

NETEVENTS

APAC PRESS & ANALYST SUMMIT

FINAL

*Debate I:
Software Defined Networking (SDN) -
Is It Really the Future of Networking?*

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Software-defined networking – Is it really the future of Networking? And are the big switch vendors finished? Well, data centres, they're facing a crunch, aren't they? They've got complexity. They've got problems with latency. They've got problems with too many servers, if you like, physical servers. They've got lots of traffic, lots of applications, a number of networking protocols and physical layers. And they're in need of more speed, and all of this costs money.

Can the network cope? Traditional networks use decentralised switches with data planes and control planes on the same physical hardware. The question is, is OpenFlow the answer to this? Obviously these guys think so, they are all in favour. We will find out a bit more about that in a minute. What they are proposing is that you have a centralised, managed controller, with OpenFlow data plane switches. We will be talking a bit more about that in a minute.

What they are proposing is that you have a centralised, managed controller, with OpenFlow data plane switches, of which we will be talking a bit now. I have got a diagram that perhaps brings this a bit more to life in a moment. And this technology

has the potential to automate configurations, to improve network efficiency, to reduce the total cost of ownership that Mark has been talking about. But, the question is, can they do it? Because the data centre switch market has an awful lot of inertia in it. There is \$6 billion worth of equipment every year, sold into the data centre networking market. Vendors have been consolidating and, at the moment, the last figures that Gartner had, these figures are all from Gartner, is that the top three vendors had 82% of the port shipments. That's a lot of control in one place. It's a lot of inertia in the market.

In the service provider market, you have \$13 billion dollars worth of equipment sold every year and the top four have 85% of the market. So, in this context, what can the future of software defining network be, can OpenFlow have enough momentum, or, will these proprietary boxes continue to rule? Effectively, what these sorts of numbers mean is that you don't have a lot of turnover of networking equipment, either in the data centre, or, in the service provider market. I will skip through those. Very briefly, these came from the Open Network Foundation.

This is a diagram that gives you a bit of an idea what this is all about. I found this quite a helpful diagram. At the moment, what you have, as I understand it and these guys will correct me if I am wrong, because these guys know far more about it than I do. Each switch obviously has all these things in one place, the custom hardware, the operating system that runs the switch, and the features that run on top of that. The theory is, at the moment, from the SDN point of view, is that the network operator system, as it transitions, will move to become centralised and then, finally, you will get the features moving off the custom hardware and all the hardware will become is, basically, as I describe them, dumb boxes, something that Mark disagrees with.

In that context, let me ask first of all, I asked you Mark whether or not this is a land grab, to try and push Cisco out of its current huge dominance of the networking market. Would you agree from Dell? And from NEC?

Bruce Bateman

I don't think we see this as a land grab, we see this as a change in the community. The community is changing; the customers are asking for more openness, they are asking for more open standards, they are asking for the ability to interact with other products, whereas with HP, Dell also wants to provide you and end to end solution and we believe that the issue here is not just SDN, which controls the network plane, but it also has to do with how you control your storage and your server. So there is a lot more around this than just this one piece. We believe that is the orchestration that we want to look at. It's not so much a land grab as it is a request from the community to be able to take existing equipment, look at best of breed products and integrating them. And so, we have partnerships with other vendors in our ecosystem. How do you integrate with them? That I think is what the community is asking for.

