

# NETEVENTS 2015 CLOUD INNOVATION SUMMIT

**DRAFT**

## *Debate Session I: Cloud Service Innovation: Who's Investing in What?*

Chair: Jeremiah Caron

**Senior Vice President - Analysis, Current Analysis**

Panellists:

Juan Tellez	Senior Architect, Apcera
Arpit Joshipura	VP Strategy, Product Management and Marketing, Dell Networking
Kevin Vachon	Chief Operating Officer, MEF
Tom Gowan	Director of Services Integration, NTT America
Mike McBride	Open Networking Foundation

### **Manek Dubash**

Okay, and without further ado I'd like to invite Jerry Caron from Current Analysis and his panel to come down and let's talk about cloud innovation. We'll be setting the agenda here I think for the rest of the event and yes, hand over to Jerry.

### **Jeremiah Caron**

Thanks very much. Hello, everybody. Very happy to lead this panel discussion that we're about to have. I've been working with NetEvents for quite some time, so I'm always honoured to be invited back and to get a chance to lead a conversation like this,

so thank you to the NetEvents folks for putting us all together and thank you also for that excellent opening Keynote Presentation which hammered home a couple of points that lead very well into what we're going to talk about with my panel members here.

The one that stuck out, and I've heard this many times before, is this notion that wow, the Cloud market as defined as perhaps as broadly as you could define it, maybe not, is already a \$100b market. Wow, that's phenomenal. \$100b, that's tremendous. We do a number of studies of enterprises, as a lot of companies do. I don't really see enterprises putting up their hands saying, "Yeah, we're going to spend \$100b more than we did last year, or whatever". So, the issue is that there is all these suppliers out there who need to fight each other and kill each other to get a piece of this \$100b that is not new money. It's money that's being shifted from somewhere else, right. It's not brand new money we're talking about here.

So, there is an intense competitive dynamic amongst all kinds of companies, service providers, whether they're carriers or pure web-based service providers, or whether they're technology companies or ISPs, or resellers, integrators, you name it, to get a piece of this action which is not new action. It's just being shifted from somewhere else.

That leads us to innovation. How do you differentiate? How do you innovate and that's what we're going to talk about right now?

So, let me quickly, before I introduce the panel, go through a few thoughts to guide the discussion. I'm with Current Analysis. I lead the analyst team worldwide. Current Analysis is about competitive differentiation. We help our clients create competitive differentiation in the markets that they play in, mainly in the telecoms and technology space.

So, the innovations in cloud service, there is a couple of thoughts. What we're going to talk about, first of all, enterprise requirements. The Keynote speaker mentioned you've got to start with the requirements and we'll talk about that. What are service providers doing and what should they be doing and then we'll have a panel discussion?

So, a couple of quick thoughts. Some no-brainers. Okay, what's happening with Cloud? Yes, this is from a study we did of 874 enterprises around the world just a couple of months ago. Large number use cloud services. The rest that don't, plan to. Then there is a small percent who gosh knows what they do, but they're not going to do it. But, the point here is that yes, cloud is important whether we're talking about software as a service, platform as a service, or infrastructure as a service. Really, we're reaching the point where we can no longer talk about Cloud because we'll just be talking about enterprise, computing and everything like that without making a distinction.

What kind of Cloud are you using? Well, it turns out the majority are using what we would call private Cloud, where they built it and manage it themselves and created that sort of agile environment themselves, or they're doing it in a managed way. Or, an increasing number are creating a hybrid solution where they use a mix of Internet-based Cloud solutions as well as their own private-based Cloud solution. So, that's interesting. We expect to see the hybrid portion of that grow rapidly over the next couple of years, but it's primarily private Cloud.

Well, why is that? Well, no-brainer again, what are the concerns in moving to a Cloud-based strategy? It's security. It's reliability. It's privacy. It's controlling costs. These are these things why moving to a public environment right away is a bit scary, particularly as you get to more sophisticated mission critical applications.

Now, that's an opportunity, obviously, for the suppliers. That's the case today. But, these are the concerns. Certainly no shocks here for anybody.

What I find interesting about this information is look how many concerns there are in double digits on a percentage basis. That's a lot of concerns. This industry has a lot of work to do, frankly, to create differentiation as they work to innovate because what this tells me is what's out there now raises a lot of questions and a lot of problems.

