

NETEVENTS

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Debate VII - OpenFlow, OpenStack and Open Everything: What Open Source, SDN, NFV, and Cloud Standards Mean for Bringing Open Networking and Open Cloud to the Industry

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Let's get this show on the road, as I believe they say in this country. So standards, open standards. The open standards movement loves standards so much there are loads of them. Are there too many? Are they going to succeed? Who knows? John Fruehe is going to come and take us through the whole sort of open standards thing. John and your panel come on down let's talk about that stuff.

John Fruehe

Alright, we're going to talk about software-defined networking, open source, open standards and all those other great things. This basically happens because every single business has said I need to be more agile. Every CEO, every CIO is thinking about how do I move quicker. It's not about changing the network. If the network worked great

everybody would still continue to do what they're doing. But you see companies like these who didn't move fast, who missed the market, who missed the opportunity and those are the things that ultimately hurt businesses. In order to move faster they have to change their networking because today's networks are broken. There is nobody out there that likes the way they are doing it but it is the way we've always done it and it's very painful to change. But we have to have some change because the business world is moving faster and the network can't keep up.

What we see now is a lot of companies talking about the idea of digital transformation and it is a fancy word. But what it really boils down to is I need things that are open, programmable and scalable and that in essence is exactly what software-defined networking is all about. Software-defined networking really spreads across the entire enterprise. You see everything becoming software-defined today.

I always say that VMware would have done a tremendous service to the industry if they had used the phrase software-defined servers instead of virtualisation. We have software-defined servers. We have software-defined storage.

Software-defined networking touches everything from the Davis Centre, the campus, the branch office, carriers and even cloud services.

So what I'd like to do is introduce the panel here. Let them tell you a little bit about who they are, what they do and how software-defined networking is really going to work in their environments.

Jeff.

Jeff Baher

Thank you. I'm Jeff Baher. I head up the Product and Technical Marketing for Dell EMC Networking and our service provider solutions. I report to Tom Burns who you heard earlier today.

I think you nailed, right. For us we see a significant opportunity when we look at networking fundamentally to disaggregate the hardware from the software. If you peel that back you will find over the last couple of years there's this significant opportunity not just disaggregating the core elements of hardware and software, but even within the hardware itself there is a significant amount of opportunity to disaggregate at the silicon level, the hardware and platform abstraction and, of course, what we're doing at the software level. So this is the beginning of a very, very exciting time that ultimately is about opening up networking finally to the role of innovation and exposing a significant amount choice to customers on their journey.

Mike.

Mike Capuano

Sure. Mike Capuano VP of Marketing at Infinera. Some of you came out to our facility the other day. Can I give a little background on Infinera so people understand where I'm coming from here?

So Jeff, coming from the Dell EMC world is going to be more of a layer-two or layer-three switching guy. Infinera does transport and so when think transport you should think primarily optical transmission. One of the things to remember with optical transmission is we're moving photons around the network and you cannot create photons and software. So it's important to know that at some point you do need physical innovation that will create more photons with less space and power.

Infinera focuses on that plus software. We're pretty well known for the PIC, photonic integrated circuit. We combined that with electronics to create high capacity signals that travel across the fibre. We take those chips. We build them into systems. Those are basically boxes, boxes that are connected by software including SDN. Our service throughout our customers and our web-scale customers, the ICPs, build networks with those. So that's kind of what we do. We're vertically integrated.

So my angle here is going to be talking about programmability of that part of the network. When you're at that part of the network there are digital elements where you've got some switching involved. Whether it is OTN switching or packet switching. But there's also the transmission piece which is analogue and that is a very complicated nuanced place that is fairly difficult to control with software. So when I talk you'll hear that viewpoint.

So our goal is to have this transport network and on top of that we do different layers of abstraction. We provide access directly to the platforms through things like [NetComm]. We provide a next layer up of an abstraction layer called our Open Transport Switch software, which gives a little bit more abstraction. Then just recently, we have announced our Xceed software which is based on the ODL controller, open source control software and that gives yet another layer of abstraction. So what we try to do is build the most programmable transport network that will plug into any third party orchestrator at whatever layer of abstraction the service provider wants to use.

