Dell 100GE SDN-WAN

Dell EMC 100GE SDN using OpenDaylight (Beryllium)

Dell Networking – Data Center Technical Marketing
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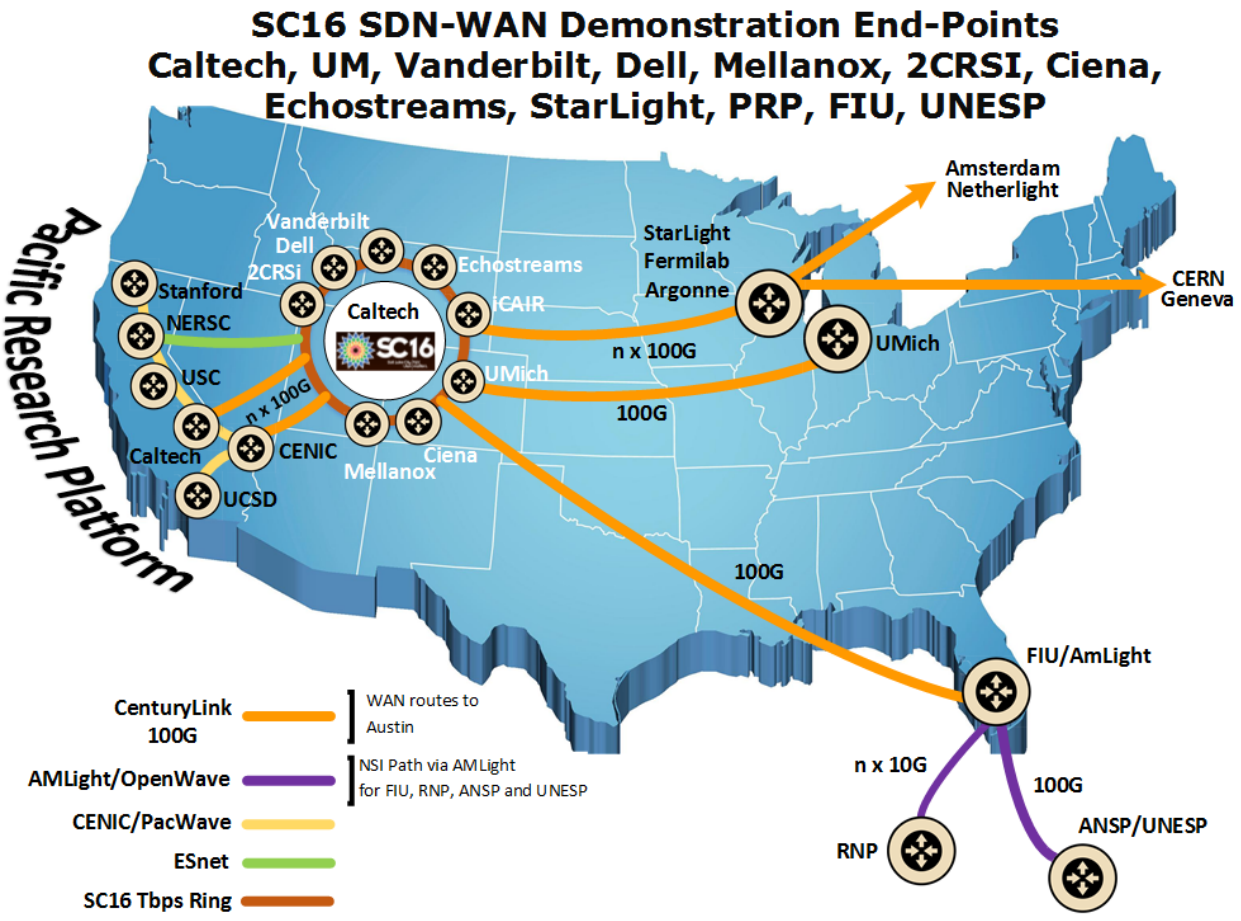
Overview

Dell EMC continues to be an active SDN (Software-Defined Networking) contributor and innovator through the support of the open source SDN platform better known as *OpenDaylight* (ODL) latest release ([1]Beryllium). SDN as a whole continues to improve in building programmable networks that are flexible and responsive.

At Supercomputing 2016, Dell EMC reinforced a continuing partnership with Caltech University to create a live 100GE SDN-WAN demonstration showing a full mesh multi-site 100GE SDN connections.

Figure 1, shows a high level overview of the connections that were deployed between the convention center in Salt Lake City and the different external sites with the Caltech booth as the hub connection between the different booths.