Okay, so, service provider action. What are the service providers that we work with? What are they doing? Well, first of all, facilitating hybrid connectivity and facilitating that hybrid approach. That is where the market is going and that is where all service providers that we work with are moving toward is figuring out how to work the security, how to work the reliability to support Internet offload or whatever when the customer wants it in addition to a more locked down approach. Security dominates the discussion. That's good. That's a no-brainer.

Then on the private side engineered systems so the market can move down, where people can put in a solution and it's sort of in a box and works.

Now, why is this important? So, if we ask the question how many suppliers do you use for infrastructure as a service, or how many suppliers do you use for platform as a service, or how many suppliers do you use for software as a service, you can see that in a large number of cases it's more than one. This creates a problem that the industry is working on, but it creates a tremendous opportunity to innovate and this is where we're seeing the most innovation among cloud service providers today is in the act of supporting this multi-cloud environment. That is where the innovation is happening. They're not out there trying to beat up Amazon on price. They're not trying to come up with the next great SaaS offering. They want to support that. What they want to do is differentiate in supporting this multi-cloud environment.

So, here the big things happening and it's all around APIs. Cloud interoperability is the big thing - working together, creating co-operative partnerships. We're already seeing this happening. Think about AT&T and their bond service where they're

recruiting partners to create a benefit in differentiation by using AT&T network services. That all drives down into linking up this discussion with internal telco, or carrier discussions around SDN and NFV and how to make that work for them.

So, what are carriers' or service providers' primary driver for SDN and NFV? The great thing about this one is we're now down to less than 30% is about saving money. The majority is about service enablement and revenue generating things. That's really good for the industry.

When are you going to spend money on SDN? And again, the issue here is if you want to talk about Cloud to enterprises, the first thing that service providers have to think about is cloudify thyself. You cannot cloud other people and help them until you cloudify thyself, yourself. So, when is this going to happen?

Interesting bits are the red and green. In a very short amount of time, 12 to 18 months, you know, a tremendous number of the companies we talk to are planning to spend money and deploy SDN in this timeframe. Now, the one thing you need to know about studies like this is the companies you interviewed lie. They don't think they're lying. They think that they're going to spend this money in the timeframe they talk about, but it always shifts out. We should create some sort of law like Moore's law or Metcalfe's law, or whatever about looking at this and then shifting it out another two years or whatever. But nevertheless, that's what they say.

NFV, even shorter timeframe. You know, creating your own telco cloud environment to better support the APIs, the enterprise services and consumer services by doing their own thing in a very short amount of time. So, that's what's going on in the marketplace.

Who we have talking here today? So, in no particular order in terms of who is sitting where, actually, I'll let you introduce yourself. So, let's go with the newbie, Tom.

### **Tom Gowan**

Sure, thanks, and sorry for interrupting in the middle. My name is Tom Gowan. I'm the Director of Services Integration for NTT Communications. We're a global service provider who has traditionally been a global infrastructure management service provider, but we've been getting into Cloud vision and how we tackle exactly these issues.

### **Jeremiah Caron**

Okay, welcome and no worries about coming in late. I'm glad you were able to join. Mike.

**Mike McBride**

Mike McBride. I'm representing the Open Networking Foundation, the ONF. Open source, SDN, community. We are the ones that created OpenFlow which in some ways started off a lot of the talk about SDN. I'm also an Erickson employee, Director of Technology.

**Kevin Vachon**

Kevin Vachon, COO of the MEF. Most of you know us. We've been the driving force behind the carrier Ethernet market, now moving on to drive the development of more agile and orchestrated services on a global basis. I'm a MEF employee.

**Arpit Joshipura**

Arpit Joshipura, Dell. Nice to see some familiar faces here.

**Juan Tellez**

My name is Juan Tellez. I'm representing Apcera. We're building a pass for the Cloud which we called the World's First Hybrid Cloud Operating System.

**Jeremiah Caron**

Okay, great. So, we have a number of speakers here, all of whom have some really good ideas about how service providers of all stripes can innovate in this marketplace the way it is structured today. So, I'm going to ask you all a question and if you could kind of be succinct and then we'll have some interactivity. I'm actually going to start with the new guy who just walked up because you are a service provider. You work with a service provider. So, what's NTT thinking about in terms of how it wants to innovate in terms of its cloud service offerings and what are the key things and again, if you could all keep it kind of brief and we'll have some interactivity.