Some service providers have enough resources or ICPs have enough resources where they want to write directly to the box. Some have a layer of abstraction because they have their own controller already. Some want the whole thing they want the full controller. So that's kind of the way we look at the market. But our goal is to make our network completely open and completely programmable through those different layers of abstraction.

Neela Jacques

Sure. My name is Neela Jacques. For those not familiar with OpenDaylight we're one of the largest open source projects in the world. If you've heard of Lynx or you've heard of OpenStack, OpenDaylight is very similar except that we focus very much on networking and specifically within networking software-defined networking.

The reason that we exist is because some of the things that these folks have been alluding to which is the network is the key to so much of innovation that exists in our world today. If you look at it, if you think about your device in your pocket which is more powerful than the biggest supercomputer in the world. For \$800 you now have the power to calculate almost anything, to hold almost anything. You get on a plane, you put it in airplane mode, and it becomes an \$800 brick. Because the network has become so crucial and critical to almost every part of our lives as consumers as well as businesses.

But unfortunately, we're still doing networking, managing networking the same way that we were 20, 30, 40, 50 years ago. We still manage things in a bespoke managing directly to a box. What you hear over and over again is for us to get to the next generation of innovation. Whether you're looking at cloud, IOT, self-driving cars or anything else that you can imagine. All of this requires an agile programmable network. But the problem inherently is it's hard to innovation in the network because the network is inherently connected. You can come in and create a much better virtualisation software. You can come in and create a much better storage array and put it under a desk. But in the network immediately the question is, hey this is really nice but will it take down my network. Because if does on United Airlines I can't have any planes fly for the next six to seven hours.

So the reason OpenDaylight exists is that the industry has needed a Lynx, a TCP/IP. One platform that everybody could contribute to and that everybody could leverage. Today three and a half years after being created OpenDaylight is by far the largest most successful open source project in the networking industry. Being leveraged by lots of folks like Infinera. Being installed at the heart of the biggest networks in the world like AT&Ts, Tencent and Comcast.

Steve.

Steve Garrison

Steve Garrison, ZeroStack. We sell a cloud platform and we have neutron and open virtual switch embedded in the software as part of our software-defined storage as well as storage management and server management. So we've got a piece of the puzzle in there.

In general, over the last five years of my life I've spent a lot of time trying to help enterprises consume open source technology. I think that it could be a good avenue for this panel to attack. Because open source is perceived to be low cost. But what you save in CapEx you make up in OpEx so unless it's well packaged or you work with great organisations like OpenDaylight who help you with tools and best practices and interoperability studies and things like that. So open source isn't a panacea if it is unwieldy and not well packaged by the organisations promoting it.

John Fruehe

Now one of the keys for software-defined networking is the fact that it splits the control plane and the data plane that's really that fundamental essence of what it is. A lot of that is actually just disaggregation. I've heard several people talk about disaggregation. How does the panel see disaggregation happening and in what different ways across the network?

Jeff Baher

I'll start. I think if you grew up with servers, disaggregation doesn't really seem like that big a deal. You know you go back to the late '80s and we were disaggregating the mainframe into service storage and networking. The server fundamentally was disaggregated at that moment. You had an ecosystem of manufacturers with semiconductors. You had another ecosystem. There was wrapping metal and building systems. You had operating systems and then applications. Then obviously later virtualisation software.

That's the world that networking is now trying to catch to. Over the last 20 years hardware, software for networking came together inextricably tied and monetised in that way. That is simply not the way that the same customer had been procuring some of the same other elements in their data centre. So this is the shift in economics. It's a shift and opening of the innovation. Ultimately, we believe that there's a strength in numbers. The more people we have that can innovate at the different layers of the infrastructure, at semiconductors, at systems and software versus having a small set of suppliers like [Wang, Amdahl] and IBM. You cannot do it. There's just not enough from a velocity perspective.

Dell obviously grew up with that in our DNA. As we look towards networking that's the major opportunity.

John Fruehe

Right, anybody else?

