

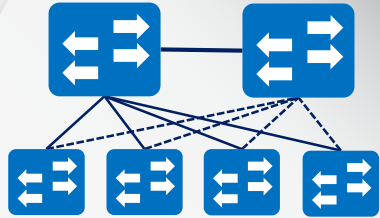
Nexus 7000

Product & Roadmap Update

Brian Kvisgaard

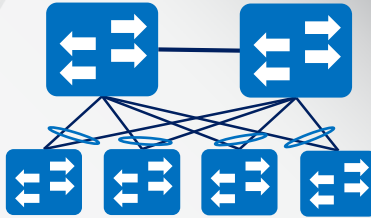
3rd May 2017

Nexus 7000 Series – Designed for DC Core



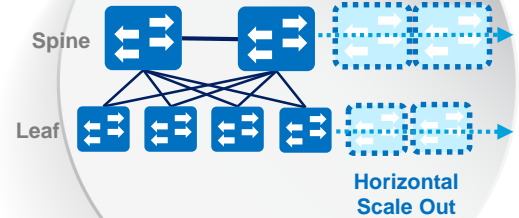
STP BASED DESIGN

- Classic STP Limitation
- 50% of all Links not utilized
- Complex to Harden



VPC BASED DESIGN

- No STP Blocked Ports
- Full Links Utilization
- Faster Convergence



FABRIC BASED DESIGN

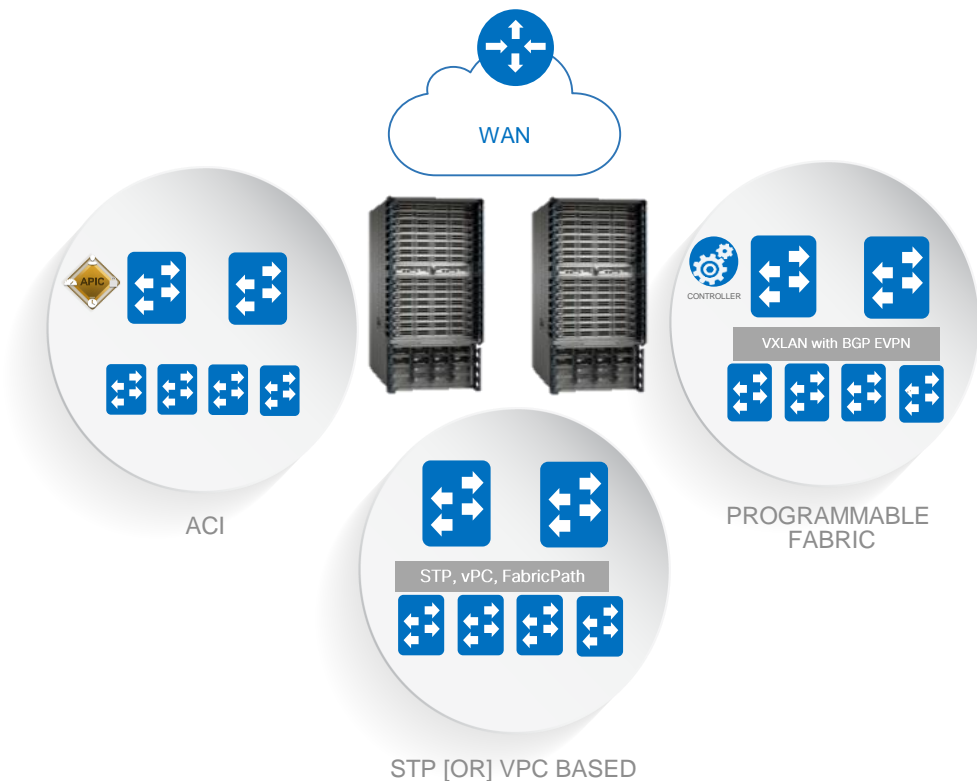
- Simple to Configure
- Higher Fabric Bandwidth
- Consistent Latency

Spine
Scales to provide
fabric bandwidth

Leaf
Scales to provide
access port density

Workload Mobility | Application Communication | Port Density | Bandwidth

Nexus 7000 Series – Designed for DCI



SOLUTION

L2 INTERCONNECT

FABRICPATH, VPC, OTV, VPLS, VXLAN

L3 INTERCONNECT

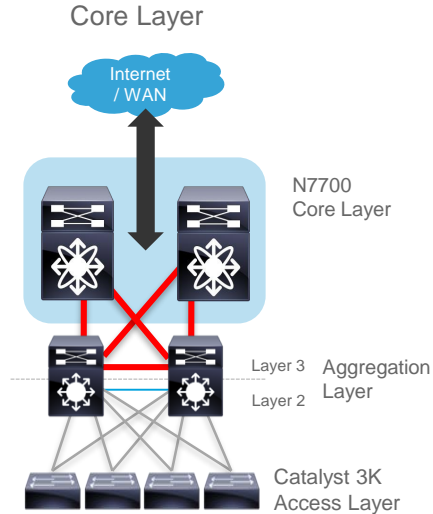
IP VRF-LITE, MPLS, LISP

BENEFITS

PROVEN & MATURE DCI TECHNOLOGIES

HITLESS ISSU
STATEFUL PROCESS RESTART
GRACEFUL INSERT & REMOVAL

N7700/M3 in Campus network



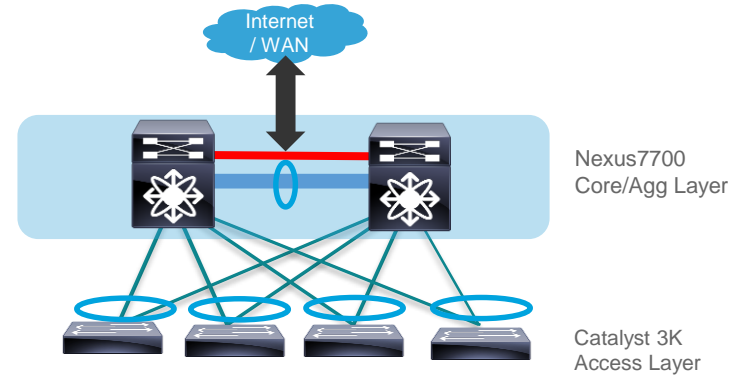
Design requirements:

