficient upload speed while I'm downloading my email working at home to, in fact, have 99.99%. In fact, you may have 50%. So there are some technical characteristics. But I do like your point that there is network management occurring, and in fact, the consumers – I think everyone here who has a smart phone is managing their network on selecting do I choose the IGF wifi signal? Do I select my 2G or 3G signal in order to make that throughput and meet those expectations?

VLADIMIR RADUNOVIC: Bob wanted to add something.

BOB KAHN: I think it would really simplify things for everybody to have some concrete examples why you would need to manage a wireless net different from a wire line network or a fibre net. And we've had some examples where you kind of had to work around them to get at the problem. Let me hypothesise one. It's not a problem I have, so people may want to tell me that it's absolutely irrelevant, but the basic concern about wireless that doesn't exist on a fibre net is the amount of spectrum or bandwidth you have to work with. If the wireless spectrum was efficient and able to operate within an unlimited amount of spectrum, I would argue there isn't much difference between that and the regular network. But with limited bandwidth – and it's actually very costly to buy – there are fundamental limitations, and a person who is trying to operate a wireless net, wants to do the best job they can in both supporting the customers and also maximising their return on investment.
So here's a specific example. A customer wants to send voice over a wireless net, and they choose to do it with, I don't know, 64-kilobit PCM, or maybe they want to do sound quality at a megabit per second. And somebody else has coded their stuff down to 2 kilobit per second LPC coding or something better. Who is it that gets to decide how to use the spectrum of the network?

Well, if you are in a flat environment where, you know, you are just charging the customers by data and you have unlimited spectrum, then money will win out. They can do whatever they want. Just pay for the bandwidth. Without that, somebody's going to have to decide, hey, wait a minute, maybe it's not okay to send megabit per second for voice when you could send it at 64 kilobits. Or it's not okay to send it at 64 when everybody else is sending it at 2.

So I think that's an example of a concrete [situation] and I can give you cases where the bandwidth differentials for voice are really significant, like factors of ten or more. Who gets to decide that? I think that's a valid kind of

issue. I think if the discussion about fibre wireless, for example, or other high-band were given choices that users or carriers have to make, it would really simplify the discussion better.

VLADIMIR RADUNOVIC: Pablo wanted to add something. Thank you.

PABLO MOLINA: Thank you. I think you made a very good point, Bob. If we are going to look at this issue from a serious perspective, we have to look at it in a very comprehensive way. So let me give you a couple of examples. Before this session, I used my mobile phone on the IGF mobile network with Skype to call my sister in Spain on a mobile phone. I had to wish her a happy birthday. So there we are combining the wired and wireless Internet. For example, tonight I will talk at 12:40 a.m. to my students at Georgetown using Cisco WebEx from the hotel room on wired connection, and some of the students will be listening on wireless. So unless we have a comprehensive view of traffic management for all these technologies coming together, we will hardly be able to succeed in having a comprehensive network.

VLADIMIR RADUNOVIC: Another question from the audience.

SALANIETA TAMANIKAIWAIMARO: Hi. I am from Fiji Islands. In terms of wireless versus wired, I would say at the end of the day, technology needs ... I like what Jake said. Take for instance in Fiji, because we're not like the United States, where it's just land. We are 300 islands spread across the sea. So of course, the customers' demands in our geographical makeup would largely determine the deployment of technology. But in terms of the argument between wireless and wired, because it's dependent on geography, each jurisdiction has to choose in terms of arguments; streams and spectrum would differ because we have different geographical contentions. But at the end of the day, if we go back to the fundamental question, the fundamental issue, who is it for, and why are we building technology and what sort of services do we want to provide?

If it's for people, I suppose our approach to network architecture -- and the gentleman from Cisco alluded to how you have different network architectures. And the issue is: how do you manage the differing network architectures? I'm not a technical person, so I don't know much about the technical details, but from a consumer point of view, at the end of the day, as a consumer, I would want to know if my capacity to use the Internet freely, accessibly, whether I'm on a remote island in the back of nowhere, whether I am in an arid desert, or whether I am in suburban or metropolitan place where traffic is dense and there's severe constraints on spectrum. At the end of the day, it's how does it serve me as a consumer.

VLADIMIR RADUNOVIC: Thank you. One of the questions or one of the dilemmas that we discussed this morning – and Mark noted – basically, France Telecom sees two types of networks, one that can easily be suggested, right, which is especially in the developing world and probably wireless, and the other one which maybe is not that congested, so a technical view for management is different. But regardless of the management as such, there are these intentions of the Telecom operators, as I mentioned earlier, to also introduce managed services which are business driven. Now, Mark, can you just reflect on behalf of France Telecom and give us a European perspective?

MARC LEBOURGES: In terms of traffic network management, I think there are two different [issues]: one is the dichotomy between managed services and Internet access, which is current, and the other one is the traffic management within the Internet access, which is the second point. At France Telecom, we provide both Internet services and managed services. What I call 'managed services' are services for which we manage the service layer as a network operator. Telephone, IPTV, and professional telephone are managed services, and we may think in the future 3D TV will be a managed service. Only for the managed services can the network operator guarantee the quality of service, and managing the application layer allows us to optimise network operations in the function of the service.

For instance, mass mobile voice has been provided because we were able to completely optimise the technical chain down to the transmission radio link. For instance too, IPTV can be offered on a large scale because we can manage multicast routing. And professional customers give high value to data service and to professional service because we guarantee and we manage security, quality, and reliability.

So what is the effect on this managed services on Internet access itself? The history and also the observations show that it is positive. There is a positive declaration of managed services and Internet access. Internet has always shared its infrastructure first of all with [?] and then with academics. Now as regards sharing the infrastructure with the commercial service, the managed services of the operator...just a few examples. Managed services are being sent for network operators. Capacity research: Internet, fibre, wireless, but all these improvements of the infrastructure have improved the capacity available for Internet access. The price level: Internet price is affordable because a large proportion of the cost of infrastructure is covered by the revenue of managed services. Also, there have been a lot of people who have started to practice to use the Internet in the home because of the appeal of triple play offers; people interested in TV and telephone, they bought triple play and they started to use Internet. So the view that managed services is taking away from Internet access is superficial. Generally they go one to the other in history. Without managed services of operators, Internet access would never have been available to the general public.

Now, if we move to traffic management within Internet access. It is true that the situation is very different, whether there is enough capacity. In that case, traffic management is just a way to optimise the service of which one; or if there is not enough capacity... because if there is not enough capacity, in any case, some traffic will not be served, which means that the first policy objective should be to be in a system where there is an efficient match between sufficient capacity and the traffic. This should be the priority. And in a system where the price to use Internet access is de facto zero. While the marginal cost is not zero, you are sure that the demand will not exceed the capacity. And so you will be in a bad situation.