**Tom Gowan**

Sure. So, the NTT vision has really been to transform our managed infrastructure services into more of a managed ICT service provider delivering more application management and getting more into the application stack. When we saw the move to most of the application services turning into cloud services, software as a services, we realised quite quickly that we needed to bolster the infrastructure to be able to support and enable a lot of these software-enabled and API-enabled functions to drive services to the Cloud. So, what we've been doing for the last five years has really been innovating in the use of SDN and NFV technologies to drive services into a cloud-based arena and then also to drive agility and performance support. We're basically creating an orchestration layer or an abstraction layer of how developers can actually

turn up services on demand and not have to worry about building the infrastructure or the integration of the infrastructure. So, there is a lot of innovative things that NTT is working on to basically expand the SDN and NFV technologies into more of a marketplace that can push cloud-based services or application-based services into a cloud-based on demand model and then how do you build an orchestration layer on top of that that allows customers to take advantage of all those features.

### **Jeremiah Caron**

Now, Current Analysis works with NTT as well as a lot of other operators and I can concur that NTT is really driving leadership. If I were to pick one company, and not just because you're sitting here, that is actually innovating as best they can in this marketplace, I would pick that.

Now, leading into my question for Mike, what's the role of standards, or what's the role of open source approaches? Is this something that NTT really requires, or are you kind of cutting your own path and then the market will come as it does?

### **Tom Caron**

NTT looks at it in two different areas. The first area is to drive innovation we have to look at open source and open source technology. Our first private cloud, global private cloud offering utilises SDN technology using OpenFlow switches. So, we've been a member of the ONF Forum and basically worked together with ONF to basically rollout the first production environment of an SDN-enabled cloud.

But, we also have deep relationships with partners like Cisco and Emware, and so we have to also respect that there is going to be privatised protocols and privatised things that enterprise customers may just want the reliability of. They may not want to take a risk on an open source or something. So, all the open source that we look at is driven towards the developer community and how do we develop a resource that any developer can use with an open structure.

But, the enterprise infrastructure and operation side of the house requires reliability and stability. So we like to make sure that there is still some proprietary known vendors out there that are known for high availability and delivery

### **Jeremiah Caron**

Right, okay. Leading right into Mike. So, you know, we had a little discussion via email etc., open source is something you're pretty passionate about. So, can you talk about what the importance is and is it a good thing or is it something that maybe perhaps could hold back the industry from growing where it needs to go? So, what are your thoughts on that?

**Mike McBride**

Yes, the short story, it is a good thing. I'd probably answer it this way. We're seeing a lot of our customers and partners really becoming software companies. NTT would probably agree with that and they're moving towards that direction.

It was AT&T recently at their Mobile Congress that said over the last eight years they've seen 100,000% increase in their mobile data traffic. How do you keep up with that growth? You're really only able to do that through software. You're not able to keep up with that with the equipment. So, if the focus is on software, then, of course, you start looking at all right so we have a lot of these standards. We have a lot of these open source communities happening now. We're seeing a lot of our customers and partners becoming involved in OpenDaylight. The new kid on the block is ONOS out of ON Labs, Open Networking Operating Systems. All the major players are a part of both of these main open source projects. That includes OpenStack as well. They all have a lot of momentum.

So, what about the traditional standards organisations? I'm a long time ITF guy. Even to this day I Chair a working group at the ITF. So, what about us? Well, we're still doing a lot of good things. I mean the Internet is amazingly successful and that comes from protocols that were developed within the ITF, but we do need to change and develop to be able to be much more quick. We're slow. We take forever to be able to create the standard and open source doesn't have to do that. They have hundreds of developers. They're all agreeing on what it should look like and boom, it's gone.

So, I think going forward, open source is going to be even more relevant. Traditional standards bodies are still going to be relevant into the future, but they will need to be much more quickly able to innovate.

**Jeremiah Caron**

I think one of the things from our studies that has come out that's quite interesting is that the areas, and we're talking about operators and their use of standards for NFV and SDN, is it's pretty low on their concerns, standards. They have other things that they're more worried about. It's not that they don't care about standards. They clearly do. But it's that I think they have faith that the industry will come together and then it comes down to the speed which the Keynote speaker brought that. Standards help things go faster. So, we'll see what happens there.

But on that topic, if I can move to Juan from Apcera. The issue of the development environment and what companies are using in terms of the trends and what's going on there, a term that comes up quite often is containers and how that works and Docker and is that the ultimate solution. What are your or Apcera's thoughts on how development for cloud services environments can aid innovation?