- High performance
- 10G and 40G Mix
- Full L3 Feature Set
- HA features (GIR,ISSU)

Topology Description:

- Mix of 10G and 40G southbound
- L3 Link's Downstream and upstream
- MPLS/IP Northbound
- 40G to 10G Breakout

Collapsed Core/Aggregation Layer



Design requirements:

- High performance
- 10G and 40G Mix
- Full L2 and L3 Feature Set
- HA features (GIR,ISSU)

Topology Description:

- Mix of 10G and 40G southbound
- L3 Link's Downstream
- MPLS/IP Northbound
- vPC Southbound
- vPC Peer Link

N7700/M3 in Software Defined Access, Fabric Border

FABRIC BORDER:

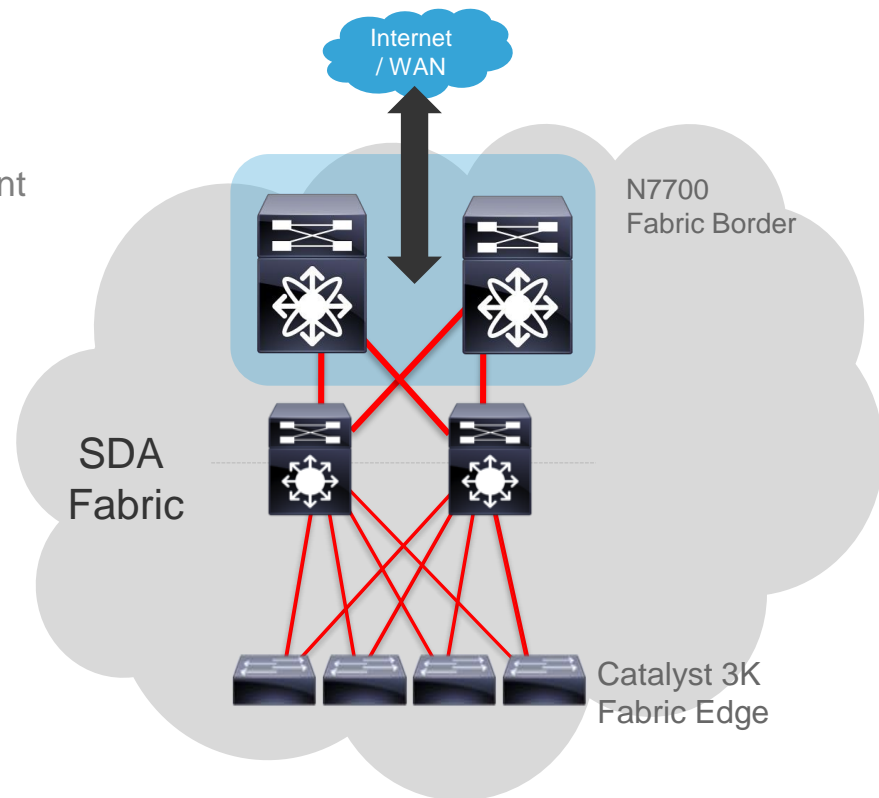
- A Fabric Border Node in SDA connects traditional L3 networks and / or different Fabric domains to the local domain. It is where different domains exchange Endpoint reachability, context (VRF,SGT) and policy information

Design requirements:

- High performance
- 10G and 40G Mix
- Full L3 Feature Set
- HA features (GIR,ISSU,SMU)

Topology Description:

- Mix of 10G and 40G southbound
- L3 Link's Downstream and Upstream
- MPLS/IP Northbound