And what is said is you just have to increase the capacity, it usually will not solve the problem. Why? Because the Internet is designed to occupy all the space which is available. Therefore, if you increase the capacity, you will increase the demand because there are people who are very skilled to occupy bandwidth, and they will occupy the bandwidth you offer. If you do not introduce a price signal covering something like the margin of cost, you will not have the correct match, and you will have a problem. So the priority is to introduce in the current system a price signal to balance the demand and the capacity. If you do not have it, you will have a shortage of capacity; and this shortage of capacity, of course it is better to be managed than not to be managed because if it is not managed, de facto the location will go to the one who is better skilled at occupying overcapacity, and people who are not technicians and really need to use Internet in their daily life will not be able to use it correctly. Therefore, it is necessary when there is shortage to offer -- and it is necessary to have price signal to prevent shortage. Thank you.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: [????] when capacity is increased sufficiently. So I think that's just something to keep in the back of your mind.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: Then building on that, one of the big questions in the sort of policy debates about this is – which also is related to the discussion of managed services, and then the best efforts – which is the best efforts in that keep getting better. So far, the answer is yes. And the fact that the best efforts Internet is so far better today than even we thought it could be five years ago actually has created the entry of new services. So it's that dynamic. The question is how can you have best efforts – it's not slowing down. It's only getting better. It's going to continue to get better, attract investment in new services and applications that we never thought about, and then at the same time, in parallel, allow for ... there's a managed services within the public space, and then there are always separate [???]; within enterprise, there's always been virtual private networks and separate things, which I don't think that's what we're talking about, and to some extent actually, it's a separate thing. Then maybe you think differently. But VPNs have other characteristics as well.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: Well, just to make the point on VPNs, it's certainly true that many of them are built on private facilities that are paid for exclusively by the consumer of that virtual private network, but many times access to that virtual private network is achieved through the public network by way of encryption internally. So in some ways, the public net still has... often has a relationship to an otherwise privately implemented relationship.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: Yeah, and when I get on my VPN here at IGF, I'm

tunnelling through the, you know, wifi access point. So yeah, they work in complementary ways.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: It's true the limits in terms of applications is moving in time. It may go one way or the other. For instance, voice, for a very long time, needed dedicated capacity and signalling. And in fixed network, now it's available, with some exception. In mobile network, it starts to be available. The capacity is completely fixed. The video has stopped. Now there are videos on the Web. Now there are sites on the Web, which may in the future, if they are generalised, be managed in a more marginal way. But it has to be flexible. The two categories – I do not think the one category will swallow the other.

VLADIMIR RADUNOVIC: We had some questions from remote participants. Ginger?

GINGER PAQUE (remote moderator): We do have a question, and as a matter of fact, you can see it on the screen if you like. The CT, the Caribbean Telecommunications Union has a remote hub in Port of Spain, Trinidad, and Tobago. Nigel Cassimire from that hub has asked or commented that it was mentioned AT&T was considering moving away from flat rate pricing on the mobile network. Do they expect this to lead an industry trend, and would this conceivably extend to Internet access pricing?

JAKE JENNINGS: Well, obviously, you know, because of legal requirements, anticompetition law or antitrust, we do not conclude or try to direct where the industry is going to go. We made a business decision for AT&T. We looked at our usage patterns of some of our mobile customers, and it was … you know, you had situations where some customers were making up a significant portion of the total usage. So when we moved to this usage-based pricing, it's data, and most of the data on our network for consumers is, in fact, for Internet access. But that's not when we're pricing our access differently, but rather, it's the data that is being downloaded that is being priced.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: Actually, I thought it might be useful just to step back a little bit from this conversation. Although I would say on that wireless point that was interesting, our regulator, the Federal Communications Commission, recently came out with a position where it said we have a lot of agreement on what should be done around these issues that we're going to label net neutrality or open Internet. But it wanted further information on a couple issues which are more complex. One is wireless and should it have a different treatment. And the other is managed services and how should we think about those. And on wireless, they actually said that a movement towards different pricing packages that were associated with the volume of usage and more closely track that might actually be a positive or interesting development in the sense that doing something like that might mean there was less of a need to have a sort of regulatory oversight because the market and the usage might actually respond to the scarcity of spectrums. I thought that was just an interesting point to put out there.

The other more general point that I wanted to make is we didn't really set this out at the beginning, but I think we all share certain values here, and what we're trying to do is find the right balance as industry, as policymakers and so on, to achieve those values. Vlada, in a way, you referred to them. So we want openness from the user, the consumer perspective, and choice. We also want to expand the broadband available and have all the investment, and that's really clear and has been a theme here for five years. And we want innovation.

And I think there is, at least from the perspective of an operator that is doing that investment and is seeing a lot of innovation by ourselves and by others, when we've been in a situation where there have not been rules, there have not been regulations in this area, we have to think about whether introducing regulation that is may not be necessary, may not be justified, will actually, in some way, restrict the investment in the innovation. And we want all three of those things from the point of view of I think a robust, open Internet.

And I just say that, for example, when we look at wireless, that's more competitive. There's a lot more competition. We have FCC things, maybe some pricing schemes might be also ways to ensure that as consumers you have that choice and you can have openness on the Internet. I just want to pick up a little on the policies on the Internet rather than the technology.

VLADIMIR RADUNOVIC: From the audience, then we get back.

AUDIENCE MEMBER (2): I would just like to ask the question whether or not this is only a question of capacity or if it is also a question of transparency, unfair business practices. I won't say where I'm from, but I know there is a network operator that blocks the VoIP traffic because it also offers voice services, and it sees that as cutting into its profits. So the question is, is this debate only a question of capacity, or is it also a question of transparency?

And the second question is -- well, it's tied in. You've heard statistics on the growth in Internet users, but what about the network usage? Is there evidence to suggest that the network is being maxed out, so to speak, with this exponential growth in users, or is the network holding up?

VLADIMIR RADUNOVIC: Thank you. Scott, do you want to --

SCOTT WALLSTEN: Moving to the economic...

SCOTT WALLSTEN: Right, but let me first say something about prices. I'm glad to see the discussion of prices because there are lots of ways to manage the network, technical aspects being one, prices another. And I'm doing some research now on broadband prices around the world, and we've built a data set with about 25,000 broadband plans, and one of the things that comes through pretty clearly in the data is that plans that have things like bit caps and longer contracts and so on actually lead to lower prices for the -- an average consumer, I guess I should say. Obviously, phone an individual, it's going to depend on how high those data caps are and how much is charged after that. But it can be... you know, these can be benefits to especially sort of low-volume users.