Dr. Atsushi Iwata

The current problem in the data centre market is, for example, that because of increasing number of virtualization software on server side, dynamic network configuration for supporting those environments and flexible flat layer 2 network configuration among several racks are required and have some limitations in the current environment. The current data centre has to support a lot of tenancy (which provides isolation for servers, storage and network for each tenant) for different customers, and the number of current VLAN is limited to the 4k, but the customer wants to have more than 4k because of the flexibility and control of those tenants. The current system doesn't support that. OpenFlow/Software Defined Networking (SDN) can solve this problem very flexibly. For example SDN provides network virtualization capability which provides a slice of virtualized network from layer 2 to layer 4, and thus can provide flat layer 2 network for each tenant. Also SDN provides capability of a network switch pool, a network appliance pool, and a server/storage pool, where SDN controller can define which network, network appliance and server/storage resources can be mapped to each virtualized network, (i.e. tenant), and dynamically configure those resources in an optimized way. In addition, for datacenter market, customer tends to customize the network capability because of rapid changes of datacenter's application changes. However, those customers ask to the current switch and router vendors to add new functions for this, they have to wait for next two years. SDN provides customer's customization capability which runs on SDN controller. If customers want to customize new functions, they simply code a new network application on the controller and run it to get a new network function. This is very beneficial for datacenter customers.

Manek Dubash

Atsushi thank you. Mark, both Bruce and Atsushi have talked about customer requirements, customer driven, and we all know that actually, if you ask a customer what they want, they don't actually know what they want, they kind of know what they don't want, they know what their problem is, so are customers actually asking for this?

Mark Pearson

Yes, I believe they are. Again, as we talk about some of the issues addressing the network administrator, the error-prone nature of managing devices one by one is clearly no longer acceptable, especially in the speed it takes to deploy new applications in today's enterprise. So that's definitely a driver. Automating the infrastructure, making the network requirements cohesive with the systems administrator is another key important area.

Manek Dubash

Ok, a question for Bruce. Migration. As I said, there is a lot of inertia in the market. There is also a lot of inertia within data centres where they are owned by service providers, where they are owned by enterprises. Basically, you don't change your network switches that much, so this is a whole new paradigm if you like, I guess. How are you going to get from here to there?

Bruce Bateman

We believe it's going to be a slow roll, just as virtualisation, I think we said virtualisation started in the early 1990s and now we are virtualised 50%, so that's 10 years and we have only gone 50%. We still see the same thing that happened with network virtualisation. So we will start to see slow changes, we will start to see people doing testing and originally a lot of the SDN OpenFlow was for academics to do testing of networks. We will start to see that. We will start to see migration. But there will be changes. There are other four or five factors in a network. And this is with the 10 gig end to end solutions coming; you will see a lot of need for people or for data centres to change. Power consumption costs are going up. So we see that there will be change but we also see that it will take time.

The issue will come not so much from a technology point of view, but from a financial point of view. Data centre owners will want to reduce their Opex and by spending a little bit on Capex, you can reduce your Opex. Then you would make that change, then you are going to be looking for products that support the new technologies, the OpenFlow, OpenStack and that kind of product, so that's where we see it happening. It will take a few years. There is also a cultural issue. I am a three-tier networking guy from 1995. I grew up in that era. So that's kind of what I am used to. We start to say now, well, am I a CLI guy, so you say SDN marks the end of the CLI. Well, that's kind of what we see, the change, the next-generation network operator will be more about the business side, not the 4.am CLI side. And that's really where we see the change happening and the more sophisticated the network. The other reason why you're going to see change is it's really complex now. And as complex as it is, humans can't do it in time. So, we need tools that will allow us to do it.

Dr. Atsushi Iwata

In addition to the previous comments, there are two cases which are migrating to change OpenFlow/SDN based network. The first one is virtualized machine server-facing network, such as TOR switches and aggregation switches, accommodate SDN easily to connect usual layer 2 / 3 to core switch/routers. The other area is between datacenters. Last week, Google talked about their deployment of OpenFlow between their datacenters in global manner. Inter-DC needs global network view of traffic optimization and thus using OpenFlow to control network path for traffic engineering.

Because those areas have a significant benefit of employing SDN, SDN will be deployed first in those areas and gradually expanded to other areas, such as carrier/provider networks.

Mark Pearson

I'd like to add a few more things to what's tried and changed in the data centre. So we have talked certainly about cloud applications and virtualisation, but there are these other drivers such as Big Data, Hadoop type environments, the consumerisation IT mobility that are all now coming together, that together now drive a lot of change. So, the combination of these things, the need for bandwidth, the need for smart application awareness in the network are the things that are now going to drive the data centre to transition.