FY17-18

Secure Segmentation with TrustSec

One Management with Prime Infrastructure

One Policy with Identity Services Engine

3500+ Unique Rich Campus Services

Hardware Investments

8P x 40G QSFP Module - IOS 15.5(1)SY

APIC-EM

IT Simplicity with Auto Conf, Interface Template and EEM

High Availability with VSS, SSO and Quad Sup SSO

Campus Fabric

Full MPLS for campus

Network as a Sensor & Enforcer



Catalyst 6500

1



Catalyst 6800

2



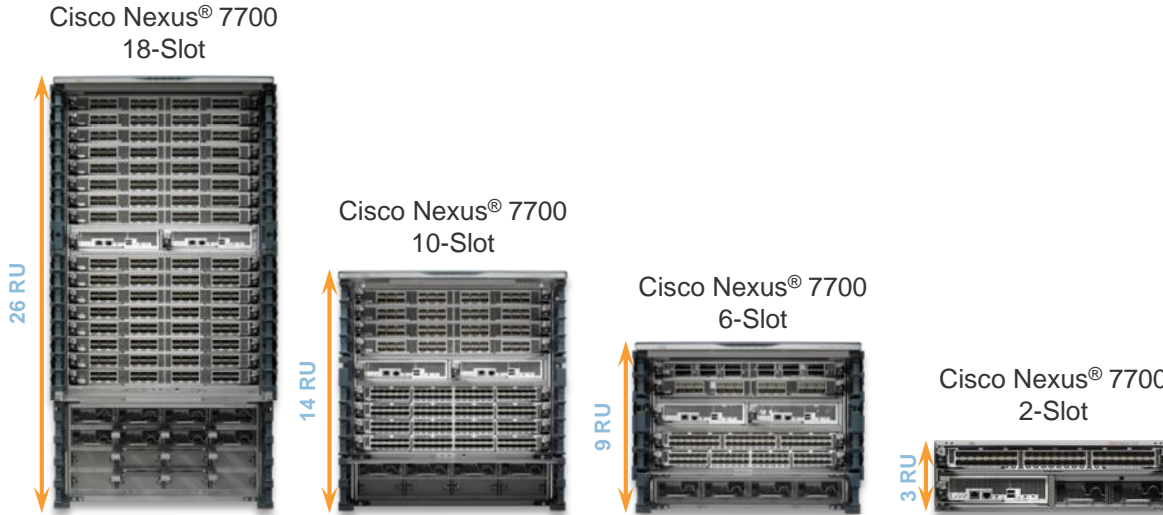
Nexus 7700

Position for the following requirements:
- Optimized for 1G/10G and low density 40G
- Full Campus Fabric support
- Proven Catalyst 6K Class of feature set
- Single O/S requirement in the Campus
Offers: C6807-XL-S6T-BUN / C6807-3850-10G-
Caveats: No 100G support

Position for the following requirements:
- High-density 10/40/100-Gbps connectivity
- Full Cisco SDA Capability
- Closest in features (MPLS), buffers, tables to C6K
Offers: N7706-EN-B22S2E/ N7710-EN-B23S2E
Caveats: NexOS in Campus

Campus Core Modular Transition

Cisco Nexus 7700 Series Switch Family



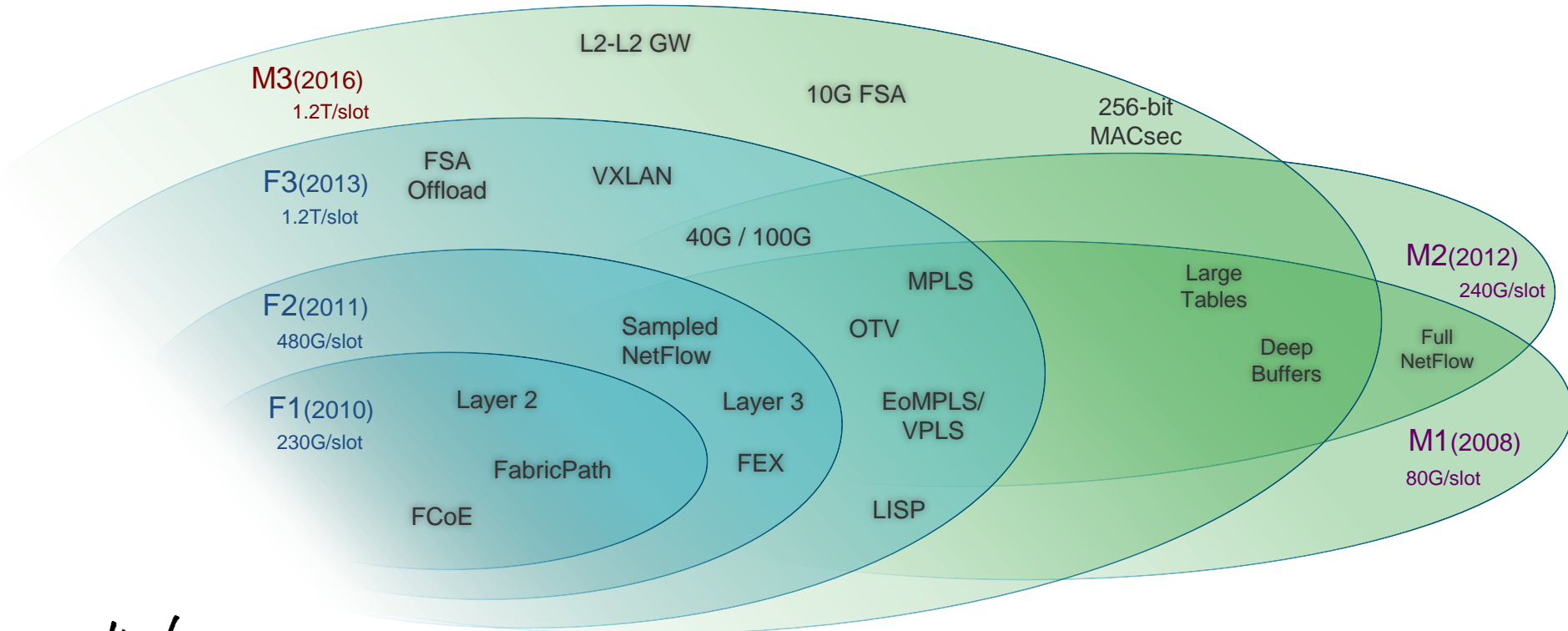
100G Density	192	96	48	12
40G Density	384	192	96	24
1G / 10G Density	768	384	192	48