And another point with that is that as an economist, I tend to, I love congestion pricing because all economists do, and there's some nice work by Cliff Winston at the Brookings Institution that looked at the effects of congestion pricing on investment in roads in the USA. And you know, typically, our approach in the USA to dealing with road congestion is just to pour more concrete, you know, better living through concrete. And that has, you know, that's not very effective at dealing with congestion at all. And he found that a much, much more cost-effective way was to try to use congestion pricing on roads. And you wouldn't have to invest as much, and it would lead to a much more efficient allocation of resources. The same is possibly true with the Internet as well.

Another example instead of prices can be throttling. If you look at Virgin Media's network in the UK, you get a particular speed, and if you exceed some amount of data transfer at a given time of day, they throttle your speed back until that time period expires, and then you're back to normal. Now, in principle – I haven't seen any analysis of this – but in principle, that means they didn't have to build as robust a network as they would otherwise because they don't have to worry about such high peaks, so that allows them to serve more people faster in principle. So these can be really effective things that can also be good for consumers.

Also, just to that point, I think it's the point that you raise about an Internet service provider blocking content or a service from a competitor, that's a potential real issue. We want to look at what incentives are facing a provider. And when you think about a random website, a provider doesn't have any incentive to provide that because they want the network to be valuable. When it's a competing service, that's when you want to step back and think about it. Providing telephone service is one thing; providing video is another.

But those are classic antitrust issues, and I think should be viewed generally in that case. I think there are real issues to worry about. But typically, antitrust laws deal with that. Now, in lots of countries, especially in developing countries where you have an incumbent and it has a long history of trying to make sure it doesn't have to compete with anybody, it could be blocking interconnection with mobile phones and so on, then you've got other issues going on, and hopefully you have a competition authority who deals with things like interconnection and so on.

VLADIMIR RADUNOVIC: You wanted to comment?

JENS KOCH: Yes, let me present it from the perspective of a regulator. Picking up what you just said about authorities. I think we all will agree that the main challenge for a regulator like me is how to secure that there is

level playing field for all players, ISPs, service and content providers, industry, and not at least consumers. This could, of course, be obtained in several different ways. You could provide hard traditional law or we could choose soft law regulation, but if we do that, it is important that all the players are involved in the working out of this soft law regulations. And also, of course, I'm a regulator. I would say it's important for the regulator itself to monitor the market, to monitor the behaviour of the operators, of course, also the consumers, but that is another question, and if necessary, take up again the hard way or the hard law regulation.
If you permit me, Vladimir.

<UNIDENTIFIED IN ORIGINAL TRANSCRIPT>: Could you define soft law for me?

JENS KOCH: I don't think there is one definition of soft law regulation. We all know what hard law regulation is. That is the law and the secondary regulation. Soft laws could be other things, like guidelines introduced from the authorities, guidelines agreed upon by the market players and other forms of what we say soft law regulations, mainly voluntary in its origin, but perhaps not so voluntary when it comes to the end of the day.
In Norway, we have chosen to apply soft law regulation, and if you permit me, Vladimir, a little later perhaps I can give you a short overview of how we were able to come to such resolution.

VLADIMIR RADUNOVIC: Yes, we'll definitely move to that part as well. Yesterday, when you did the introductory speech at the opening, you mentioned some of the policies related to Internet are also done between different parties not involving all, but does it also apply to net neutrality, and what is the user concern, basically, about all this debate?

LYNN ST AMOUR: So I think users, whether it's net neutrality or it's managed services versus public Internet, there's three things we actually like to say is important in any sort of user decision. The first is obviously access, and that's very, very broad. It's appropriate access at an appropriate time. It's knowing what you're buying and what you're getting, how your traffic is being managed. It's expecting the same level of service at peak periods as not peak periods, and if not, you know why not and what they're doing.

Choice is really important, so an appropriate competitive environment is extremely important. And transparency. And I think we all use transparency without perhaps spending enough time looking at all the aspects. It's not enough to simply say we've put some information on the website or it's in our service contract or it's in your terms of agreement. That's certainly important, but it's a very, very, very small step. And I think there's a role for consumer organisations, probably some user advocacy organisations as well as governments to really help with a broader perspective on these issues.

We've had quite a complex conversation here today; most end users wouldn't actually understand or know what to do with it. Everybody's mother is always their test example, I suppose. But I think there's a real, very solid piece of work that could be done to explain these levels of discussion services trade-offs in language that works and examples that are understandable to the average person. I think competition and choice is fine, but if there's no basis for comparing across those services, that's not particularly useful. So I think some comparables that are actually set up, possibly at a national level, possibly at a broader level, so you can more easily compare the services from one provider to another provider, would be extremely important. A lot of agreements you read are like reading legal contracts.

So I think, again, it's access choice, an appropriate competitive environment and transparency, and I think there's an awful lot of work that can be done to open up all of those discussions for end users.
And I'll stop there just in the interest of allowing more people rather than talking specifically about the net neutrality. Obviously, the Internet Society wants an open Internet. We want processes that are open that facilitates discussion by all stakeholders. We simply believe that that sort of diversity and robustness will actually deliver the best solution in the end.

VLADIMIR RADUNOVIC: We'll definitely get back in the last part on how do we achieve that and hear more about the Norwegian, probably, example, maybe some others, and see what's the role of the regulators. Chris.

CHRISTOPH STECK: Actually, I would like to take up the point because I think it's very important to talk from the consumer perspective here. We tend to speak sometimes from a different level. And I think the informed

decision by the consumer is very important, and this, in the end, if you have a competitive environment in a market and you have consumers which, for various reasons, know what they buy and what they get, I think these two mechanisms will, in the end, basically not allow situations like the one kind of described before, that a voice over IP service is blocked, for example, because the consumer will just go to different provider. And I think the problem will go away rather easily. This is competition. It's what we're used to.
But I think this is an important point, and I think it needs requirements, and maybe we will talk about these requirements maybe later on.

GINGER PAQUE: I don't know if I got the microphone under false pretences because you think I'm asking as remote moderator. I'm not. This is a concern, a very, very strong concern, that was also manifested by another participant attending this panel. And I am going to change the subject because I think it's very important. We're talking now at least about consumers finally, but this is the Internet Governance Forum. Supposedly we're trying to bridge the digital divide. Where is the developing voice here? Where? Who is speaking? Who is telling me what's going to happen? How is this going to affect development? How is it going to affect the things we actually should be addressing here today? And I think this is a very important point that so far we have not addressed. I don't know if you meant to bring it in later. What do you think?

VLADIMIR RADUNOVIC: Well, definitely it should be brought by the audience. When we discussed with some of our students who are from developing countries, from Africa, Pacific, and Caribbean, so on, many of them were... I don't want to say not knowledgeable...they understand what it is about, but they don't feel that the net neutrality debate relates to their countries because they have a basic problem with the access. And network neutrality doesn't really come up. The question is what happens when the access comes and whether network neutrality debate is basically going to change the rules of the game in developing countries.

