IPv6 Only deployment at Cisco
Cisco IT – Deploying IPv6 only in Building 23 in San Jose

Khalid Jawaid
Global Infrastructure Services, Cisco IT
Monday, 13th Nov 2017

Agenda

- Cisco IT Overview

- Dual Stack Recap

- IPv6 only @ Building 23 in San Jose Campus

- IPv6 only Data Center Plans

Cisco IT Overview

- 50,000+ Devices

- ~400 locations in 92 countries

- 200,000 Sq Ft of Data Center space

- 150,000+ Users

- ~ 5 Million IP Addresses (All Inclusive)

- ~ 6800 Applications

Cisco IT Overview

- 11 iPoPs advertising Cisco IPv4/IPv6 space (PA /32 from ARIN advertised across the world)

- EIGRP for IPv6/IPv4 + BGP

- Management over IPv4 (Except IPv6 Service Monitoring)

- Cisco Network Registrar for DHCPv4/6 Stateful Services

- SLAAC Exception with RDNSS (where supported)

Dual Stack Recap

- Most of network dual stacked since June 2011 (World Launch Day) – Started Core outward in June 2010

- Dual Stack Data Center (DC) for www.cisco.com

  - Upto DC Core

  - Includes Management (IPv6 Service Monitoring)

- DS Pilot

  - Cisco Virtual Office (Home Office IPSec VPN)

  - Extranet

Our IPv6 Timeline

2010 – 2016 – Dual Stack

2016 – 2018 – Dual Stack + IPv6 Only

SJC23 – IPv6 Only

IPv6 Only Pod – DC / Quarter
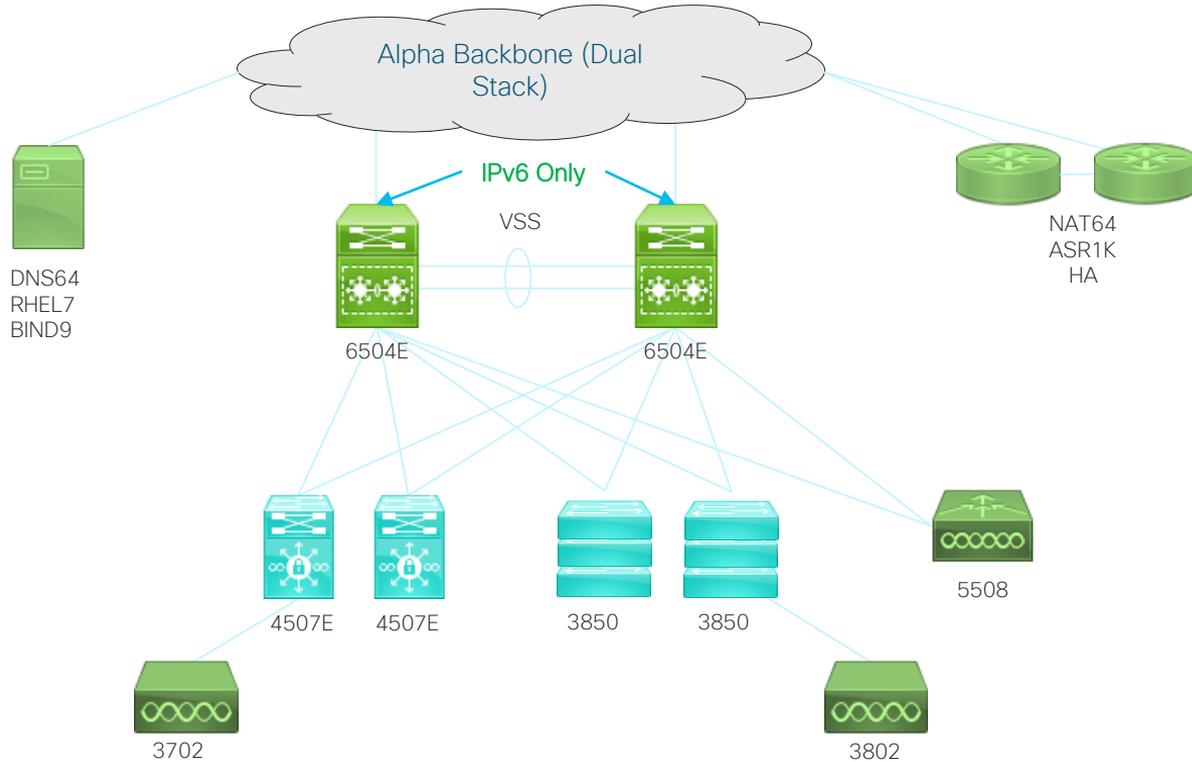
2018/19 – 20??