Fabric **BANDWIDTH**
1.32 Tbps

Smaller **FOOTPRINT**
More compact

Environmental **EFFICIENCY**
True front-to-back airflow

Cisco Nexus 7000 Series Module Evolution



Cisco Nexus 7000 F3 Series Modules

DC CORE | DC INTERCONNECT

Nexus 7000 10G

F3 48-port 10G Module
N7K-F348XP-25



Nexus 7000 40G

F3 12-port 40G Module
N7K-F312FQ-25



Nexus 7000 100G

F3 6-port 100G Module
N7K-F306CK-25



Nexus 7700 10G

F3 48-port 10G Module
N77-F348XP-23



Nexus 7700 40G

F3 24-port 40G Module
N77-F324FQ-25



Nexus 7700 100G

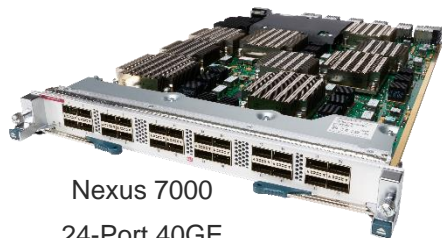
F3 12-port 100G Module
N77-F312CK-26



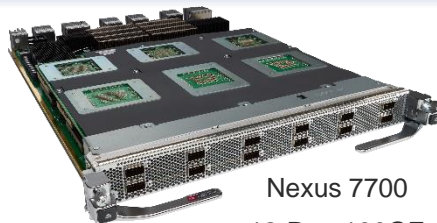
Cisco Nexus 7000 M3 Series Modules

DC CORE | DC INTERCONNECT

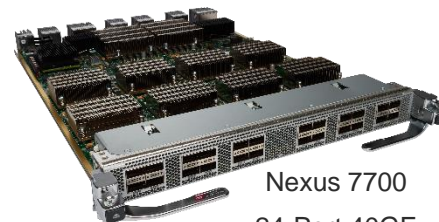
All Cards
Shipping
Now



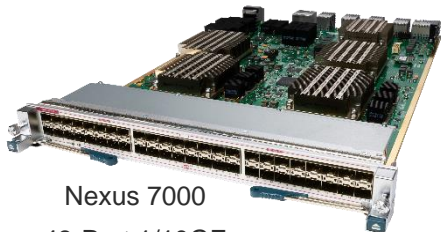
Nexus 7000
24-Port 40GE



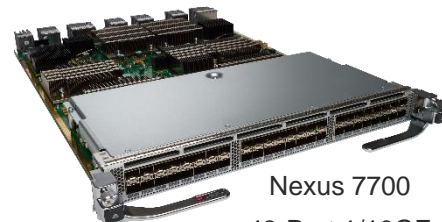
Nexus 7700
12-Port 100GE



Nexus 7700
24-Port 40GE



Nexus 7000
48-Port 1/10GE



Nexus 7700
48-Port 1/10GE

Enhanced Scale | Enhanced Security | Deployment Flexibility | Investment Protection

Cisco *live!*

Cisco Nexus 7000 M3 Series Modules

256-bit AES MACsec[#]

- 48 1/10 GE Ports (SFP+)
- 24 40 GE Ports (QSFP)
- 12 100 GE Ports (QSFP28)

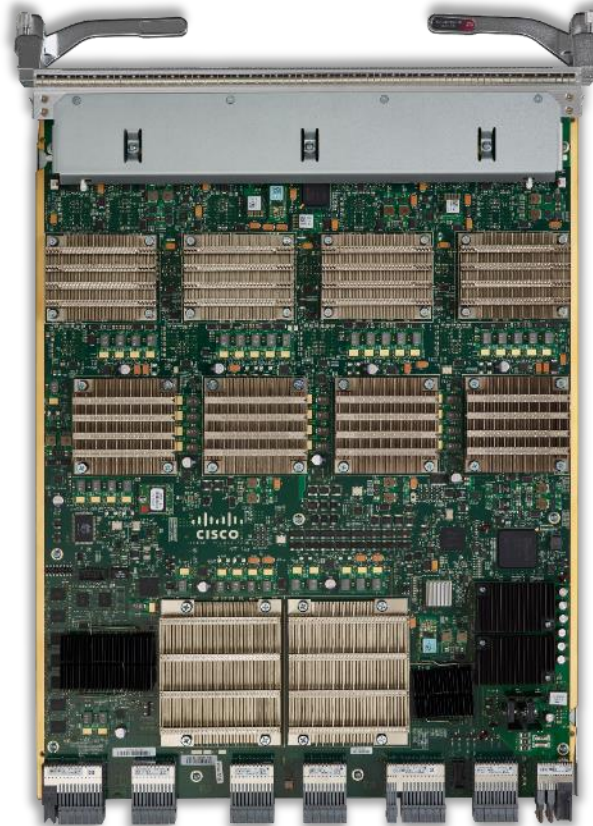
On all ports/speeds

Deeper Buffers

- 31.25MB per 10GE Port
- 125MB per 40GE Port
- 375MB per 100GE Port

Larger Tables

- 2M* FIB Entries
- 384K* MAC Entries
- 128K ACL/QOS Entries



New Cisco M3 ASIC

- VXLAN, OTV, LISP*, MPLS
- FabricPath*, Classic L2/L3
- Cisco TrustSec – SGT, SXP, SGACLs

Advanced Parser

- Layer 2 to Layer 2 Gateway*
- GTP Hashing

Multi-Core Fabric Services Accelerator (FSA)

Enhanced Performance for BFD, Netflow, and Other Distributed Fabric Services

* Hardware Capability. Software support may be available in the future. See NX-OS Software Release Notes.