Figure 1 Supercomputing 2016 100GE SDN-WAN Demonstration



1 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiJlfqOu8zQAhVJxWMKHeXtCz0QFggeMAA&url=https%3A%2F%2Fwww.opendaylight.org%2Fodlbe&usg=AFQjCNFuAAIH9yWbB4o8KmqLNsOjYTnopQ&bvm=bv.139782543,d.cGc

Topology and Tests

This year's Supercomputing 100GE SDN WAN OpenDaylight live demonstrations used Dell EMC Z9100s and S6100s data center switches in conjunction with Qlogic's high performance 100/50/25GE NICs, a subsidiary of Cavium, Inc. In addition to the hardware used, Caltech University created and implemented separate modules as part of the controller.

Figures 2 & 3 show a high level topology diagram of the live demonstration. The Caltech booth serves as the 100GE hub point. The SDN controller is situated inside the Caltech booth and it is managing all the Dell EMC switches spread across several booths as well as outside the convention center such as the University of Michigan, Stanford, Fermilab and more.

Each link between the booths consisted of a single and sometimes dual 100GE end-to-end fiber drop provided by the SCinet team. At each booth a Dell EMC Z9100 or S6100 switch and high powered server with 100GE NIC was used to generate a full mesh connectivity amongst the different booths.