Mike Capuano

Sure. So from the transport view we definitely have seen disaggregation in the digital domain layer 2 switching. Starting to see it with layer 3 routing. In terms of transport where we've seen disaggregation there's a trend around open line systems. So you'll typically have these things called transponders and they actually shoot the photons out that would connect to another transponder somewhere. That's the analogue domain. But they have to go in to a line system that amplifies the signal over time. Typically, those things have all been sold together as one package by a transport vendor.

So the first thing we're seeing to be disaggregated is this line system. For example, Infinera recently tested and validated our solution against Lumentum's white box open

line system, Whitebox WSS. So now you can go buy transponders from Infinera or terminal equipment from Infinera and you can buy Whitebox solution from Lumentum. So that's a type of disaggregation that's starting to happen in the optical world.

I had this question when we had folks out. In terms of actual transponder to transponder there's talk about that. There's initiatives around that. But that's a really hard problem because it's analogue. There will probably be progress over time. The trade-off is if I can get these two end pieces from one company that gives me 30 per cent more capacity on my fibre across the Atlantic that I paid 300 million dollars for, I'm probably going to take that. So what has to happen is there needs to be enough value in different transponders talking to each other to overcome the economics of innovation in the analogue domain that I said is very nuanced. So that's kind of the reality of transponder to transponder right now.

John Fruehe

Okay. Now disaggregation is one part of the game. But the other part of it Neela and Steve is when the market actually starts to take off and you see more and more people getting involved and shares start to pick up there starts to be consolidation. People see these technologies as interesting. So do you expect that as software-defined networking becomes more mainstream you'll see more consolidations, you'll see more plays like that in the market?

Neela Jacques

I think yes and no. Some of you may have seen I wrote an article about what's driving this explosion in open source. I argued that it is that platforms have never been as important as they are today. We've moving from a world in which, like the last two speakers said, where everybody basically built a vertical stack and you maintained your vertical stack.

Now where we've come is a completely different model. A model that is more modular. A model that is more abstracted. Really if you think about that, what you want is the model that works the best. It's having a common platform that many people leverage. So is it more integrated, you know, there are some companies getting bigger some companies getting smaller. It's not necessarily about the size. But once you have a great platform that everybody can leverage then you unlock a tremendous amount innovation on top. You can have industry leaders as well as little start-ups all coming up with new technology that plugs into it.

We've seen it so much in the mobile phone. The power of having a couple of platforms out there and then allowing a gazillion people. We've seen it in the internet, this is the future of technology in the future of network.

Steve Garrison

Yeah I think that's spot on Neela. I think there's actually is a share shift going on now. I think companies like Dell who are open-minded, no pun intended Jeff, in a good way. You get that open integration and having different choice for the customer is great. There are other companies out there that start with a C that don't get it. They're going to be the losers long term.

I think beyond just disaggregation there's another key idea here with openness and open networking. It's a common set of APIs. I think the controller is one of those. But also how do I just connect with things. So RESTful/OpenStack APIs are becoming very prolific as a gateway between adjacent devices. This creates a new kind of ecosystem. Again the vertical single box, think IMB mainframe think traditional Legacy as I call them, networking companies. The new guys want to create a new ecosystem that goes sideways and the [modularity].

The key I think is customers want choice. But again, we have to have standards, tools, and helpful hints. Because just putting these things together, they're not Lego blocks. I found a lot of teams want to get there but we as an industry have to help through education and standards bodies. Again, I think OpenDaylight is doing a great job in that sense.

John Fruehe

Great that you can bring up standardisation because that ties up perfectly my next question which is standards are wonderful. They allow everybody to be able to do things in a common way. They allow you to accelerate a lot of the time to market in these products by reducing a lot of the uncertainty. But at the same time does standardisation limit innovation for companies?

Jeff Baher

I'll start. I think it's a balance, right. Open source gives us an opportunity to get to some places faster. But the standards give us an opportunity to extend that to a larger development base. Maybe, for example, the fact that we all know to drive on one side of the road because it's a standard for how we can innovation with transportation. So it could be that there is a kind of a back and forth between adjacent markets that require standardisation to unlock innovation within another. So I think they're very tied you need both to measure and test markets and incubate but then also to solidify.