SALANIETA TAMANIKAIWAIMARO: Thank you. I'd just like to make reference to what Ginger said and somebody from the panel mentioned that the regulator in the United States, I presume, is sort of hinting towards movement towards pricing depending upon volume. And for me when I hear that as a consumer, what I'm asking is does that mean prioritisation of packets in terms of the more volume, the more you pay, and what does it mean for those who can't afford in terms of equity?

And I also make reference to France Telecom's comments when he said the need to hear, to watch the signals, the cost signals. Speaking from a developing country's perspective, from Fiji, I suppose to some extent I represent the Pacific. I suppose I'm the only Pacific Islander here in the Forum. And in Fiji, for example, in terms of costing, we have one international gateway, one fixed line provider, and you have a bunch of mobile service providers. So in terms of the Internet in Fiji, if it's expensive from the international gateway, clearly, when translated down the rings, of course it's very expensive for the consumer. And this is the difference between France, between Europe, and the Pacific. The difference is this. In Europe and in the United States, you all have the privilege and the opportunity to transition into liberalisation. For most of the developing world, for my part of the world, liberalisation was forced -- not so much forced. It's a good thing. I'm all for liberalisation because it means more competition, cheaper prices. But the reality is then we don't have cheaper prices because we haven't had a chance to transition into liberalisation, and we have regulators who don't actually have economic analysts who understand what benchmarking is, vertical integration, and all of that.

So at the end of the day, the consumer has to pay appalling amounts of money and is not able to access basic things like Internet to be able to trade. If you are from an island and you want to sell, you want to export to say New Zealand or Japan, you are not able to know how much you can sell it for and whether someone is ripping you off, and if you are selling at market price.

And because ICT is a critical thing, I actually think ICT is the backbone of every industry, and not only is of economics, of politics, of agriculture, of trade, it's like an analogy that I would use is, aside from backbone, would be probably it's like blood. You know? You need blood, oxygenated blood to give life, and I see Internet and ICT as that. From a developing country's perspective, these are some of the challenges we face.
Yes, there have been World Bank reports that say broadband is the way to go. There's a direct correlation between investment into broadband and direct economic growth. But if the World Bank or if other stakeholders who are present who have the capacity to impact policy or have the capacity to redirect donor funds and

whatnot into the developing world, I think then people need to appreciate and to understand that the jurisdictions are different, and what's in the dynamics in the States doesn't necessarily translate for the Pacific.

However, back to the prioritisation of packets. If the United States regulator is sort of signalling that movement towards pricing depends on volume, as a consumer from a developing world, my question is how is that going to translate into the developing market?

VLADIMIR RADUNOVIC: Thank you. Another point that Chris made when it comes to choice is that basically in many countries, it's not that easy to choose between the providers. Either you don't have a choice or you need months to change from one to another. Another concern that we had from developing countries was what happens if there is a priority of packages based on a commercial level? And the operators make a deal with, say, Google, Facebook, or whatever. And then there is a small little company somewhere in Botswana with three intelligent guys or girls coming up with amazing ideas, something like what Facebook or Google were in the early days, and they want to make it live through the Internet. Can they make it live if they cannot pay for it? If someone else who pays will be prioritised, and then the small business dies. Lastly, we have the diversity of content and probably also the needs of the people in the developing world, and as you said, when you have possibly highly congested networks over there with the very low bandwidth, and then you need to introduce much more management, how does that impact the choice of these users to access basically all these services on the net?

Now, Jeremy, on the side of the consumers, basically.

JEREMY MALCOLM: Well, some of the points I was going to make have just been made, but I agree we can't rely on competition between broadband providers to make sure consumers' interests in the network are upheld. In many countries we have a monopoly or oligopoly situation where there are telecommunication providers dominating the market. In fact, 20% of the world's broadband consumers are served by just two ISPs. So we can't rely on competition. Sometimes we have to take affirmative steps to make sure consumers' rights are upheld.

I don't think the consumer movement takes a dogmatic position on network neutrality. We are not going to say that there aren't valid applications for prioritising packets. Certainly there are. We're really concerned about the underlying issues like is there adequate competition? Is there adequate choice? Do consumers have adequate information? Is there adequate equitable access, particularly for disadvantaged consumers, both in the developing world and even in the developed world? So I think the bottom line is that the market isn't always going to be enough. Sometimes we do need either regulatory or civil society intervention to make sure that consumers' interests are upheld.

VLADIMIR RADUNOVIC: Thank you. We had a couple of questions. I'll just take a couple of questions now. Bob?

BOB KAHN: I was actually going to raise the issue looking to the future about what this notion of managed services really is likely to be about. I had the experience the other night watching the US open tennis, and the television in the hotel had it nicely on the screen but with the German soundtrack, and I got on to the Internet and I got the audio. They wouldn't stream video here from the USA, but I had an audio track, which turned out to be two seconds ahead of the video, so it was kind of an interesting thing. But here I'm dealing with two different media to watch the same programme. That may turn out to be a paradigm for the future. I am sure service providers are going to want to have more of a hold on their customers that might now be the case.

Second is that we've had a longstanding issue in network design as to what is efficient coding of information. It's partly a technical question but partly a management question. I remember when the early networks were built, we had wideband networks. They were 50 kilobits, but nobody could generate that much traffic. Then with the Ethernets and the megabit-per-second services, many people complained that we weren't using them very well because we were just inefficiently using those networks, sending whatever traffic. Recently, especially with the wireless networks, there's more of a push toward being more efficient in the use of those networks, and if I were in that business, that's what I would be looking to see: how can I make the most efficient use of that spectrum.

If you look at what's been happening on the Internet, we've now moved in part in the direction of having application-specific clients. We no longer have the notion of the single portal into a net. If you go to an app store and pull down an app, it's often tailored to a specific application and can be coupled to that application for the purposes of the application provider.

Another – these are just hypotheses, and we have a good panel here, and I'm happy to have them at least opine on these issues – is you could actually view network management in the future as some sort of a compact between the user and the network provider. So if you get an app down for an application that's run by an application service provider, is it not also the case that you couldn't get an app down from the network service provider, and that app would tend to take what you're sending and optimize it for use on the network? They may be able to give you better prices if you use the app to do their transmission on the net than do appropriate coding.

Finally, the last point I would make is perhaps we're not thinking about what the content of the future is really going to look like going over the net. So for example, today you might have a particular notion of what a book is or what a song is or what a movie is, but the book of the future might very well have a sound track as part of it and a movie built in and some spreadsheets, and it's no longer clear how you manage that unless you have some way of understanding how to code that efficiently for the network that it's going over. So I can manage a carrier providing an app that would deal with some of these things and do a really efficient job of coding. Now, they may sell you two or three different apps. Here's an app you can have for $10 a month, and you can have this other one for $40. It'll code everything better, but it will use more bandwidth.