**Juan Tellez**

So, about anybody year ago this company came out of nowhere called Docker and it got a lot of traction with development environments and developers quickly started adopting. The question is why? One of the key answers to that is the speed at which they were able to begin to assemble applications, the concept of micro services. As you observed that going through the year and early this year you see that velocity of Docker slowing down as the market begins to see that the generalised concept of containers is what is moving the market and it is what is causing all that action in that space.

Containers allow you to create a symbol, multiple pieces, multiple micro services into bigger applications and that creates a lot of speed of development. So, I see a lot of corporations trying to take advantage of that speed and in development environment and going forward, what we want to see is what happens to those applications that get developed in that style using Docker containers, using CoreOS, using other containerising orchestrations like Apcera (inaudible), Mesosphere. What happens when these types of applications start going into production?

**Jeremiah Caron**

Given the trend that you just described, are enterprises and are the services companies delivering offerings to enterprises? Are they faced with the sort of confusing array of options and choices? Is that the state we're in now?

**Juan Tellez**

Yes. There is a little bit of that. Some of the companies I have talked to so far, they're saying they're very interested in Docker. They're putting Docker or containers or platforms in their development environment, but they don't know what to do going forward because there is so much movement, so much speed happening. Even to us in the industry, we're building containers. We're amazed at the speed that things are going. Just a couple of days ago I noticed an announcement of a relationship between VMWare and CoreOS. Who would have known?

So, yes, there is some confusion in the market. I think corporations are beginning to look at trying to move into the Cloud and they don't want to jump whole hog into it and that's why hybrid is a hot thing in 2015. Corporations may want to keep their databases in-house and then have some of the processing out in the Cloud. They don't want a lock in. Corporations don't want to be stuck with just AWS or just GCE. They want to be able to have kind of a, if you would say, either a standard or a way to move from one to the other, or to be able to do both at the same time, have part of your application in-house and part of the application sitting in AWS.

**Jeremiah Caron**

Yes. Multi-cloud, there is other terms for it.

**Juan Tellez**

Yes. So, multi-cloud, hybrid, yes.

**Jeremiah Caron**

Is the future reality, right, and for some cutting edge enterprises it's a reality today and making them work together as well as integrate with their on-prem datacentre space solutions is a tricky thing.

Kevin, so, in terms of the connectivity to support that ideal that enterprises seem to want and that the market seems to be moving toward does create some connectivity issues. In terms of meeting the demand, or the potential demand for this, what are you seeing service providers offering and how does software defined networking and/or NFV help or hurt that endeavour?

**Kevin Vachon**

Sure. There is an awful lot of innovation going on with respect to service development, new service. Obviously there is a general global trend towards development of more dynamic, on-demand type connectivity services. Much of that is driven by Cloud, but it's just driven by customer need for being able to run their businesses in a more agile way as well.

SDN and NFV become critical enablers of that, the ability to control the network from software, obviously Cloud-driven, the ability to have virtual interfaces turned up to provide the time to market for new service types.

But, there is something that is not I think being talked about too much here and I see it when I speak with a lot of service providers. I think there is a big training issue in the sales organisations of some of the service providers because when I speak to the engineering side of the house, the development side of the house, the strategists, they're talking about all this new service innovation and development. Many of the sales people are selling what is easiest to sell. They're not necessarily providing future-proof type offerings to the service providers. It might be easier to sell if you have some kind of legacy service, you have capacity in your network, you can put the order in, it's easy, it's fast, you turn it up right now, I get my commission. I'm seeing that kind of on a repetitive basis.

So, you see the innovators in the market, they've taken steps to ensure that their sales teams are fully aware of the new generation of services coming to market, where their particular organisation is going and you see others that aren't there. I think that we're

seeing that particularly as you move down to the mid-market where the customer's sophistication in terms of the availability of offerings is lower than say larger enterprises.

### **Jeremiah Caron**

Yes. This is an issue I think that maybe NTT is seeing this. But there is a promise of the capability to switch our providers and to do something in a different way in terms of connectivity or indeed application services. The promise is that's going to be much more flexible than it has in the past, but maybe we're not there yet. There still is this sort of lock in thing.

So, Arpit, I want to shift to you. We've covered a lot of ground. I'm not sure how we're doing on time, but I get this feeling, five minutes okay, that we're kind of winding down. Being from Dell, Dell is involved in lots of different things. But, one way of looking at it is you represent IT on this panel. From what you've heard, how has it mapped your understanding of what enterprises want in terms of cloud services and what they want to see happen?

