SDN Impact in Higher Education

Gabriela Herrera Systems Engineer

Otoño 2015 PUEBLA, Pue. 22 y 23 de octubre



Agenda

Software Defined Networking

SDN Use Cases







Software Defined Networking

"...programmable networks (or more precisely, network elements that can be configured through a reasonable and documented API)..."

– Ivan Pepelnjak, ipSpace.net

"Software Defined Networking (SDN) is an emerging network architecture where network control is decoupled from forwarding and is directly programmable..."

– Open Networking Foundation



FOUNDATION



What is Software Defined Networking?

- Simply a programmable network where control is decoupled from forwarding hardware. In other words, abstraction of a networking element's control plane from physical hardware.
 - Generally speaking, this allows the "logic" that controls the data path to be decoupled from the physical switch/router.
- Creates a networking environment that isn't fenced by traditional Ethernet protocols, proprietary operating systems and traditional networking architecture concepts.
- A concept and a new way to architect networks (fit network to business need not fit business to network).



What is OpenFlow?

Component of an SDN solution.

- Protocol that defines communication between a switch and network controller.
- Does not provide any mechanism to actually "network", but rather provides the framework for a server(OpenFlow Controller) to communicate (OpenFlow Channel) with a switch (OpenFlow Enabled).
- Applications (can be as simple as scripts), must be layered on top of the controller to determine network logic.





Controllers

- The *"brain"* of the network
- The allow the definition of the traffic flow.







Applications

В	Brocade Flow O	ptimizer Dashboard Policy Ev	ents				🌣 Settings 🙎 Administrator 👻 🕄	
0	verall Traffic Rate Re	port		Events for last 30 minutes				
	60000 50000						All Action Audit 8 🛆 6 23 0 23 17 1 6	
, pos	40000		Large Flow Identified to destination 60.60.60.9. No Action Performed.					
	20000						AUD-1008 Q 02:11 PM Large Flow identified to destination 60.60.60.4. No	
	0	-25 min -20	Contracting Contracti					
Curr	rent Large Flows	S		DNS_Reflection			S AUD-1008 O 02:11 PM Large Flow identified to destination 60.60.60.12. No Action Performed.	
N	Monitor Mitigation Action: NONE			Monitor	Mill	gation Action: NONE	🗴 AUD-1008 🕒 02:11 PM	
	Traffic %	Identified On	Destination	Traffic %	Identified On	Destination	Large Flow Identified to destination 60.60.60.11. No Action Performed.	
0	62 18	Mon, 23 Mar 2015 21:11:32 GMT Mon, 23 Mar 2015 21:11:32 GMT	120.120.120. * 120.120.120.	56 43	Mon, 23 Mar 2015 21:12:15 GMT Mon, 23 Mar 2015 21:12:15 GMT	150.150.150. * 150.150.150.	AUD-1007 O 02:11 PM Profile Updated Successfully.	
	18	Mon, 23 Mar 2015 21:11:32 GMT	120.120.120.		_	×	AUD-1007 O2:11 PM Profile Updated Successfully.	
U	DP_Attack			ICMP_Flood			0 VTM-1004 () 01:59 PM	
N	Ionitor	ма	pation Action: NONE	Monitor	МіБ	Flow Added for IP_Add_180.180.180.2 on BVC for destination 180 180 180 2		
	Traffic %	Identified On	Destination	Traffic %	Identified On	Destination		
	29	Mon, 23 Mar 2015 21:11:08 GMT	60.60.60.2	100	Mon, 23 Mar 2015 20:49:37 GMT	90.90.90.2 *	▲ VTM-1001 ③ 01:59 PM IP_Add_180.180.180.2 detected (Add) on destination 180.180.280.2 ▼	
0	19	Mon, 23 Mar 2015 21:11:08 GMT	60.60.60.4				Page 1 of 1 P	



Then, what's the difference?





Software Defined Networking

SDN makes the network programmable by separating control plane from data plane.

- Requires a switch that can be programmed with an SDN controller using a protocol.
 - It is preferable to use a standard protocol such as OpenFlow



OpenFlow

Protocol that defines communication between a switch and network controller.



Network Functions Virtualization

NFV is virtualizing networking elements such as firewall, router, load balancers (application delivery controllers).



Network Virtualization

- It tries to create logical segments over an existing network by dividing the network logically at the flow level.
- NV is an **OVERLAY**
- The goal is to allow people to move VMs independently of their existing infrastructure and not have to reconfigure the network.



SDN is not...

- A protocol that can be enabled and bring new features to the network.
- Network Virtualization

SDN IS A SOLUTION







Why SDN in Campus Network?



- Vendor dependent for new services
- Time-consuming

2014 Brocade Communications Systems, Inc. CONFIDENTIAL—For Internal Use Only



SDN Campus Network Demonstration Detect Delay Sensitive Apps – VolP, Real time video



SDN Campus Network Demonstration

Packet Replication – Multicast, IDS, Surveillance



Internet 2



Problems

- MAN LAN project: Advanced production IP network for Research & Education IP services and peering services. Sites include NYC and Wash DC
- Development & deployment of large scale environment for research
- Tighter integration of performance programs with the network portfolio San Luis Ob
- Operational support for research
- IPv6 and security services



8.8 Tbps of Optical Capacity

- Benefits
- MLXe provides high density 10/100G at MAN LAN project for I2.
- Brocade enables their Open
 Exchange with SDN and
 OpenFlow with the MLXe
 solution and 100G
- SDN with OpenFlow enable cloud routing and SDN applications along with highspeed routing & MPLS
- IPv6 and security services are supported by MLX products



Universidad de Guadalajara

IPv6-SDN

••••		iá openflow noc udg.ma	c	0	
Estadorma de Pol en la Universidad de Da	The Open Science, Scholarship & Service	0xxxxx00	0/~~	Circuit Details	
OSE		3			
Biolognaph > Hame > Cir	outt Detailte		Workgoug	admin	E 1 1
Summary					*
Description circuito-IPv9				Edit Circuit	
Type Bandwidth Local 0.Mbps	Restore To Primary 1 minutes	Static MAC Routing Static MAC Routing	tetus Owned By admin	(Berrove Cenal	
Endpoints	1000				
c1.com.udg.mx - e10	3 e1/23	4)		Charge Path	
c2.com.udg.ms - ef/1	a5/1	160		Force Reprovision	
s2.com.udg.ms - e5/1	e5/1	160		Force Reprovision	
Utrasfon History	Icheduled Events Circuit Layout Cir	out Layout Raw			
	Margar &	Inclusion I			
	gwt.core.ud	g.mx			
8	SY 2 and				
S			Loading		
			and a second sec		
	A 11		Loading		

Otono

Remeber when networking used to be exciting?

Now, it's that time again

THANK YOU!