Training / Development

IPv6 Only Mandate (New Apps)

Building 23 IPv6 Only Scope

- Single Campus Building

- Wired / Wireless

- Mobile Devices (iOS and Android)

- NAT64/DNS64

- Management and Data

- Unified Communications / Collaboration (Spark/Jabber/Webex)

Physical Topology – IPv6 Only @ SJC23

IPv6 Features Deployed

- First Hop Routing – HSRPv2 (v4/v6)
- First Hop Security
  - IPv6 Snooping (Address Gleaning, Device Tracking)
  - ND Inspection
  - DHCPv6 Guard
  - RA Guard
  - Source Guard
- DHCPv6 Stateful (Default and Preferred) / SLAAC (Special case)
- EIGRP for IPv6
- NAT64/DNS64

Statistics

- Average 300 Users, peak 500

- 3 Months Time to Deployment

- Approx. 7 – 8 engineers

- Average Traffic 250 Mbps (v6 Only Links)

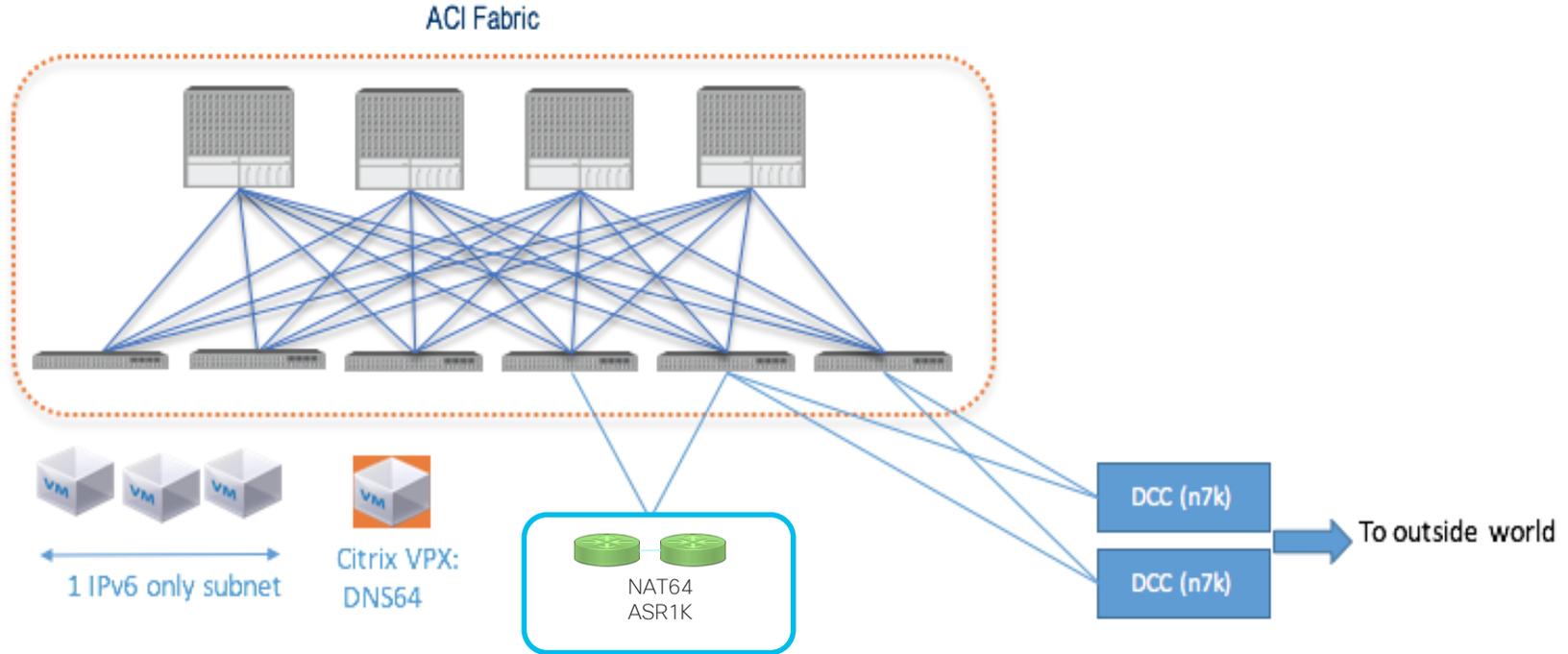- Average 32K NAT64 Entries
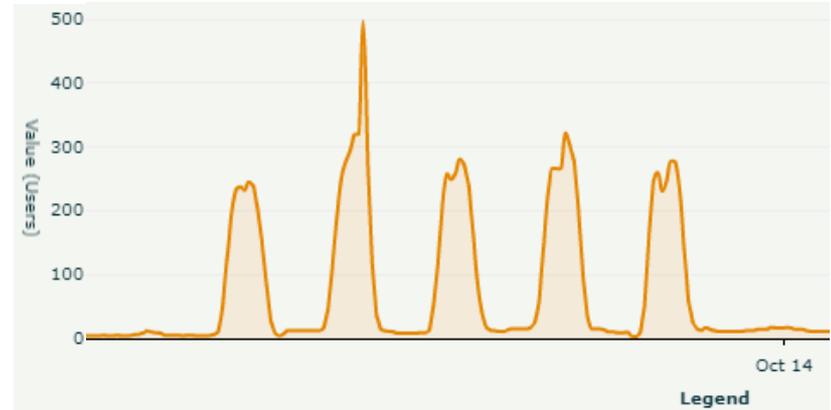
Charts (NAT64 XIates)
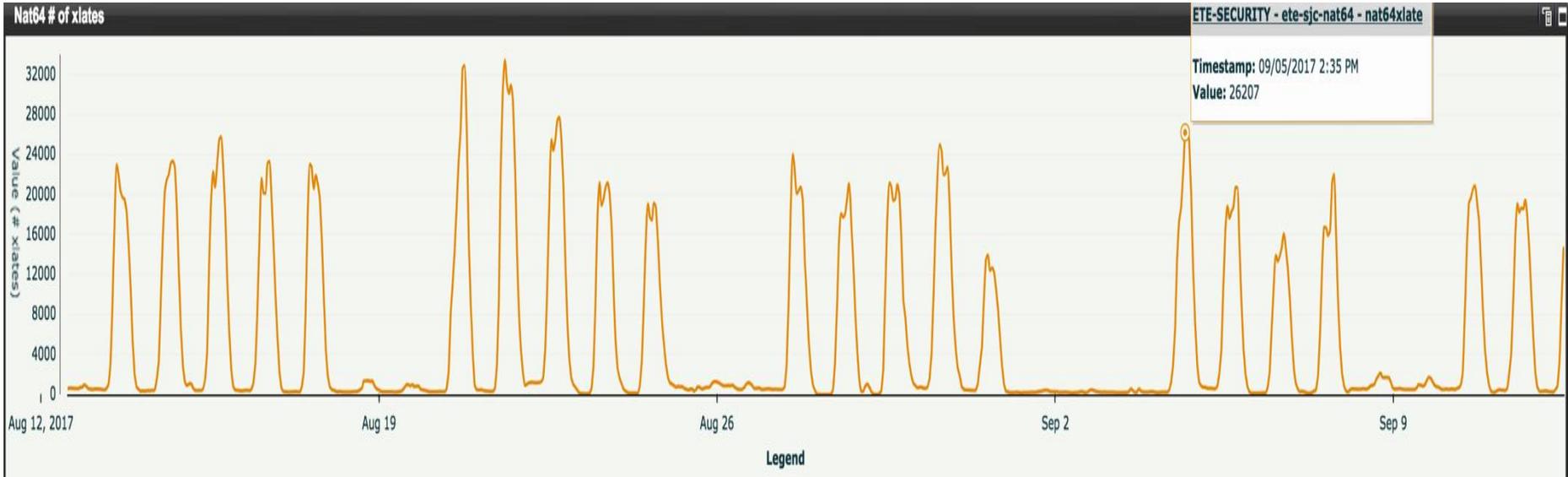
Not available via SNMP, gather with a script