Figure 2 Supercomputing 2016 100GE SDN High Level Link Diagram

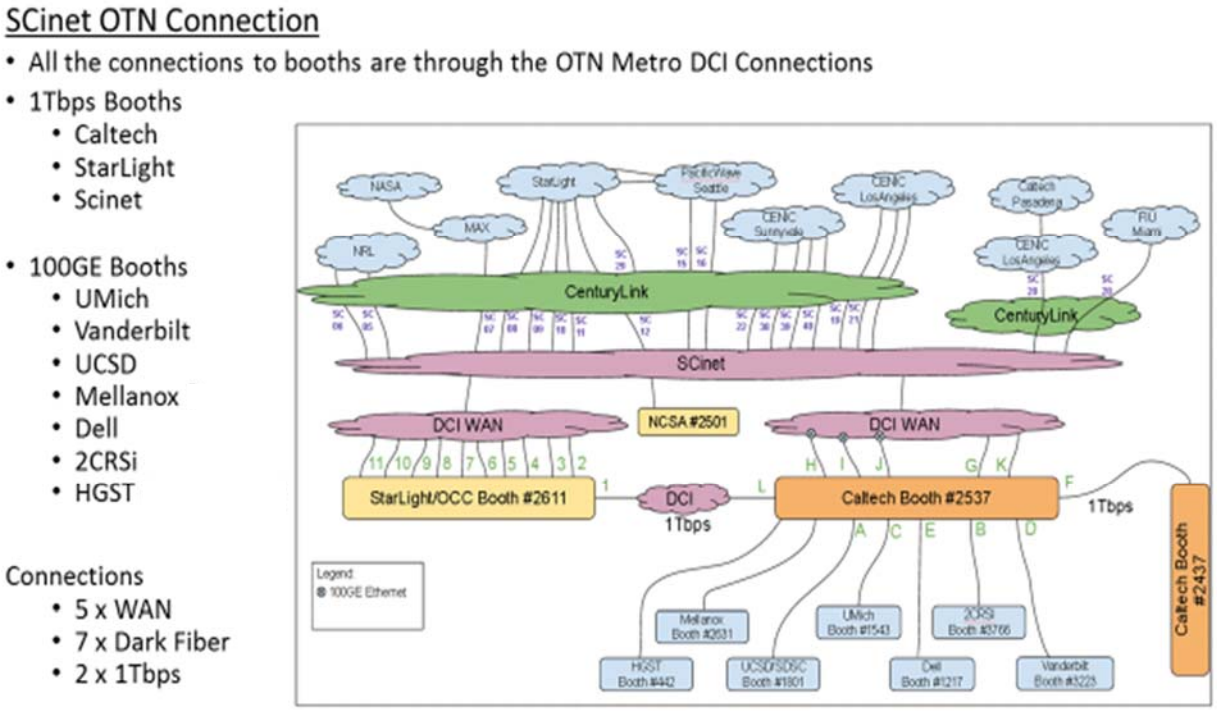


Figure 3 Supercomputing 2016 100GE SDN Caltech Booth Diagram

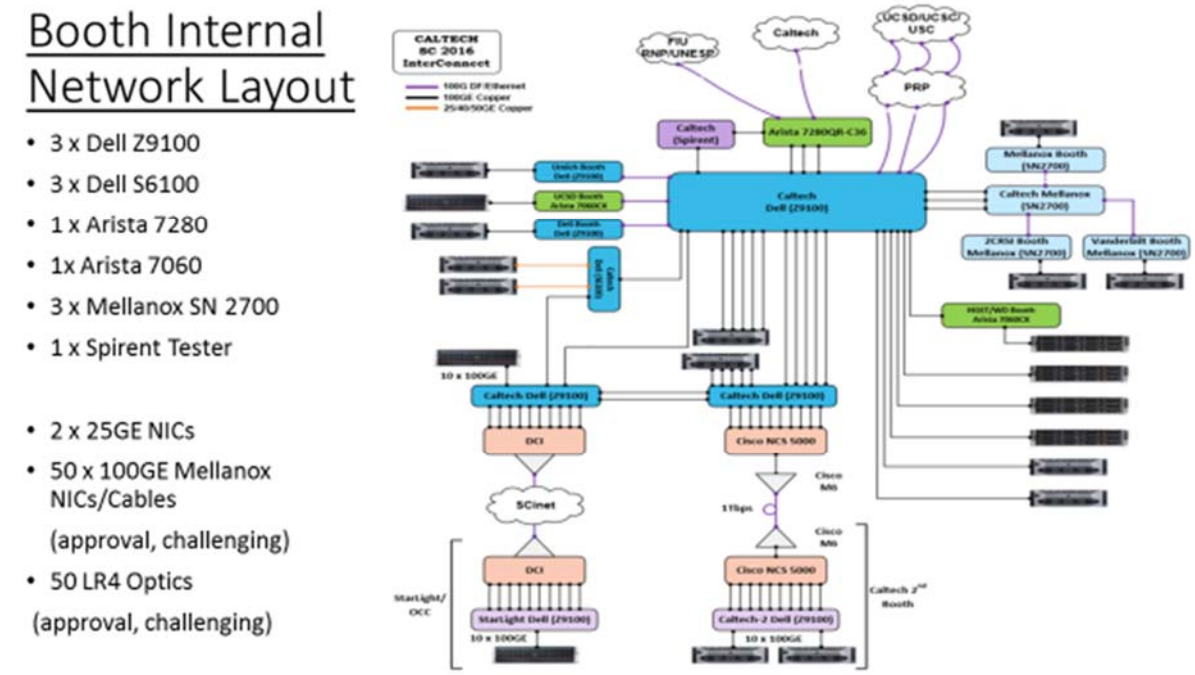
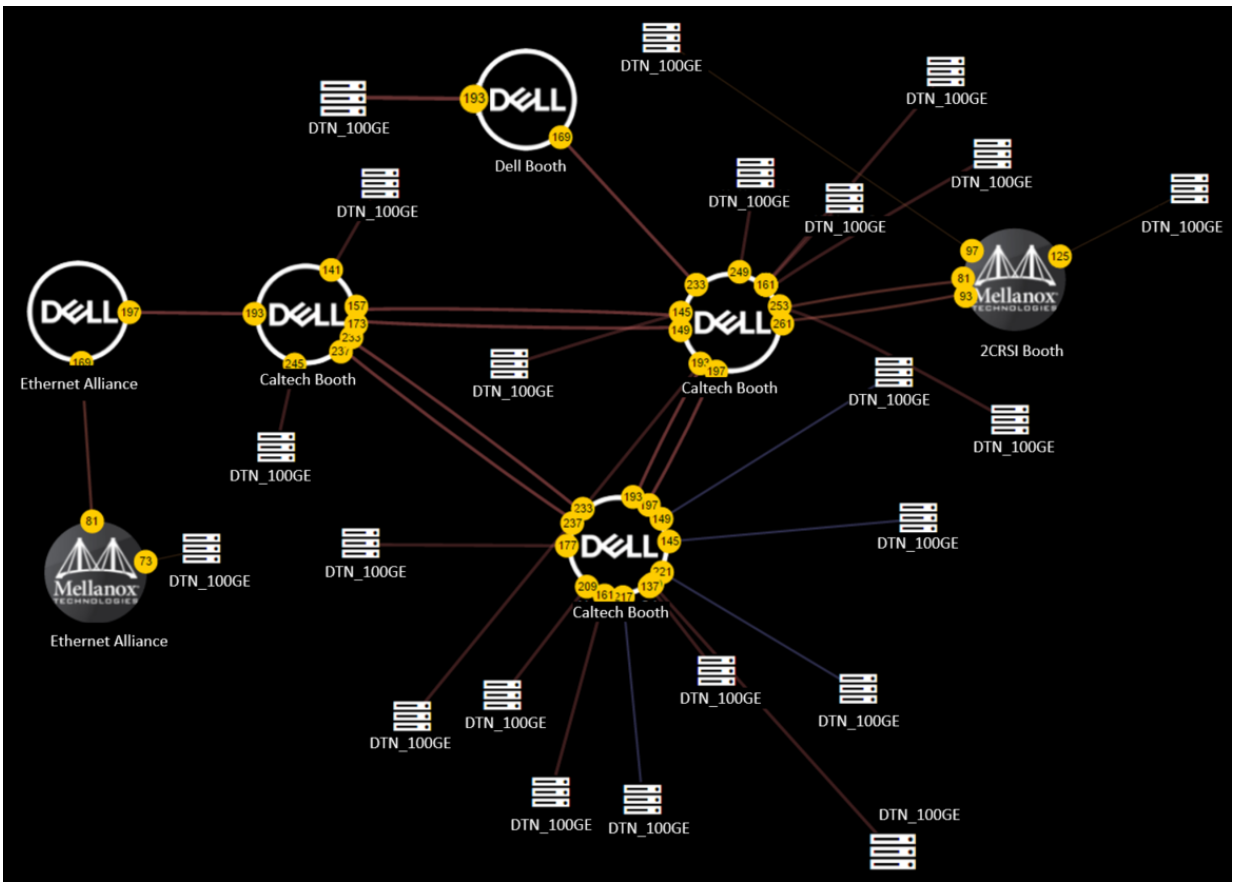