So I think my point here is the notion of what's the information, the notion of what management is really needs to be thought out, and it could have a very different kind of view in the future than we're now thinking of.

VLADIMIR RADUNOVIC: Thank you. I think you've opened an important point, what are the advanced services? What are the managed services? What are these services that we're talking about that are coming in the future and we might be looking at them differently than before. Can I take a few more questions, then back to the panel?

VINT CERF: I just wanted to signal that I wanted to get in the queue.

VLADIMIR RADUNOVIC: Yeah, sure, you're in the queue.

JOVAN KURBALIJA: He doesn't apply network neutrality.

VLADIMIR RADUNOVIC: There is no net neutrality here. Basically, I just urge you to, whenever you reflect on any of the issues, have in mind what Ginger has said, how this is going to be perceived in the developing world, because we are talking about one type of services, and iPhone apps and so on in the USA and in Europe. In Fiji, they can't think about it because the access is barely for almost dial-up connection.

IZUMI AIZU: Thank you very much. My name is Izumi from Tokyo or Japan, and first I agree with Ginger's comment on what are these lessons to be applied to the developing countries, and for that reason I think I'd like to share some of our experiences of network neutrality or packet shaping happening in 2007.
We were grappling about the flat rate versus the, you know, the pricing by usage of broadband. As you know, Japan has been one of the cheapest offering of broadband and the largest penetration. Around 2007, the overall amount of traffic sort of grew 38% per year. At that time, there was a big cry that there was a free ride observed. 10% of users were generating more than 60% of the traffic, mostly by P2P, and even within the P2P heavy users, a further 10% of those users were still generating 60% of the whole traffic.

So is it fair and balanced or not...that was the big question. Government and the industry discussed it for almost a year. They came to the conclusion to have a soft law or guideline, voluntary, because our Telecom Act prohibits discriminatory treatment of the users. So what is fair has to be carefully defined and implemented. And so they made some kind of exceptional cases where these are not deemed to be fair use of the services, and they should give consent or they should disclose what kind of traffic you are consuming; this has to be fed

back to the users who may not know how much they are generating before they take certain actions.
So with that, they offered some kind of a guideline but also sort of classes of pricing so that most of the average users were not really affected. They still kept a flat rate, while only those heavy users have to pay, if they so wish, so that there must be some kind of mechanism introduced.

So there's not a dichotomy between flat rate versus usage just as a single class of user. You have to be very careful. I don't know if it can be applied to the mobile situation in the USA, but I don't want ... if you make it too simple an argument, then you may miss both sides, so there can be certain wisdom that we can share. Thank you.

PARMINDER JEET SINGH: Thank you. First of all, I probably may not have asked this question because I really have a serious issue with coming up with a panel on global forum, which is all from the north. It's very serious. Serious enough for me not to participate, actually. And I share Ginger's concerns in this regard. And there can be no excuses for that. Nobody is here learning from other people about participating and developing a governance framework. People know their rights. People know their interest best.

And secondly, I was still interested in coming when I heard that you did speak to Diplo students, and they weren't sure if network neutrality was a developing country issue, and that made me get up and speak. If not, you should probably have asked the question of the same students whether policies are, i.e. free trade issues, WIPO rules. Are those students attuned to the structural issues that concern the poor in developing countries? And if they are not, then seriously they should be subjected a lot to that kind of education because network neutrality at a global forum – and we are sitting at a global forum – network neutrality in any society is primarily an issue of the less privileged. It's a basic architectural principle which makes domination of the issue much more one-sided.

Once we introduce a tiered system, once we sacrifice the network neutrality issue, there is an implication at the global connection points. There is an implication at the global flow of knowledge, information, business, everything. And that itself comes from a network neutrality point, which is already problematic from open markets. When they get loaded by inequality, the paid content could travel faster. That's one of the biggest developing country questions today. You would be completely dominated by businesses from the north, applications from the north, and the whole Internet is being shared as a poor man's Internet. You want access, you'll get cheap access, but you will get this kind of access. Do you want it? The poor guy says I want it because I want cheap access. That's precisely being done by telling them network neutrality is not your issue. Your issue is to get Internet. You will you take the Internet you get? The guy says yes, I want some Internet, so give it to me. This is what's happening. Mobile has been made into the new panacea for developing countries, and mobile Internet as a compromise Internet is being positioned as a poor man's Internet. You'll get it, it will be cheap. Just deal with it. It doesn't matter that you can't create or put things on the Internet. You'll do your work, get your information, small stuff done, travel arrangements, and that's it.

So actually, equality can be bought by money at high levels. The poor person says you can get a cheap Internet. It is being subsidised by the companies who are doing business with you, and therefore, this is the compromise Internet you get.

Now to a more practical question. I do not know how the practices are shaping up in developed countries. In India, the biggest mobile telecom gives Facebook for free. Now I would ask the question of the panellists whether they consider it network neutrality. I'm not sure. Facebook is free. So if the rest of the Internet is paid for... and whether you would call that 'Facebook Internet' or not. I mean, it is coming on IP protocols.
But there's no other Internet. If you want Internet, you pay for it. You need Facebook, you get it for free. One of the youngest telecom providers gives a book of ten services for $1. You get those ten services, Twitter, Google, et cetera, and the rest of the Internet is costlier.

So what you are going towards is a cheap Internet, even probably a free Internet, where the business relationships work. The networks or businesses who are paying for the content, paying for the channels, and you get a compromise; that's the main formula that's happening in the developing countries. So let's not at all confuse ourselves. It's the biggest developing country architecture right now.

And the last thing: when you start talking about network management issues, it can be many levels from where you could be talking. I think you probably need to have different workshops and talk from different levels. One is the technical issue, the technical management issue. Network management from business issues, because a couple of businesses, many sitting up there, have to figure out how they can keep on doing business because business needs to be done, and it's socially useful.

Third is a consumer framework kind of thing. A person who pays in a private contract framework should get what he pays for. I mean, that is a private contract framework. People who get into a contract... and the contract should be transparent... and the consumer's framework, as Jeremy said, is still not enough. And the next two frameworks are about rights, and the next is a political framework. We need to have a separate workshop on what does network management mean from a people's rights framework and a political framework. A political framework means there are trade-offs. We try to figure that there is a user and all users are shared. We know in political economics, there is a trade-off between equity and growth. There is a trade-off between information, all the fun things we want to do and the basic necessities of life. There's a lot of network neutralities. There is the richer consumer who wants more and more and is ready to compromise on network neutrality, but the equality issue is more important for the poor people.

Last, I prefer the flat rate principle to getting the carriers to pay. I am fine if people have to pay for bandwidth which is not structural to start Internet, but if bandwidth providers pay for it, it's a structural damage.