Manek Dubash

Ok, so there is a lot to pick up on there and I would like to talk about a lot of the staff issues as well. Obviously, you mentioned Bruce you are a CLI three-tier sort of guy and a lot of people in data centres are going to be like that, obviously no disrespect, I am sure that's perfectly good, but, how are those people going to have to change the way they do things? You also mentioned, and Mark mentioned as well, that you can make configuration changes much more quickly, which obviously means you can propagate your mistakes much more quickly. So, what's the people angle on this?

Mark Pearson

Ok, I will start with that. First of all, the network engineer has a long time to live, so the network engineer does not go away. His particular job may change here, in which now they concentrate on policy in the network instead of device by device CLI. The other aspect is because the network becomes programmable, that the network engineer potentially takes on a job of programming policy and [indiscernible] these open APIs to other systems. So there is actually maybe an expansion in the role of the network engineer, not a decline.

Dr. Atsushi Iwata

The network engineers have to change from CLI for each device to programmable logic for entire network. SDN controller provides a network topology view, traffic conditions, and several ACL policies for security reasons. The network engineers provide a network control policy in a global manner and configure on the SDN controller. This is more high-level network design and management work. Also, by using northbound API, SDN controller can be integrated with server management system, such as VMWare Vcenter, and IBM Tivoli and so on. In this case, network

engineer takes a role of this integrated management part for network design and management.

Bruce Bateman

Actually there are a couple of things here, firstly, big changes in the network, we are flattening the network, we call it distributed core, and there are a lot of reasons for that. But what is going to happen is, the guy who knows how to do the network is your biggest asset and he will be, or she will be, the one who writes your templates, who writes your scripts, who builds. In data centres in the past, it's usually three or four, or in a small data centre, two or three people who really, really understand the data centre and what the concept is and what the business needs. And then you have 10 or 15 or hundreds of people who follow.

What we can do now is take the knowledge of those core people and get them to write the scripts, write the templates and then the team can test them. Network engineers won't go away because, in the end, they still have to understand virtualisation, you still have to understand OSP, AGP and all of these other technologies. So, the difference will be how you use them. Where you might use them at a higher level, a conceptual level and understanding how the network is driven.

Manek Dubash

Ok, let's talk a bit about what the network has to do, the kind of stuff it is carrying. Yes, we have talked about applications, but it also involves, as we touched on a bit earlier when we were discussing this over breakfast, things like storage. Now, storage networks have traditionally been completely separate from the rest of the data centre network, but the way things are going, slowly but surely, is that storage traffic is going to be carried over the production network, or at least perhaps a parallel production network, I don't know. Where does storage come into this?

Dr. Atsushi Iwata

First of all, the current OpenFlow supports TCP/IP traffic. Thus, IP-based storage, such as NAS, iSCSI, are already integrated to OpenFlow/SDN network. And, Fiber Channel, SAN is configured in a separate network from SDN. If SAN needs to be integrated to SDN, SDN have to integrate FCOE switches. As you know, FCOE requires additional requirements such as DataCenter bridging capability and data-loss control for switch buffer management. Technically speaking, if FCOE switches support OpenFlow capability and is integrated with SDN controller, this could be supported in the future. However, because FCOE switches and typical L2/L3 switches (including OpenFlow switches) are different hardware specs, we need to have a gateway function of both islands.

Manek Dubash

So, no blocked traffic basically.

Dr. Atsushi Iwata

Yes, right.

Bruce Bateman

So, at Dell, we definitely agree that we are going to see a change. We are announcing today some blade products that will do 8g and 10g. What is going to happen is that change in those products will support FCoE. What OpenFlow brings is this orchestration question of yes, OpenFlow orchestrates the network, but you have the other parts that need orchestration and this is where Dell believes that it's bringing in network orchestration, virtualised servers, virtualised storage and all of that. OpenFlow and SDN does not make any changes to the blocks of storage, but it's how it flows, and as you virtualise, and as you move your VMs from switch to switch, from data centre to data centre as your controller make these changes, the storage has to go with it and servers have to go with it. So, we have to think about a lot more than just how the workload goes and where the other parts of the application are.