John Fruehe

Steve.

Steve Garrison

Yes I was just going to jump in with [unclear] in there which is certification. I think standards are good for one class of products. But would people really want to know whether APIs or just Plug and Play software is it been certified by somebody to comply so it really does plug and play. So I think certification is a softer standard, if you will. But it gets the same benefit to the community.

Just in your initial part of the question, John. I definitely think standardisation hurts if the standard bodies are manoeuvred and managed by the big vendors who don't allow innovation. So democracy in the standardisation process is actually a goal [laughs] and not always the achieved goal that's the goal from the start-ups anyway.

Neela Jacques

Actually just to build on what Jeff said. I think imagine two extremes. In one extreme, everybody goes on a standard and the problem is you don't have any innovation, right. The great news is everything works with each other but you have to continue turning the plug over and over again, right. On the other hand, you could say, hey free for all. No standards. Everybody standardises with themselves. That could come about because people reject standards. Or that could come about because everybody goes and writes their own standard.

Clearly, what we need is something in-between. We need some level of standardisation. We need some level of collaboration. Some level of common platform and it can come from one company. If we think of something like [vSphere]. It's been a good example of an industry standard that's really been driven by one company. So you can get these standard groupings that happen. But at the same time, you need room for people to come in and say this isn't working for us right now. We're going to go try to create another one.

So I usually say within my own community, for things that are relatively early I like to see two or three different approaches come up. I will encourage for a few years two or three different approaches. I don't want 10. But I also don't want just one.

Then the second part is over time as things become more mature it's important to encourage people to put aside their desire to see their way win and to actually collaborate and work with others. Because often, you know what, it's more important to be on the standard one than the one that's two per cent better.

Mike Capuano

I think I'd like to get your all opinion on this but it seems like when it comes to APIs and information models in the networking space, we do have a few right now right. We've [MEF]. We've got ITF. We've got ONF, [unclear]. So we've got a few of those going on and maybe to your point Neela when you look at how things shake out it seems like - you guys can feel free to disagree with me. But [on box] kind of configuration management is now narrowed down to sort of one or two [NetComm and OpenFig]. So the shakeout is starting to happen. But I do think right now to really move forward

there's a lot of choices for network programmability information models and APIs that somehow the industry needs to figure out how to get those to shake out where it's going to be challenging. Because right now as a company we look at, we pick one information model and one sort of API and we've got to do translators for the other ones and it gets really complicated [unclear].

Jeff Baher

Well this is back to my point that too much is too much and this is back to Neela's point. We're already way beyond critical mass now and little vendors can't afford to support all those, big vendors even don't do them all well and customers are just left in the trenches going hang on nothing works. So it is chaos if we go crazy on this.

I've got to talk about the elephant in the room which is a standard. Whatever kind of standard it is. Where there is a hard standard, a spec or whether it is open source. There is always an interest to try to get your technology, the thing that your three years in investment cycle in, to become the standard. You immediately get an advantage over everyone. That's not evil. That's not bad. That's business. Right. If you're a leader your interest is to maintain your leadership. If you're instead, if you're a hungry start-up your interests change. Doesn't matter what that change is, whether it is better or worse. You just want to change things up because that gives you a better chance to end up winning.

So we have to recognise that in an industry like this you have these dynamics. You have players. Every player in the room has an interest. Everybody at this table potentially everybody sitting there. So people like myself, and we play many different roles, have to find a way to how do you balance that. How do you take all of those energies all of those interests and leverage them so that you get something, which works, for the greater good. Right. It's a delicate dance to be honest and some people have been more successful at it than others. I'll have to be honest.

John Fruehe

Absolutely. Now one of the things - we've got a lot of college graduates. It's that time of the year. Everybody is off looking for their new jobs. Five years ago, if you were a college graduate you wanted to go work at Amazon. You wanted to work at Google. You wanted to look at Facebook. Because those were the cool companies that were doing interesting things. But if you own a television and you live in the United States, you probably have been inundated with ads for GE. Where they talk about GE and our apps and our development and our software. It seems off that somebody would do that.