VLADIMIR RADUNOVIC: You raise an important discussion. Basically, when we started the discussion in 2008, it was already obvious, as it is now, that most of the trends come from the western world, not from the developing world. In that sense, the problem of the people from the developing world not understanding, not figuring out why this is important for the developing world is not in them, as participants from the developing world know. Not, not understanding the structures, but rather not understanding what this issue is about because these are all new services. It was our intention generally, as it is now, to explain more about what the debate is over there in USA and in Europe so that they can join it and, of course, join it as you did here, and I'm absolutely thankful for that.

And probably in the future, you are quite right, we might organise more sessions. This is the only one at the IGF when it comes to technical and economical aspects and also the user. It's just a concern if we have these kind of sessions that on technical level we might only have techies. On an economic level, we might only have economists. On the human rights and user rights, we might only have civil society and users, and user groups. That would not be good. But let's try to do it in future definitely and mix together these three aspects. That's absolutely certain. We have several more comments. I'll give to Pablo, and then we'll turn back to the panel for comments.

PABLO MOLINA: It's clear to us, for example, for those prestigious business schools in Europe or Asia or the United States that are making money teaching online, they will be willing to pay for managed services because we'll just raise tuition and people will pay for that. However, many of us are following the model worldwide in the United States, in Vietnam, Spain, and many others place, the model of the Massachusetts Institute of Technology for open course work, by which you make many of your academic materials available for free to the world for the benefit of mankind. And right now, that content can travel to those parts of the world in India or China or some other places because of the network neutrality rules and practices in place. Once that traffic becomes part of this lowerclass Internet, for which there's not much investment incentive as opposed to selling big managed services, what is going to happen to these services that we're trying to provide to the world? And what kind of framework do we need in order to ensure that these services do not become either unavailable or just simply impractical? To these people that are trying to provide services and learn more and take advantage of this free content.

VLADIMIR RADUNOVIC: Thank you. Let me get back to the panel first. Vint, Mark.

VINT CERF: I know we don't have much time left. Let me point out first of all there's a finite amount of capacity on any network at any one moment, and you can't have more than it is available, so it has to be shared somehow.

Second, I think that we should be open to quite a wide range of different business models. At Google, for example, because we are an advertising-driven company, many services that might be charged by others are free from Google because they are paid for through this advertising model. There may be other ways of providing network service other than simply having the user pays.

Whatever model is adopted, though, I think that it's still extremely important that users have freedom to go anywhere they would like to go on the Internet and that the providers have the right to reach those consumers. It's fair to say some applications work better at higher speeds and some don't. There's no magic here. Whatever the end-to-end capacity turns out to be will determine whether some applications are feasible or not. I would like to reiterate one more time that in the collaborative global Internet environment, it is the ensemble of companies and organisations that provide the Internet that gives the end-to-end product, and there hasn't been, to my knowledge, very many or maybe even many end-to-end multi network agreements on quality of service. The consequence of that is that best efforts has turned out to be the best we could do on an end-to-end basis, setting aside the fact that some networks can provide managed services within the context of their own networks because they have control over the resources and can manage it more precisely.

VLADIMIR RADUNOVIC: Mark?

MARC LEBOURGES: Yes. I just want to shortly react on three points. One concerns emerging countries. You may know we are quite active in particular in Africa and also in some countries in the Middle East, and we do -- we are doing business, and it's a big part of our growth. And there are trends which come from Africa; everything which is mobile payment, for instance. It's starting much sooner in emerging countries than in developed countries. So it's not true that trends always come from the north, so to say. What we are doing, just as an example, to get access, it is making business; we are doing, I think, good business, and also things like putting cables around Africa, east and west, in order to have capacity and not to have shortage of capacity.

One second point, when I was speaking of price signals and the question of whether it means volume-dependent price on the retail side, it may be this; but the price signal may be sent to the retail side, and it also may be sent to the service provider side. And this depends on who has the best price to take an educated decision from this price signal. And my own view is that sometimes the service provider is better to use the price signal efficiently.

One last thing. When we mention the need to manage traffic in case of congestion and to make sure that everyone can go through, and I come back to the example which was given from Japan, giving prioritisation in case of congestion does not mean, necessarily, asking payment for this prioritisation. It just means that people who occupy a disproportionate proportion of the capacity do not take it all and that everyone can go through. So making traffic management is not to give extra possibility to privileged people. It is the contrary. It is giving a fair share of the resource to everyone. Thank you.

JOVAN KURBALIJA: Well, thank you. Vlada promised to ask for neutrality in managing this session, and I have been queuing since Lynne's comment almost half an hour ago. Although I have some connections with Vlada, and I thought of using this privileged access, but it didn't work. He put me in the queue quite behind. I'll just make a quick comment on the question of choice. I think it is an underlying word; if you do a linguistic analysis of this transcript, choice is probably the most frequently mentioned word. I have here one concern, and the concern is not necessarily related to the Internet, but it's particularly important for the Internet. It is the question of position of choice in modern society. It is the underlying principle in the economy and in political systems. But what we are noticing as a serious trend is what we can call 'delegation of choice'. If you see what the fastest growing industry in the United States especially is, but also in Europe, it's industry of various consultants from finance to sex. Therefore, what we had as some sort of achievement of society to have a choice, we started delegating to consultants and to the new industry.

Now, it is a general problem of modern society, but it is particularly relevant and problematic when it comes to the Internet because of what Sala said: it is the blood of modern society, and the question of choice is of strategic relevance. Therefore, we have to see how to ensure real implementation of this principle, which exists everywhere, in all policy documents, in all proclamations. But when it comes to implementation, it is getting increasingly complicated and difficult. We are increasingly locked into limited choices, for various reasons: for convenience, or the difficulty in switching to other services. Therefore, I think besides the regular mechanisms

which Jeremy mentioned, like consumer protection and anti-monopoly law, there is a need to do more in order to ensure the real possibility of exercising choices. And that's why neutrality is essential for that problem. Thank you.

VLADIMIR RADUNOVIC: Thank you. Robert?

ROBERT PEPPER: I'd like to come back to the comments that we heard from our colleague from Fiji and then from India also. You know, we're talking about managing networks, but before you have a network to manage, you have to have a network. Yeah, I know, but you have to have a network that actually is going to give you more than what I'm hearing that you currently have.

SALANIETA TAMANIKAIWAIMARO: <Off microphone>

ROBERT PEPPER: I'm sorry. I can't hear you. Use the microphone next to you.