IPv6 Only DC (PoC Stages)

- Single Pod
- Data plane only
- NAT64/DNS64
- Stateless and Stateful NAT
- Enable a Pod / DC / Qtr starting ~FY19*

* Subject to approval

High Level Topology

ACI Fabric

1 IPv6 only subnet

Citrix VPX: DNS64

NAT64 ASR1K

DCC (n7k)

DCC (n7k)

To outside world

Issues and Challenges

Issues Found (Campus Building)

- AnyConnect – Client Issues on Mac (software fix)

- SNMP – No MIB support for Xlate on IOS-XE (Enhancement Defect filed) – draft-jpdionne-behave-nat64-mib-00 (Mar 2011)

- Cisco TV – Players Issues on Mac (Player issue – resolved w/upgraded backend)

- Jabber – Client fails to connect (CUCM Issue – resolved with upgrade)

Issues Found (Campus Building)

- Spark – Web endpoints do not work (Not IPv6 enabled)

- Webex – AAAA synth errors due to Webex GSS response (GSS Upgrade required)

- IPv4 Literals (Workaround with static DNS entries – Not scalable)

Privacy Extensions and SLAAC

- Main concern for not using SLAAC on Android

- RFC 4941 – sec 3.6

  "Devices implementing this specification MUST provide a way for the end user to explicitly enable or disable the use of temporary addresses."

Google – Can you please give users a switch for Global addresses so we can allow or disallow a device based on posture?

Gaps and Issues (Data Centre – WIP)

- WAAS (Wide Area Application Services) i.e WAN Optimization – Does not support IPv6 yet

- PXE Boot – Not supported over IPv6

- Storage – IPv6 only not tested – IPv4 must be served as long as it exists or storage pools will be fragmented (cost and operational impact)

- More as we further develop the design / get into deployment.

The Larger Issues

"Dual Stack adoption has held us back from the latest innovations"

"Making the business case for DS was hard. For IPv6 Only, it's hard and risky"

"The IPv6 Only message is not flowing downhill – yet"

Acknowledgements

Great Team Behind This

- Guilermo Diaz (CIO)
- John Manville (SVP GIS)
- Ben Irving (Sponsor Director)
- Travis Norling (Manager ETE)
- Charles Radke

- Hitesh Panchal
- Norman Fong
- Tsung Chan
- John Banner
- Many More!