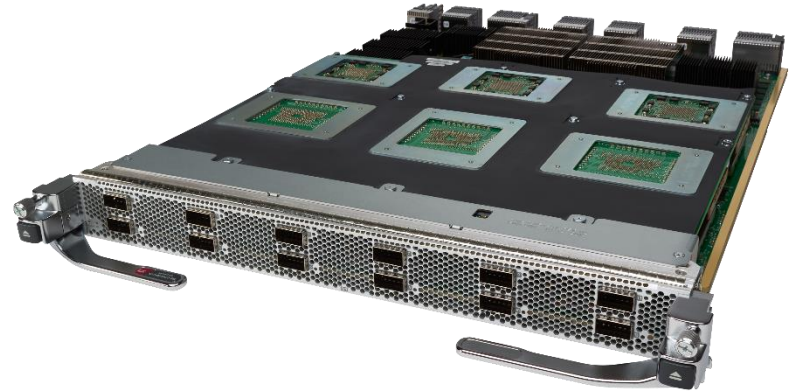
Compatible with Supervisor 2/2E and Fabric 2 Modules | VDC Interoperability with F3 or M2 I/O Modules

Nexus 7700 M3 12-Port 100G I/O Module

QSFP28 Optics for 100G connectivity

QSFP Optics for 40G connectivity

Approximately 6 μ s cross-fabric latency



M3 12-Port 100G Card

Notes

N + N Power Supply Redundancy

- Nexus 7706 with 4 M3 100G cards requires 3.5KW Power Supplies

NEBS Compliance

- Nexus 7718, 7710, and 7706 switches may require new fan trays if they are fully loaded with M3 100G cards
- New fan trays are planned for H2CY17

No M3 100G card planned for Nexus 7000

High Voltage AC/DC Power Supply



Up to 3.5KW

17% More Output Power

Energy Efficient*

* To be certified

Input Voltage Range

AC	110V – 305V
DC	192V – 400V

For Nexus 7004, 7702, 7706, 7710, and 7718
 Mix & Match with 3KW AC & 3KW DC
 Online Insertion & Removal Capable

Input Type	Input Voltage	Output
AC input	100 to 120 VAC	1500W
	200 to 210 VAC	3100W
	215 to 240 VAC and 277 VAC	3500W
DC input	200 to 215 VDC	3100W
	220 to 380 VDC	3500W



Introducing the M3-Series into new & existing chassis

(F3 + M3) VDC

M3



F3



Full Layer2 and Layer3
Interoperability

No L3 Proxy

(M3 only) VDC

M3 – 48p 10G



M3 – 24p 40G



Full Layer2 and Layer3
Interoperability

M and F modules interoperate at the Lowest Common Feature Set

VDC Interface Allocation – M3-Series Modules

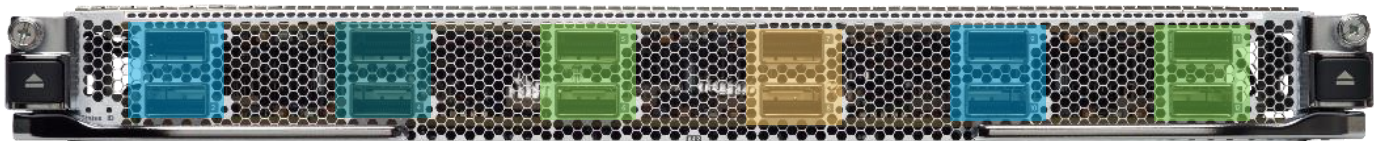
M3 10G
24-port
port-group



M3 40G
6-port
port-group



M3 100G
2-port
port-group



VDC 1

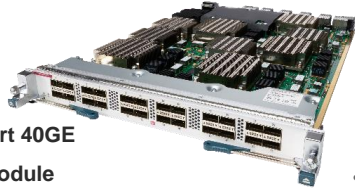
VDC 2

VDC 3

VDC 4

Port-group size varies depending on I/O module type
VDC Allocation on port-group boundaries – Aligns ASIC resources to VDCs

4x10G Port Breakout Capability



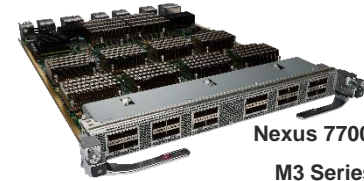
Nexus 7000 24-Port 40GE
M3 Series I/O Module



Nexus 7000 12-Port 40GE
F3 Series I/O Module



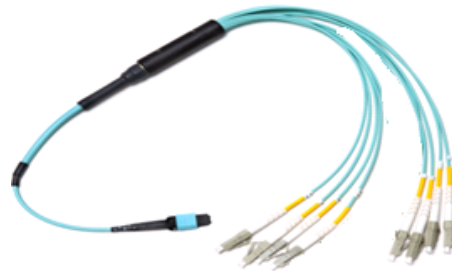
- Direct-attach active/passive copper breakout cables
- Direct-attach active optical breakout cables
- Fiber breakout cables (not included with optics transceivers)



Nexus 7700 24-Port 40GE
M3 Series I/O Module



Nexus 7700 24-Port 40GE
F3 Series I/O Module



Seamless 10G aggregation into dense 40G/100G ports
Breakout per port not per line card | No need to reload

NX-OS Continuing Enhancements & Innovations 7.3 and 8.0

- **vPC Hitless Role Change**
- **GIR Enhancements**
- **OTV Enhancements**
- **iCAM, CATENA, Integrity Management Architecture**
- **Smart Licensing**
- **ACI DCI - GOLF**



vPC Hitless Role Change (7.3)

- vPC hitless role change provides a framework to swap vpc roles between vpc peers without traffic interruption.
- Provide a new cli – “vpc role preempt”
- This feature provides a graceful method to perform insertion or removal on layer two

Replacement of the traditional way of role changing

- vPC needs role change occasionally: Topology change, system maintenance, switch reload/dual-active recovery, etc.
- Traditional way need a peer-link flapping – peer-link and all secondary vpc legs flapping, traffic interruption occurs
- Customers need a hitless way
- vPC STP hitless role change feature pioneers a hitless way of perform system level layer two network change
- This feature will serve as a replacement of the traditional way of performing role change