Figure 4 Live 100GE SDN-WAN Demo screenshot



Upon the controller discovering and programming all openflow enabled links and devices a full view of the network as it concerns the OpenDaylight SDN controller is seen in figure 4.

There are several things this particular Caltech controller implementation provides:

- All links have a unique ID assigned by the controller.
- All 100GE links have a unique color and size
- The view of the network changes as end hosts are handled, i.e. if a particular end host or device is moved, all other icons move and re-arrange themselves

During the live demonstration, the modules/plugins developed by the Caltech team were tested to make sure reactive intelligent routing of traffic between endpoints in the network took place.

In addition to reactive intelligent routing functionality, the following path selection algorithms were also further tested as they were in Supercomputing 2014.

- Round Robin – each new traffic flow from each node attached to an open flow enabled device is assigned to the next best possible path between source and destination
- Shortest Path – each flow is assigned to the shortest path (least number of hops) between source and destination
- Available Bandwidth – each flow is assigned to the path with the largest available bandwidth
- Longest Path – each flow is assigned to the longest path (the greatest number of hops)
- Random Path – each flow is assigned to one of the available paths at random

Each of these algorithms receive constant updates as the modules are changed, released, and then integrated into the controller release.

Conclusion

SDN continues to flourish and Dell EMC is committed to this effort. With Caltech University and others alike within the open source community, these ongoing contributions through the creation of custom modules being integrated into current as well as future OpenDaylight versions, makes the vision of a robust and flexible SDN based networks more realistic and closer to achieving its full potential.

For more information on Dell EMC SDN OpenDaylight solutions click here.

http://en.community.dell.com/techcenter/networking/w/wiki/11762.the-dell-networking-opendaylight-controller-for-openstack-deployments

Appendix – Dell EMC Switch SDN Configuration

1.1.1 Dell EMC S6100/Z9100 SDN Configuration

The configuration of SDN in the Dell EMC switches three key components:

1. Configure the cam entries to allow openflow entries
2. Configure the openflow segment with the controller
3. Configure openflow on the switch ports participating in openflow

S6100>**en**
S6100#**conf**
S6100(config)#**acl-cam l2acl 3 ipv4acl 2 ipv6acl 0 ipv4qos 0 l2qos 0 l2pt 0 ipmacacl 0 vman-qos 0 efcmacl 0 openflow 8 fcoeacl 0 iscsioptacl 0 ;** the total number of blocks should sum to 13
S6100(config)#**cam-acl-vlan vlanopenflow 1 vlaniscsi 1;** vlanopenflow 1 enables openflow

Reboot the switch. Configure the openflow instance segment

S6100(config)#**openflow of-instance 1;** currently 1 instance is supported
S6100(conf-of-instance)#**controller 1 <controller_ip_address> tcp**
S6100(conf-of-instance)#**flow-map l2 enable**
S6100(conf-of-instance)#**flow-map l3 enable**
S6100(conf-of-instance)#**interface-type vlan**
S6100(conf-of-instance)#**of-version 1.3**

Configure openflow instance on the interface(s) attached to end hosts

S6100#**conf**
S6100(config)#**int hu1/1/1**
S6100(int-hu-1/1/1)#**openflow of-instance 1**
S6100(int-hu-1/1/1)#**end**

For more information on this year's and past live demonstrations click on the following link.

http://supercomputing.caltech.edu/