The application we have is SQLdatabase on Tokyo, whereas the application sits here in Hong Kong. So, you may have storage and data in a lot of different places. All of that has to be designed in.

Mark Pearson

Storage obviously has a very unique service level requirement. Obviously it has to be lossless in nature, low latency, high throughput and so portioning a network to carry converged infrastructure, storage, data, it's very important that we allocate the network to have those attributes and it's the introduction of this SDN central control plane which provides a great area to deploy this kind of policy.

Manek Dubash

So we have talked about storage, we have talked about the network. Let's talk about management, because this is going to be key to it all. Mark, in your presentation you touched upon this. If it's all going to work, if it's all going to be cost-effective, then you need, as you said, one pane of glass to manage the whole thing. But of course, hardware vendors being who they are, they all have their own proprietary twists on these things and you will need their management interface to make it all work. Now obviously, in my data centre, I have lots of people's equipment. How is that going to work?

Mark Pearson

I'll go ahead and start this time. So, we are introducing this in the end control plane through our product that we call IMC. IMC, even though it is a single pane of glass for HP networking, it is actually an open system that manages over 6,000 industry standard devices. So, it does provide that robustness across multi vendors. But, the other aspect, as we have been talking today, is this degree of openness and integration and APIs into the other orchestration systems, including the hypervisor management or the cloud orchestration layers. I mentioned OpenStack earlier.

Bruce Bateman

In Dell we have launched our open network, managed network 5.0 tool which manages not only. Dell had a legacy networking business and last year they acquired a company called Force 10 Networks. Our products now not only manage the Dell legacy products but the Force 10 products and third party products. You said earlier that it's a dumb switch and what's the value of a Dell, HP or other vendors' NEC? The value is in those tools. The value is going to be in the extra features that that switch can do and what we can do with that. So, there will be things where the features go up, the ability to do those features still had to be in the switch, so the value will be in our management tools, our value-add will be in our management tools and our orchestration tools, and also in the extra features that the switches can do.

Dr. Atsushi Iwata

OpenFlow/SDN can provide open interface to multiple different SDN switch vendors, and also open interface to multiple different SDN controller vendors. Last April, NEC released NEC's OpenFlow switch and controller products as a commercial use to the datacenter market. Currently, we keep doing interoperability testing with multiple switch vendors, such as IBM, HP, Dell for aiming at a multi-vendor integrated solution. We'll make our controller to support multiple different switch vendors for DC solutions. This is definitely Open strategy and multi-vendor strategy for solution space.

Manek Dubash

Ok, questions from the floor? We have a few. One at the back there, is that you Daniel?

Daniel Bar-Lev - MEF

At the MEF we have been working for quite a while on defining carrier Ethernet services where service providers and business enterprises can define for each other an end to end service in terms of carrier Ethernet. You were talking today a lot about software defined networking and it sounds like you are very much talking about managing the elements in the network, in the data centre, in the storage area. The

question I have is, do you see OpenFlow interfacing at the service level? Do you see it having a position in the market where OpenFlow can be used to help specify and explain what type of end to end carrier Ethernet service is needed?

What we are seeing in the market from the point of view of the MEF, is that what used to be carrier Ethernet services just for the enterprise for the service provider is now in the cloud. Our members are talking about using carrier Ethernet services not only from the enterprise to the data centre, but also even within the data centre, service providers specialising in connecting between data centres and within the data centres. So, do you see OpenFlow interfacing at the service level or with wide area networks?