Hitless vs. traditional role change

	Hitless role change	Traditional role change
Availability	Helsinki	Day 1 design with vpc
Need role priority config	Yes	Yes
Peer-link flap	No	Yes
Vpc legs flap on new secondary	No	Yes
Error recovery	Yes	No
System maintenance support	Yes	No

NX-OS Software Upgrade

NX-OS HA

- Industry Leading Data Center HA Solution
- Mandatory for Mission Critical Data Centers
- Focus on Operational Excellence

► In Service Software Upgrade (ISSU)

- Hitless – Non-Stop Forwarding
- Layer 2 and Layer 3
- Upgrade & Downgrade
- Only Platform in the Industry to Support Hitless ISSU for L2/L3

Direction:

- No support for ISSD
- More structured recommendations for software upgrades

► Patching – Software Maintenance Update (SMU)

- Non-Disruptive Bug Fix for re-startable/ stateful processes
- Works with or without ISSU
- Chef and Puppet Agent Support
- Patch Management Tool

Direction:

- Limited number of Patches supported
- May be disruptive for certain processes

► Graceful Insertion & Removal (GIR)

- Per VDC or entire switch
- Support per protocol used
 - vPC/FabricPath/vxlan
 - BGP/OSPF/..
- Faster Reboot Improves Availability

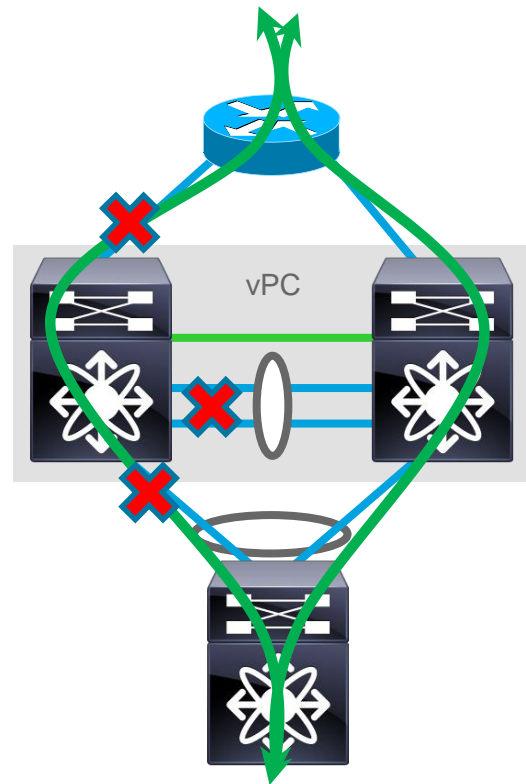
Graceful Insertion and Removal (GIR)

Change Window Begins

`[system mode maintenance]`

Change Window Ends

`[no system mode maintenance]`



Methods – Shutdown vs Isolate



Recommended

Parameter	Shutdown (optional)	Isolate (default)
MMODE CLI to use	system mode maintenance shutdown	system mode maintenance
Protocol behavior	Protocols go to “shutdown” mode Neighborship goes down	Protocols go to “isolate” mode Neighborship maintained
Interface behavior	Interfaces are shutdown	No change
List of L3 protocols supported	BGP, EIGRP, OSPF, OSPFv3, ISIS, RIP	BGP, EIGRP, OSPF, OSPFv3, ISIS
Route withdrawal	Happens always as i/f and neighborship go down	Happens for some protocols (e.g. - BGP)
Local Routes	Cleaned up	Not changed
Gracefulness	Less graceful (data traffic loss can happen)	More graceful (avoids data traffic loss)