But what we've finding is the coolest companies now for graduates to work for GE, Walmart some of the traditional. Because they're utilising a lot of open source. Now the reason that they're doing this is because they can attract developers from open source. How do you see this influx of open source developer coming in and people anxious to

work on this, changing the mind-set and the methodology of some of these older companies?

Jeff Baher

I think it's mandatory John. I mean that's the whole point I made before that if there's not trained people on the trenches to make open source work you're left to the vendor. We all know that cannot necessarily be a nice and even-handed journey. So you know there's an analogy, right, why did public cloud take off from 2008. There was a recession. So there was a whole wave of people who expect public cloud service and behaviour from their cloud. I think the same thing is happening with open source now and thank goodness, right. Because I don't think open source can take off unless there's people in the trenches who actually embrace and feel that that their love.

I would just add you hit on certifications from a different angle. I think, you know, especially for those college grads that are out there. Do I get a CCIE and do I build my career on that? Is that the future for networking or is it something different? Then what are those certifications for an [open world or an open source world].

But I think what we're witnessing is a shift in the way in which we all relate and consume technology and the box has opened up. Literally the box and then the bits within that. That is where as you expose those bits that is coming from the community. That's not coming from the suppliers. We don't have architectures that are specifying how you do things. That's the way we've been doing it for the last 20 or 30 years. This shift is happening that it's in a community. We're learning from the Amazons, from the Walmarts. We're not learning from design guides you get from your supplier from the last 10 or 20 years. So this is a central element to all of us in the future.

John Fruehe

The last panel was on IOT. How do you see IOT influencing what happens with software-defined networking?

Neela Jacques

Well let's talk a few simple things. To take one-step just before IOT. Why are we talked about SDN today? Great little data point that AT&T shared with me recently. Do you know how much data traffic on the AT&T network has increased over the last 10 years? One and fifty percent, 1000 per cent, 10,000 per cent. It's actually 150,000 per cent. Right and that just all of us streaming video and you know WeChat and Facebook.

John Fruehe

That's a lot of cat videos.

Neela Jacques

The next thing you think about is suddenly what are all the things in my house. It's not just my [nest camera]. What are all the different things in my house and that is just the consumer side. What about every wheel on a train to figure out whether or not it's got a crack in it? So from an IOT perspective if you look at it it's not about putting a computer everywhere. It's about putting an intelligent device or sensor to be able to get that information and crunch it. Without a network that can handle another 150,000 per cent or whatever it is increase, we're not going to get to IOT. We're not going to get to the self-driving cars that we want.

John Fruehe

We now want to open it up. We've got a lot of intelligent people who are in the audience. Do we have any questions for the panel?

Marcelo Lozano, IT Connect

Hello, Marcelo Lozano from IT Connect Latin America. The question for each of the panellists is how do you see the future of the SIS technology for storage and if you can give your vision about [silence that a corruption] as a security problem for the clouds that are using SATA technology.

John Fruehe

I'm going to pass that one to the storage company.

Steve Garrison

I'm not sure I fully understand the question, so yeah.

John Fruehe

Can we clarify the question?

Marcelo Lozano

I would like to know your vision about the security problem in the cloud for DATA technologies.

Steve Garrison]

I'll pass on that.

John Fruehe

I think we may have the wrong body.

Steve Garrison

We need storage hardware guy.

John Fruehe

We'll take that offline.

Steve Cassidy, Cloud Pro

Yeah, hi. Steve Cassidy Cloud Pro from the UK. There was another elephant in the room in the standards conversation which maybe a reflection of how you see your marketplace versus how the users see their marketplace. I'd be interested to see what you think of the spread or absence of spread of IPv6. Because in implementing the kind of technologies you're talking about and understanding what is even within the world of expressible policies, IPv6 really didn't have software-defined networking in mind during its design phases at all. So I see IPv6 from a European perspective as a series of train crashes. As [impositional] implementations. Sudden nonstandard uses and it certainly doesn't seem to me to be living up to its promises. But maybe you see it very differently from here.