Dr. Atsushi Iwata

Last week in Open Networking Summit, Nick Mckeown in Stanford University talked about the movement to the global network design/automatic trouble shooting/fault detection-isolation in SDN controller space. The current network trouble shoot is simply ping, traceroute, and so on. Everything has to be done by network engineer. However, OpenFlow/SDN controller would have such a global network management, and trouble shooting capability, and we can support end-to-end QoS management in carrier Ethernet level as well.

Mark Pearson

I definitely think that the carrier use case is an emerging and popular one for software defined networks and OpenFlow and we are seeing it through a number of public press releases. Another one was Verizon with partnership of HP and others. So, these are definitely valid use cases. I think the service providers are trying to find new operational models for deploying their networks. I think they are well used to centralised control planes. They have done this already but they tend to be very proprietary in how it's built and what we are starting to offer with this new paradigm is a sense of openness and interaction.

Bruce Bateman

I definitely agree. I think the kind of use case you are going to see is an interviewer, accounting that needs a lot of resources and you may have that in a different location, so you are going to have to move your VMs, you are going to have to move all of your resources to a different location and that is where it interconnects between the data centres and the enterprise will definitely have to be orchestrated.

Manek Dubash

Ok, question down here? While that microphone is coming to you, let me ask one question that I am intrigued to know. You have got all these packets flowing around, the control plane is somewhere other than where the packets are flowing. What

happens to security in this scenario? I am the best of breed kind of guy, I have got my security appliance that examines every packet in minute detail, for good reason. What happens, how does that work?

Dr. Atsushi Iwata

SDN can provide a network appliance pool to integrate security, such as firewall and DPI. Defining specific flows to redirect them to firewall and DPI we can analyze every packets for specific flows. Those flows can be identified by SDN controller side as a policy. SDN controller provides global security policy for entire network. You can simply configure a single security policy, which is reflected to all of related edge network devices to protect security. This is completely different from the current network. In the current network, you have to login to all of network devices to configure such a network policy, but SDN global policy management allows us to configure a single network policy in an entire network.

Manek Dubash

So forget my security appliance, I don't need that any more, I can put it all into the software. Is that what you are saying?

Dr. Atsushi Iwata

SDN can support both hardware network appliance and software network appliance as well. If we want to use all software network appliance, simply install those software on the server side as VM, and redirect specific flows to examine with DPI type of functions. By using this way, we can support all of security functions in software.. Of course some of security functions need 10G/40G wire-rate of perofmrnace, then we could integrate hardware network appliance as a pool.

Manek Dubash

Ok, so the software ensures that those packets get routed through whatever best security device I want to use?

Dr. Atsushi Iwata

Correct.

Mark Pearson

I definitely agree. The hardest part about security is getting the policy right and the policy cannot be compromised and security has to be accurate.

Manek Dubash

And I certainly don't want to change that.

Mark Pearson

That's right. And so by, as we mentioned here, by centralising the policy management security, it increases the correctness of the deployment of it.

Manek Dubash

Thank you.

Bruce Bateman

There is nothing to add. It's the orchestration, that's the policy at high level that needs to be done at orchestration.

Pranay Misra, CEO, Nanotel

Nanotel is a [indiscernible] and we are actually from the United States. My question is, we are actually in the telcos. In India you have close to 10 telcos and you have 900,000,000 subscribers. All the databases of those subscribers are on under conventional data centres. We are trying to open a [indiscernible] in our organisation which has cloud sharing. In all your discussions, I could not find how, down the line, the cloud sharing model will look like. If you see in telcos, you have Nokia, Siemens equipment, you have Ericsson, you have [indiscernible], you have ZTE. So, 10 years ago, people never used to share the networks. Now everybody shares the network. Either it's a passive network or it's an active network because of the cost. So, what is the road map you see that telcos are starting to share the cloud? This is my question.

Mark Pearson

Ok I'll start. Again, I think it revolves around this ability to centralise the control plane of the network equipment and when you have a shared infrastructure and you now have to have a federation of systems that come together to implement the appearing relationships. So, through the use of the central systems, the APIs, the standardisation, I think this starts to enable that type of federation.