SALANIETA TAMANIKAIWAIMARO: Sorry. Just to correct a few things. We have Internet in Fiji, and we have fibre on the ground. We don't have fibre to the curb. We have fibre on the ground. We have copper loops all over. We are about to move into NGN, and I suppose we would be the first country in the Pacific to move into NGN. But quite aside from that, the highest speed is 512. But our problem is in limited capacity, problems with the regulator, and I suppose that's enough for now.

ROBERT PEPPER: Yeah, so fair enough. I was going to focus, actually, on the cables, the pricing for cable.

PARMINDER JEET SINGH: Can I just ask one thing?

ROBERT PEPPER: Yeah, please.

PARMINDER JEET SINGH: I think it's the wrong point to start it's like you need food before you get freedom. We need the network, but we need an equal network from the start.

Second, India has got fibre network running within 20 kilometres of almost all its villages for the last five years, of which 2% has been used, and the rest of it is waiting for business models. So I think to put the strap of money is needed, where would it come from, we are going to take away your sacrifice doesn't work. The networks have to be free, and the logic of you need money and therefore it has to be made in a non-neutral manner is not for me as good starting point.

ROBERT PEPPER: No, in fact, what I was going to point out --

SALANIETA TAMANIKAIWAIMARO: Just one more thing. We have VSEP technology. We have wi-fi. We have WiMax. That's why I alluded to the comments in terms of the debate between wired line and wireless. And what else do we have? Yeah, so that's it.

ROBERT PEPPER: So what is your explanation between the high price and the --

SALANIETA TAMANIKAIWAIMARO: Exactly what I was trying to hammer home in my previous comments, which is this. Because there is no time for transition in terms of liberalisation, it happened; liberalization began in 2008. Just in case you don't know, Fiji had a coup in 2006, and not too long after, two years after, we sort of had promulgation that came out forcing the liberalisation, which the whole of Fiji is happy about. It means slightly cheaper mobile calls because now we have an open market.

The problem is this. Because we have one international gateway and as you know, with market elements, you need a strongly equipped regulator. And when we say strongly equipped regulator, it doesn't mean lots of money. Just means basic competency. So because we lack this basic competency, we have things like interconnection prices. We have severe price battles happening within the industry that are not based on benchmarks. They are just picked from the air, literally picked from the air and plummeted, and it just transcends right down and it affects the consumers.

And in terms of cost of the Internet, you would appreciate, of course, that, you know, it's a bottom-down effect. I just thought I'd say that. And am happy to talk to you over coffee at any time. I'm here for the entire Forum, and I'll throw it back to Vlada.

ROBERT PEPPER: So I don't think that anything that you have said or that, you know, the gentleman said is different than the point I was making. The difference, for example, in India, that I was going to point out – you've already made the point – fibre goes to every district in 30,000 blocks, and fibre actually has been pushed probably deeper into the networks across India than almost any other country. The question is so the fibre exists. The fibre is not being utilised in ways that actually get broadband capacity to the villages and to people at affordable prices.

There are some very fundamental issues, right, before you get to the questions of network management, of making available the capacity. When it goes to also the points that have been made about choice, attracting investment, and having competition. Maybe Scott can talk to this as well. If you don't have sufficient competition, right, you're not going... and if you do not have empowered regulators....so you know, I was a regulator for 19 years. The point is that you need to have market structures in which you have the opportunity for competition to develop that creates the right incentives for investment, in networks and the utilisation of those networks that what we see with essentially, you know, single landing stations; and by the way, in Africa, we have a great example of this.

With the introduction of SEACOM coming down the east coast of Africa, with neutral piering points, building out Internet exchange points that will provide access for any ISP on the east side of Africa, all of a sudden you have begun to see prices decline dramatically, people making investments to build out new services. But you have to have the capacity to be able to do that. And the best way to get the capacity is by attracting investment and having market structures that allow for the competition and providing the services. Right? It doesn't happen by magic.

Network management is, in some ways, an additional - it's not separate but it's an additional question about when you have networks in place, how are they managed in ways that actually create the right incentives for new services to develop, for operators to provide networks and investment on those networks, and to make sure the consumers have benefits and competition benefits from the net management? It's not a zero sum game. It's not either/or.

Vint talks about the ensemble of networks and companies that are providing the end-to-end service in ways that have developed organically. We need to maintain that and ensure that that continues. And if there is not capacity in a particular region of the world, we need to address specifically why there's insufficient capacity and what mechanisms are available to create more capacity. In the case of Africa, with SEACOM, there were a variety of mechanisms used by countries to attract investment from SEACOM, which raised private capital. If you have a situation in a country where you do not have an empowered regulator, making the transition from monopoly to competition and to liberalisation – and by the way, liberalization and competition are not necessarily the same thing. and you have to be very clear about that.

So with that, I'm going to actually turn it over to my colleague, who is the regulator, to talk about these things, but I think you're absolutely, absolutely correct, and capacity and the needs for these networks is critically important. I view, for example, broadband and connectivity as the fourth essential infrastructure globally, especially in emerging countries. After, you know, water, energy, and transportation, connectivity is the fourth essential infrastructure. And what we're seeing is the demand for that, and it's as important. I mean, you made this point about all the services that are needed for people to actually compete and be educated, you know, in the 21st century.

VLADIMIR RADUNOVIC: I just wanted to allow Mwende from Kenya to jump in.

MWENDE NJIRAINI: Thank you very much. I'm Mwende Njiraini from Kenya. I work with a regulator. Just to add on to what you have said Mr Pepper, that unfortunately – or is it fortunately? – in Kenya, for example, the government has gone into investment and actually built out networks, so the government has actually laid a cable from Fujairah in the United Arab Emirates, to Mombasa, which is at the coast, in addition to SEACOM, for

example, or Flag, which is supposed to be coming. So in this case, it's where the government has felt that broadband is essential for development.

And then again, we go to Ginger's question. What is development in terms of network access? Is, for example, an operator giving access to Facebook development? So where the government has gone into investment in infrastructure, it's because it realises that operators are not going to go in because they do not have the managed services or privileged services to be able to cover for the cost of the network. Essentially, the cost of the network is the same cost, and operators maybe in the west are using the managed services to cover the cost of their network. So in a situation where the government invests in the infrastructure, what then would network neutrality be for them? Because in essence, that network is being used by application providers or content providers from the west. Thank you.

VLADIMIR RADUNOVIC: Jackie, you're next.

JACQUELYNN RUFF: This has been a very useful and complex discussion, and I really appreciate your comments and the others that have been madeBecause we've had the queue to speak, I'm not going to be directly responsive to the last comment, of course. But I did think that it might be useful, almost as a little bit of a summary, to share the key ideas, that my company, Verizon, and Google, had put out that I think can be relevant in a lot of different situations. I'm not saying it's a blueprint for every place, and you may find some of them being similar to what you will talk about from Norway's perspective, but it's like this. Five or so ideas.