Jeff Baher

I'll let others add to this but we've been talking about IPv6 or IPNG for almost 20 years. So I think what problems they were trying to solve with IP before what they saw was going to happen with v4 and address it with v6. They had a very different universe in their mind back then. There were some that moved quickly to do v6 over v4 and tried to do different things again for I think different use cases than what we're now trying to solve for now.

There was also a tighter relationship back then with the hardware and the software. So moving from v4 to v6 if you were router manufacturer way back when had a pretty big impact on your road map and your chip selection and all of that. So I think that the model has changed. The fact that we've separated the hardware and software control plane elements forwarding plane elements means that solving the problem of a switch in the protocol or a header is a little bit different than it would have been 10 or 20 years ago when they had a significant impact on the hardware.

When we first talked about this, this was [I'm going to have to forklift upgrade my backbone]. That is not happens when you move to v6 necessarily now. So I think that the use case is that the universe has changed and as a result, we're seeing a kind of a [right sizing] of it. But no argument that has had a lot fits and starts over the years.

John Fruehe

Nice answer Jeff.

Guy Hervier, Informatique News

Guy Hervier, Informatique News in Paris. You're talking about open source everything. So in the software area it's that the open source movement is the winner. If you take for example the big data area, I mean, every big project in the world is open source. What do you think in the hardware side? Do you think that the open source movement will also have the same effect? You don't see that many initiatives. For example, you have the IBM initiatives that are on the power processor. But you don't see that many initiatives in the hardware side. What do you think about that?

Jeff Baher

I'll start on this one. I think you know the first thing that's important is open source wins. That doesn't mean that value added doesn't also win. You know, iView the enemy of open source fully proprietary. On the other hand fully open source has a huge problem which is who's going to pay for the developers.

So inherently, I think the reason why open source people wondered would they ever be another Lynx. Would there ever be another [Red Hat]. For a long time it looked like probably not. Then suddenly there are a whole bunch of them and I think the reason is the industry figured out that it wasn't open source or commercial software, it was commercial software and open source. You've been able to get really great meshing of the two. Open source plus value added.

I think if we look on the hardware side, hardware already benefits tremendously from open source. I think as we look at well what value do you add around an open source platform, one of them is differentiated hardware and I think that that's okay.

I think a second part that you can get is that you can get some level of platformization in fully proprietary hardware. We certainly see that at the chipset level and at the CPU level. You know I think things like Open Compute are interesting and will happen. My sense is there is less of a need and inherently hardware has lower agility. So what you'll tend to get is abstraction. You'll get hardware being able to - hardware makers either you focus on doing something fundamentally much better than somebody else or you standardise around a common platform. Then really, a lot of the innovation is abstracted up in the software layer.

Mike Capuano

I completely agree. I think the other thing to think about with open source is where Whitebox, it's a beautiful concept. When you go to a service provider, let me use the example of Infinera transponders over a Whitebox line system. Two separate companies making those components. Who supports it? If I have a problem do I call Lumentum do I call Infinera. Who makes the software that makes them work together? So from a hardware perspective when you think disaggregation equals open source for hardware or something like that. There's stuff that has to wrap around it to deliver a full solution.

Then to the software [plan] in OpenDaylight, we did not plan to sit next to each other. Infinera took that as an example and we've added a lot of value. We get a core SDN controller that moves really fast and that great. Because then we can focus our developer on all the value add around that which is good for us. It's good for customers. It's good for the industry. So I think it's a great model that fuses together really well.

If I could just make one comment which is the manufacturing aspect of hardware which is different than software. So I think there's the expectation that, oh I've got these specs and OCP. I'm going to go make my own server. There's only a few really on the planet that I think can stomach doing that and still support their business. So that's just another angle that I think sometimes gets overlooked when it becomes an x86 proposition. It should be like I should do this on my own, not necessarily.

John Fruehe

I just got the signal that we're now close. So I'm going to step off and thank you all.

Ono Norio, Tsushin Kogyo Shimbun

My name is Ono Norio. Telecom industry newspaper in Japan. Question is [Spoken in foreign language].