Bruce Bateman

What you are basically talking about is multi-tenancy and allowing for people to share, not just the bandwidth, but also the servers and storage and all. The multi-

tenancy virtualisation is part of that overall orchestration and we definitely see that as one of the key reasons for the SDN world and the rules developed underneath that.

Dr. Atsushi Iwata

In relation to that, the sharing network devices would come from the VNO, virtual network operator, and also a multi tenancy for supporting computers , storage and network guaranteeing the SLA, therefore, we have to make sure that everything works for end to end QoS requirement . Because SDN controller provides the global network design/automatic trouble shooting/fault detection-isolation/SLA management. we can support end-to-end QoS management in VNO as well.

Manek Dubash

Ok, have we got any more questions? Well, I have a question and it's about the governance of this whole SDN. At the moment, the way things work generally and the experience of the industry is that you have a governing body, it starts off this whole thing and that the stage we are at, and everyone is involved in that. But there comes a point where you say ok, that's done, and we hand it over to the industry and it becomes de facto standards rather than the governing body type thing. How far down the road are we towards that and is that the kind of model you have in your heads for how SDN is going to be managed, if you like, the standards side of it?

Mark Pearson

Well of course, the OpenFlow aspects are coming from the Open Networking Foundation, where, also, other APIs that we have mentioned, north side controller interfaces which are starting to be proposed. You are right in that these are coming out of a consortium of companies that are trying to provide a degree of openness and so, I think it's in the delivery and interoperation of these open systems that self governs the delivery.

Bruce Bateman

I see a few points here. First of all, you have to understand that the OpenFlow and the SDN, this is really at 1.0, so we still have a lot of development to do, there are still a lot of aspects of this. But it is a change in the data centre. Once it becomes commercial, then it becomes a value add and that is the differentiator that is going to become the value at, but it has to be at the API level still open, but above that, what services, or what do I as a vendor provide, that's the differentiator and that's why, as commercial companies, we get involved. But it does have to be open.

Dr. Atsushi Iwata

In addition to that, there are different type of interfaces to be standardized in OpenFlow/SDN area. The first one is between SDN controller and OpenFlow switches. This is being standardized in ONF, such as OpenFlow 1.2, 1.3, 2.0 and so on. The second one is between Server management system and SDN controller, and this is called northbound interface. This is also being discussed in northbound api mailing list right now and will be standardized in near future. The last one is internal API of SDN controller. SDN controller has three layers,(i) OpenFlow core operating system having OpenFlow messaging command system and its library, (ii) network topology discovery, OAM, protection type of fundamental network middleware, and (iii) network control application layer for own vendors and for third parties. Once this internal API is standardized, the third party can develop new customized network application and delivery to any SDN controller vendors to integrate a solution. The last part would take some time.

Manek Dubash

That's interesting. So there are a lot of opportunities for third parties in this?

Bruce Bateman

Yes, we have an ecosystem, we provide a product called Crowbar for cloud configuration and we have partnerships in that. The whole ecosystem, we don't do it, we partner with people like Big Switch, NEC have products that help us. We may get into a data centre where somebody has an HP and they want to bring in a Dell. How does that all work together? And that's what people are asking for, that's what customers are asking for. Whereas the old days, it was, I could buy a particular vendor and I couldn't get fired. That is changing now because it's a financial – there's a lot more involved now.

Manek Dubash

Mark, final words?

Mark Pearson

No, I think we need to think about the degree of openness from the device layer, through the controller layer and through the end solutions that ultimately the, where we call the enterprise grade solution needs to fulfil, the complete testing, the support processes, all those things come together in the ecosystem.

Manek Dubash

Ok, Mark, Bruce, Atsushi, thank you very much indeed for your contributions. A fascinating debate and this will go on, I expect we will be touching on this in future

NetEvents, so do please come again. This is not the end of the event but do think about this, do come again because this one will run, run and run that's for sure.

Gentlemen, thank you very much indeed.

[End]