### **Arpit Joshipura**

Sure. So, first of all, it's ironical that we are having a cloud summit in sunny California. That's kind of okay, very good, good start.

Secondly, I think it's a very simple vision that we have starting from Michael Dell which is take technology and bring it to the masses. Yes, we start with IT and IT is moving to a software defined world. We know that. It's been out there for three years. The heart of it is a compute X86-based infrastructure and then you have different services running on it. That same disruption that happened in IT has not just started, but has accelerated on the carrier side.

So, enterprise is one market. It's already gone software defined. Carriers, we call it NFV, but NFV is a sum of SDN plus more. So, carriers are going software defined and they're all trying to mimic what we call the web and the cloud providers in terms of agility and efficiency.

So, everybody wants to get the efficiency of a Facebook or a Google or a Microsoft or an Amazon and everybody wants to sort of provide that level of services, but they don't realise that the workloads that run in the web environment are single purpose. You're not running 20 workloads like Oracle and SAP and Exchange and [Hana] and things like that in a web environment. So, what we are thinking is very simple. There is three pieces to the entire things that we have talked about, I mean if I summarise all the discussion. There is the infrastructure piece and then on the top there is the services piece which is really very important and then there is everything in the middle.

I think the problem is everything in the middle because that's where how do you connect? How do you orchestrate? You know, things like that and that's what the problem is. That's the software definition.

Infrastructure, I agree with the team here, it's open source first and open standards. I think that one will happen because that gets you the mass adoption. You cannot keep going proprietary things. Mainframes die. Eventually things that are proprietary will die. Open wins all the time.

### **Jeremiah Caron**

Thank you very much for that. Let me sort of come back to where we started with Tom. From NTT's perspective, this came up at dinner last night and I think it's a really good point, is this about innovating with cloud services and trying to anticipate enterprise or customer demands? Is it about simply retaining the relationships that you have, or is there a genuine opportunity to differentiate versus your global MNC competitors in this space, or is it really table sticks?

### **Tom Gowan**

No. I think the idea is that NTT has realised that IT has changed. IT is now software-enabled, as you said, and I think we realised from early on that our clients were not going to put all of their workloads into the Cloud. There is going to be a hybrid type of environment where certain workloads still need mission criticality, need to be owned centrally. Certain workloads are web-enabled. Certain workloads maybe are not today web-enabled, but can be in the future. So, our strategy has really been as we sell the future infrastructure services, that they're enabled to integrate. Integration is probably the key for us. The seamless integration of connecting private cloud with public cloud, with global network options, with NFV options in the Cloud with UC options in the Cloud, those types of things.

So, back to your point about the sales teams we're not selling innovation upfront, I think the idea is we realised in the beginning we tried to sell that vision, but enterprises weren't biting in the frontend because they didn't see the migration path as being a switch. They saw it as being a gradual integration with all these other things. So, our job was really to make the customers have that integration capability and have that enabled infrastructure that has SDN and NFV built into the infrastructure that can support those future Cloud innovations and then three years, five years from now, those customers will be totally integrated. But I think it's going to take some time.

### **Jeremiah Caron**

Okay, well I think we ought to wrap it up. I really want to thank you all for your clarity. I think all of the points were made in a very straightforward way, so I much appreciate that and I think everyone is around, so if you have questions, follow-up,

there will be an opportunity to interact. Are we taking questions now, Manek? Are there any questions now based on what you've heard?

## *Audience Q&A*

### **Angus Robertson - Hubble**

Juan, you talked about CSP lock in. What do you see as the main drivers for enterprises to say, "No, that's not what I want?" I mean as long as they're getting the service, or as long as they're getting the business impact they need, do they really care about that? Why do you see enterprises looking at having a little bit more flexibility around the cloud service providers they can use? Any particular drivers?

### **Juan Tellez**

Excuse me, any particular what?

### **Angus Robertson**

Drivers for the enterprise.

### **Juan Tellez**

Yes. Well, the IT organisations are looking for excuses not to jump out. One of the biggest excuses is security. So, that's been one of the things that are hanging out there. What we're seeing as we begin to look at the market and as we offer hybrid solutions, we are finding that companies that were not willing to jump into the Cloud until we started offering a hybrid option are suddenly more willing to consider going into say WS because they know they could easily switch to GCE or some other option, or OpenStack without a lot of effort.

Up until that point they were thinking okay, these are proprietary interfaces and going to stay away.