One is that the consumer should have the right to have the access. You talked about rights. Someone did earlier. The access to use the devices to get the content that she or he wants.

Second, that if there is harm to competition or to consumers, there's discrimination that causes that, that there should be an action that the regulator with its oversight can take. That should be clear, it should be enforceable. Again, that came up earlier.

That there should be enormous transparency. That is one area where, really, parties should get together and have rules, have clarity there.

That in other instances of trying to figure out whether the network management has been somehow harmful, two ideas there. One very important one is that it should be examined on a case-by-case basis. It's very hard right now, as others have said, to predict what might be problematic two years from now, five years from now. So if we are looking at it case by case, looking for the harm to consumers and competition, then that's the best way to try to approach that.

That we should have some types of managed services. I think one that is particularly interesting for developing countries would be advanced educational services, healthcare, being able to use those kinds of things, that yes, there should be a government ability to monitor that to make sure that it's not substituting for the robust and traditional Internet.

That there are different considerations for wireless and we talked about some.

But finally, I would note – and perhaps people don't think about this so much – that when in the USA we tried to figure out what the whole picture might look like and put some ideas out there for our policymakers, finally we said we do have to think about our version of broadband access. We've got some areas that are unserved. We've got some low-income fellow citizens who have trouble affording and that our own structure for universal service should look at those things. So it's a whole picture. It's a whole package that we need to look at, and I would say for the developing world, you want to have enough flexibility to get the investment. When we made huge investment in fibre, we had a lot of flexibility. But also certainty as to what the policy environment was. You want that. You want to be able to benefit from the positive aspects of network management when it comes to cybersecurity and spam and advanced services and so on. But these may be some ideas that I think are relevant in a number of different settings. Not a blueprint, but relevant.

VLADIMIR RADUNOVIC: Thank you. Last year we had a three-hour session. This year we thought with two

hours we would fit, but it seems like we are not. We have five minutes, maybe. We will go very quickly. Jake, then we move on to how to.

JAKE JENNINGS: The wonderful speed round. Three quick points. Absolutely agree with some of the points Jackie made and especially Lynn. Transparency is just as important as part of an open Internet. So no blocking, but if you are managing the network, you know, you should inform the customer to whom you are providing service as to how you are managing that network, so transparency is actually a key.

Second, I am so glad that the development issue was raised by the fellow attendee. In fact, the WTO actually had a representative here at the IGF, and more and more we are seeing, as we service the Asian region, they, in fact, believe that they only have to do the minimum of those commitments as opposed to, say, a country like Peru, where Peru did not make commitments but, rather, decided that they were going to not only liberalise, but they were also going to have competition in the mobile market. They went from something like 10% mobile penetration to within a few years over 70% penetration.

What you end up seeing is there some sort of a capture attitude where a country wants to favour its domestic companies, so it tilts the playing field, if you will, for those domestic carriers by easing foreign direct investment limitations or requiring partnerships with the incumbent carriers. And that is yet another barrier to investment into the country. From our perspective, the question should be how does a country or how does an area, whether it's rural South Carolina, where I live – how do you incent investment into broadband infrastructures and the Internet?

The third point I'd like to make regarding managed services. AT&T has rolled out a programming product called U-verse. With U-verse, we are providing essentially all of the same channels you can get, whether it's on DirecTV, Dish, satellite TV, or the cable operators. When we do that, the economics of the network and the cost characteristics, when you dig the trench to lay additional facilities, you don't just put one piece of fibre or one copper wire. Rather, you build to the future. So you end up putting a lot more capacity into the ground. Now, our network, we chose to use copper to the last, oh, 500 feet or 500 metres. We went from providing roughly 6-meg DSL service on top of the telephone service. When we rolled out U-verse, we are able to now provide four standard definition channels simultaneously or two high-definition channels with anywhere from 12- to 18-meg Internet access. So because of those managed services of the programming, we were able to increase the broadband capacity from the consumers choice from 6 meg up to 18 meg just with that one investment. So there are opportunities where managed services can create an opportunity for significant investments into the network and for more broadband deployment. Thank you.

VLADIMIR RADUNOVIC: Thank you. So how do we ensure investments and innovations and at the same time protection of user choice and all these principles?

JENS KOCH: I think that is an easier question to pose than to answer.

VLADIMIR RADUNOVIC: Three minutes.

JENS KOCH: A few moments to return to the question, which is also reflected by my colleague when referring to the Google agreement. That is not a 100% successful agreement. If you look at the background of principles we have arrived at by working in close cooperation with all the market players in Norway. But it, I think, in a good way it reflects the principles behind the principles. So when it comes to the question of regulation in the developing countries, it came to my mind that also the developed countries has developing period when it comes to the traditional telecommunication infrastructure and regulations. Then a key word, then, was of course, access regulation. But how this access regulation could be established and practiced could by hard law or by soft law. And it is, I think, not only there is possibility for the developing countries themselves to empower the regulators, but it is, indeed, responsibility for us all.

VLADIMIR RADUNOVIC: Thank you. I just saved the last comment for Benson. As it always is, the developing countries are last in the row, but Benson.

BENSON NCUBE: Thank you. I appreciate where the trend is going regarding this net neutrality. As the voice

of the developing country, we still have concerns in terms of access, quality, and cost. Looking at access, there is a situation at the moment that even switching domestic voice services for an African country, we have to transit through Europe to go back to determination distance in Africa again, which is really an expensive process. Sometime, because of those hoops that we go through, the quality is degraded because there are echoes there. And now I don't know whether net neutrality will address those issues.

Regarding access, the same phenomena. Access to the Internet, the tier 2, tier 3 network providers are the multinational companies in the USA, wherever, in developed countries. And you still have to connect via them. And quality wise also, I heard this shift of going towards broadband services, and there was talk about a free band which is unregulated. But the downside of that is everyone is pushing traffic there. There's no control. And it's prone to interference. So with the little bandwidth that is there for Internet coming, what impact will that have? That's my question.

Finally, also regarding the allocated and the regulated frequency spectrums, in Africa you will find that there's a tendency that these frequencies are expensive. So this leaves African nations with a disadvantaged situation because you have to go for the unregulated bandwidth. But at the same time, there will be a compromise of the service. So with that, I close my concern.

VLADIMIR RADUNOVIC: Thank you. Well, I think we again just scratched the surface of this iceberg, and that we opened many more questions than we really answered to. But there will be more time, and I hope, of course, the next IGF will be the next opportunity. Maybe we will make even more sessions.

In the meantime, I hope there will be online discussions. In Diplo, we discuss this on discuss.diplomacy, and we started a discussion on net neutrality. We will try to invite distinguished experts here and there to comment and provide the answers to many more questions. I invite you also to join this discussion on net neutrality. Let's continue it online, and, well, see you hopefully at the next IGF. Thank you.