George Ozawa

Okay I will translate what [unclear] has just said. In my opinion the optical infrastructure such as FTTP, FTTH fibre to the home is advanced in Japan and perhaps in Korea as compared to the rest of the world. The implementation of the SDN and NFV at the carrier is lagging behind. What do you think of this situation? To Mike.

Mike Capuano

Sure. I think what you're so if you look at the world of service providers or internet content providers there's been a lot of progress on SDN inside the data centre. Because inside the data centre if you think about a large internet content provider like a Google

or Facebook, they kind of started from scratch. They just get to build this fairly homogenous infrastructure consisting of internet switches and servers. Those Ethernets switches, it's fairly easy - I won't say easy I don't want to trivialise it. But it's easier to apply SDN in that environment versus a carrier who's been around for 100 years who's got lots of Legacy infrastructure. There may be some fibre to the home, FTTP. But there's probably still E1s, T1s, and various protocols out there that need to be managed. The service provider has to deliver an SLA to ensure the service is delivered. Inside the data centre, there's different architectures that have been built to allow for failures that you don't really see it. So those Legacy issues are really what's taking so long.

That's why we believe the right thing is to build layers of abstraction even on the Legacy infrastructure with a standard set of APIs to allow the programming of that system. It's the only way and it is moving forward. There's definitely deployments out there. We have deployments. Other folks in the space have deployments. It's moving forward but admittedly it's slow. I think standardising on these APIs will help.

John Fruehe

We have one last question.

Na-Ri Lee, CCTV News

Hi, I'm Na-Ri Lee CCTV News from Korea. So as you know [unclear] is already an IT networking ecosystem. So what do you think how [is this ACI affect] for the progress of open source. What do you think how enterprise customer copy [their strategy]?

Steve Garrison

Maybe I'll start, yeah. So I think when we look in the data centre their perspective has been at least historically to building network and work your way out to storage and the server and then the workloads. With virtualization I think that starts to shift that orientation to lean more where the application the workload and find your way to physical network. There's a lot of customers that are trying now because they've been scaling out their virtual machines then they wanted to add [unclear] like a controller for a network virtualisation overlay.

At the same time they have a physical infrastructure that if it is Cisco they're now thinking that I should invest in ACI and an APIC controller. That's just not, in my mind, going to work. There isn't enough funding to fund a [VMware NSX deployment] if you're also investing in ACI. There's two different worlds that [unclear] will not really come together. Because it's usually a different cockpit experience coming from the virtual side from the physical side. And the complexity, they're both complex. So to try to absorb and digest complexity given the shift that's happening, it's just not tenable. So we see a lot of marketing of NSX plus ACI and match made in heaven. It's not and this is a fundamentally - how it's going to play out, it plays out elsewhere if you look in the campus. You lead with wireless then wired. So we've seen this shift on

both ends of the cord, if you will, and that changes an orientation and a relationship with the technologies and ultimately how you want to operationalise that.

Jeff Baher

A quick answer to this one. I want to take my hat off to both VMware and Cisco who have had really very good execution on some clear strategies. If you're VM where you virtualise everything but the network. You go out you spend a billion three. You buy a little start-up with little sales and you quickly spin up market that focuses really well on the thing that you already do well. Which is basically doing an overlay network based virtualisation. If you're a VMware customer and you buy a whole set of VMware stuff, putting NSX and adding to it. It's probably the best tuck in acquisition that they've been able to do.

On the other side if you look at Cisco that is a market leader that has a whole bunch people who buy a lot of Cisco who's working on the next generation of [swedge]. They do two things really well. Number one they come out with a solid piece of hardware that does seem to perform well. If you're a Cisco shop they then now give you a level of SDN that is tightly controlled around their environment and works quite well.

So I think that they've both invested in those areas. The challenge that you get of course is in both cases this works really, really well if you're a VMware shop or a Cisco only shop. But instead what you really want to do is use technology from lots of different places. If you want to manage overlay plus underlay management and work with start-ups and work with a range of vendors then you've got a problem. Because those solutions are designed in a sense to be able to provide seamless end-to-end solutions within a single vendor's offerings.

John Fruehe

Well thank you very much everybody.

[end]