### **Arpit Joshipura**

There are tools available now, software available, to port applications between clouds, between on-prem and off-prem. Dell has several of these. So, what happens is those directly tie in with the applications and workloads and it's a seamless migration right, because at the end of the day the IT team in an enterprise does not want to look like they are behind. When an employee says, "Hey man, I have connectivity that's faster

at home. I can bring my own device. I can do whatever I want and I can't get that at work. It takes forever for you to do that". So, they want to keep up also.

### **Tom Gowan**

And certain service providers have orchestration capabilities to drive exactly that point. The point is that certain workloads don't need high performance, so you can actually save business costs by putting certain workloads into more of the public cloud, but then managing. How do you manage all of the different possible clouds that are available to you and migrating workloads between those clouds dynamically as new clouds become available, or as new pricing in cloud models change and shift? So, the key for us is an orchestration layer that gives you a visibility of the whole cloud architecture.

### **Juan Tellez**

It is amazing at this day I'm still hearing from a customer that it takes him seven weeks to provision a development environment, which is insane. We've been able to have options to very quickly move for developers I think is critical.

### **Jeremiah Caron**

Okay. Sorry, one more question.

### **Scott Raynovich - The Rayno Report**

There was a lot of talk about the trend of service providers deploying these new software-based provision services. Can you give me examples of some of the most successful ones you've seen in the market, whether it's an NFV service or an open type of cloud service that we're seeing now?

### **Arpit Joshipura**

I can start and maybe we can build on. So, service providers, again, don't look at the market as service providers, as just telcos. They could be telcos. They could be cable companies. They could be cloud service providers, or just software as a service provider. There is a whole bunch of service providers.

So, one example I will give you is if you are a training house and we have companies globally that have a need where a course or a department needs to be fired up. It's for a day, two days, five days. The IT admin will just use SDN and fire it up, get it going, it's done. VMs are taken down. Servers are out. Networks are reconnected. VLANs everything goes where it needs to be and it's reused for some other service. Very agile, on-demand type compute pods. You can do it today and companies have done it today.

Just like if you are looking at Facebook, the way they do things is a very dynamic mem cash type environment where everything is all dynamic searches and links and things like that.

So, you know, behind the scenes you get a lot of agility in terms of use cases. I'm sure there are plenty of other examples that we can give.

### **Tom Gowan**

Like Arpit said, for us it's all about the services. So, services come first and then how do you deliver those services on the backend. So, for NTT, for example, we already have an NFV network function virtualisation services built into the backbone of our network delivery. So, if I'm a network backbone customer I can just go to a portal and switch on firewall services, or LAN acceleration services. These things are available today.

The future for us in the innovation space is going to be how do I make, number one, a marketplace of those services so now my customers can buy from any vendor anywhere a software-enabled device and connect it and integrate it to what they have today from a backbone and a datacentre infrastructure perspective.

But then the golden key really is to get to the point where developers can just go to a portal and say, "I want to turn up this cluster on this workload" and automatically in the background there is an orchestration engine that will say, "Here's what you need infrastructure-wise. Here are the best cloud providers that can do that". Once we understand who the stakeholders are involved in that instance. Is it for research or development? Is it for mission critical? Is it whatever? That all happens behind the scene. That middle part that Arpit was saying is the orchestration part. It's basically saying the customers shouldn't have to worry about that. They should just say I want X service and then that service is provisioned automatically and that's basically where NTT is going today and we have a bunch of services already in the cloud, but the larger scope is really to enable cross-cloud service.

### **Mike McBride**

Just 20 seconds.

### **Jeremiah Caron**

Yes, yes, go for it.

### **Mike McBride**

I will just jump in with a little bit. Thank you. So, network on demand of course is a service that is being rolled out as described and we're also seeing virtual home

gateways, virtual set top box, virtual enterprise gateways also being virtualised and moved into either the BNG or into the cloud. The decision that service providers have to make is whether to develop their own in-house solutions to do this, or to utilise vendor's solutions.

### **Jeremiah Caron**

Yes. I think that on the B2B side definitely the network on demand service is something we're seeing. There is not a name check company. There are multiples companies, but Colt in the UK and there are a couple of others.

I think we will wrap it up. We are just about ready to launch at Current Analysis an SDN-enabled services tracker which will do success tracking. So, Scott, if you would like to enquire about purchasing access to our services, we can have a chat. But anyway, thank you to everybody.

[End]