GIR Enhancements

Snapshot Delay

CLI Prompt Indicator

Mode Change Syslogs

SNMP Trap Notifications

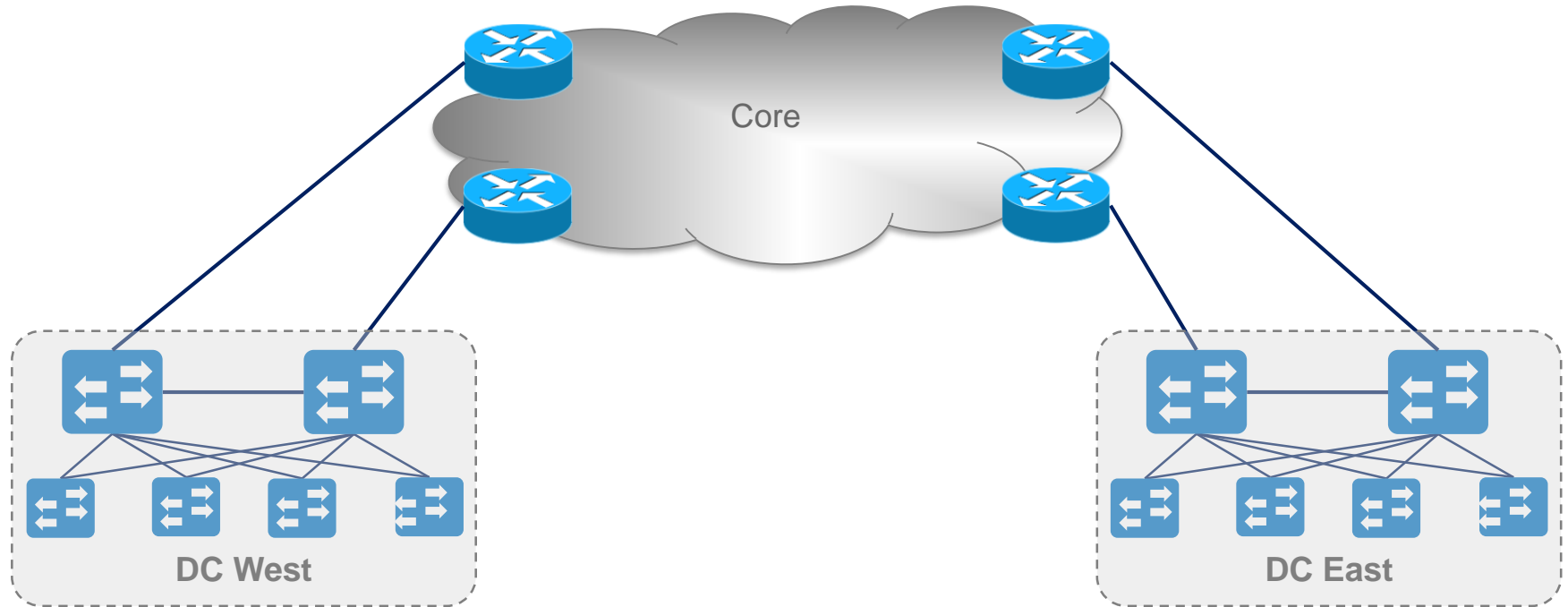
OTV Enhancements

Loopback Address as Join Interface

50% more MAC Addresses per Site

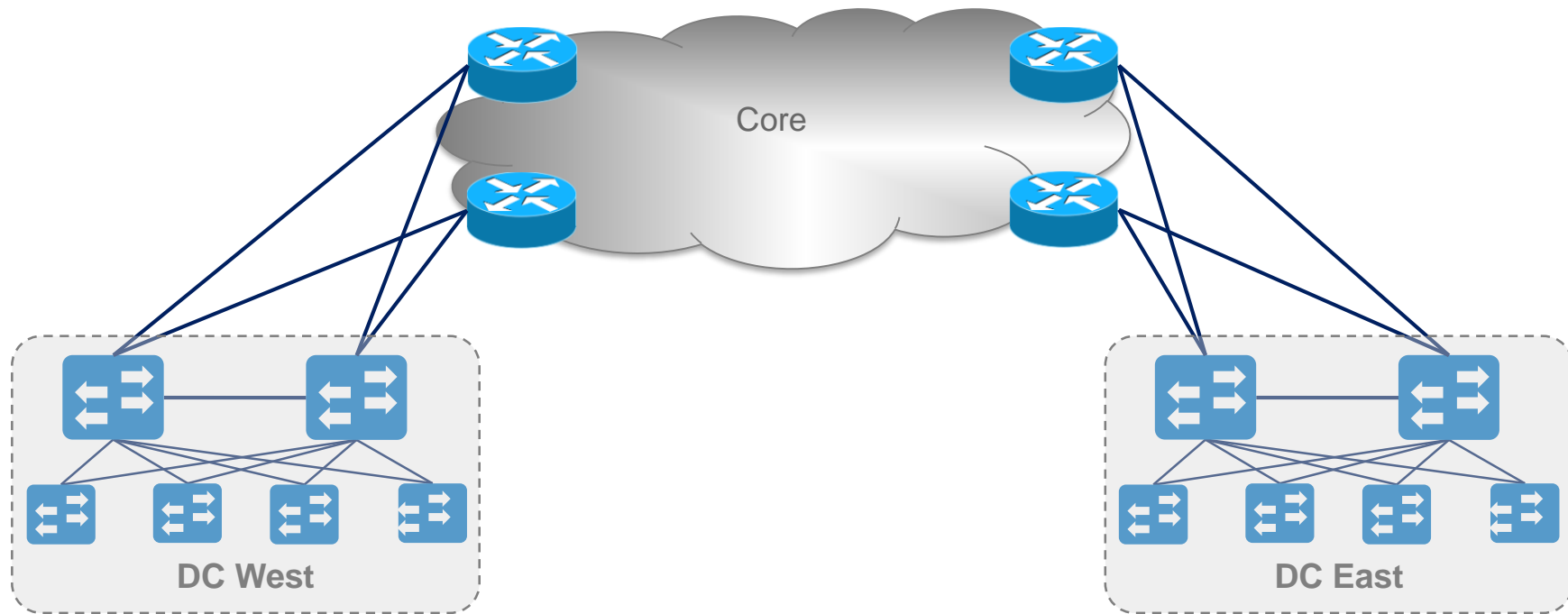
50% more MAC Addresses across
all Sites

Physical Interface as OTV Join Interface



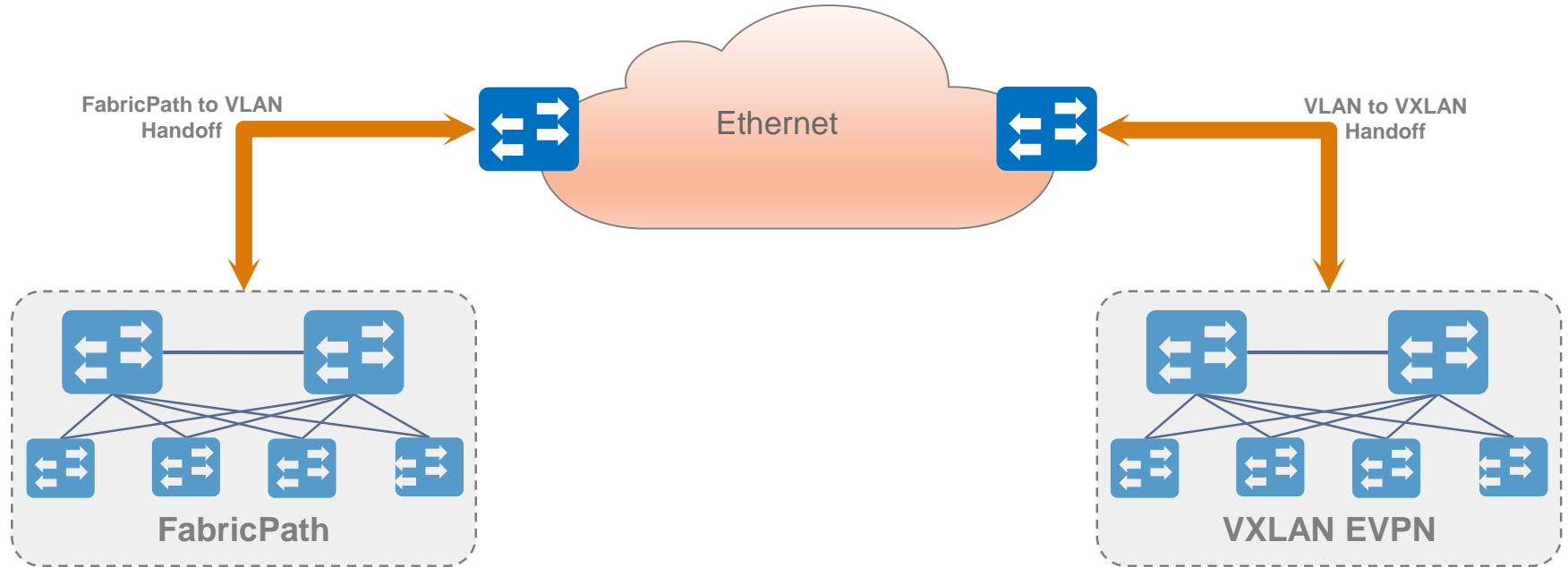
Only one uplink is connected to the Core from the OTV Device

Loopback Address as OTV Join Interface – Benefits



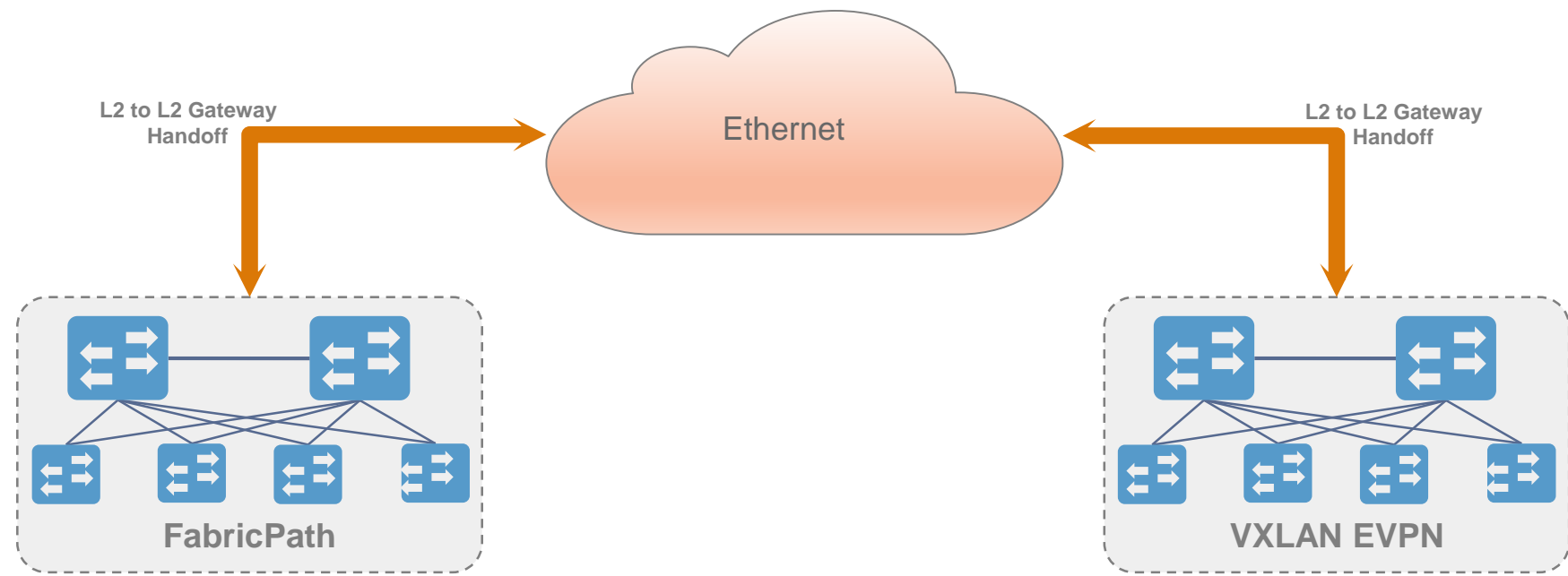
Enables the use of multiple uplinks & ECMP in the core for better resiliency and traffic depolarization

Interconnecting Fabrics – Nexus 7000 Switches and F3/M3 Series Cards



Interconnecting fabrics using Nexus 7000 Switches and no L2-L2 gateway requires two VDCs

Interconnecting Fabrics – Nexus 7000 Switches and M3 Series Cards



Interconnecting fabrics using Nexus 7000 Switches and L2-L2 gateway requires only one VDC

NX-OS Innovations

Integrity Management Architecture

- Uses open source trusted computing component
- Ensures genuine software is used
- Provides boot-time and runtime software integrity verification

iCAM

- Visual representation of TCAM usage

Catena

- Wire-speed selective traffic redirection for service chaining

Smart Licensing

Simplify Purchases

License Repository

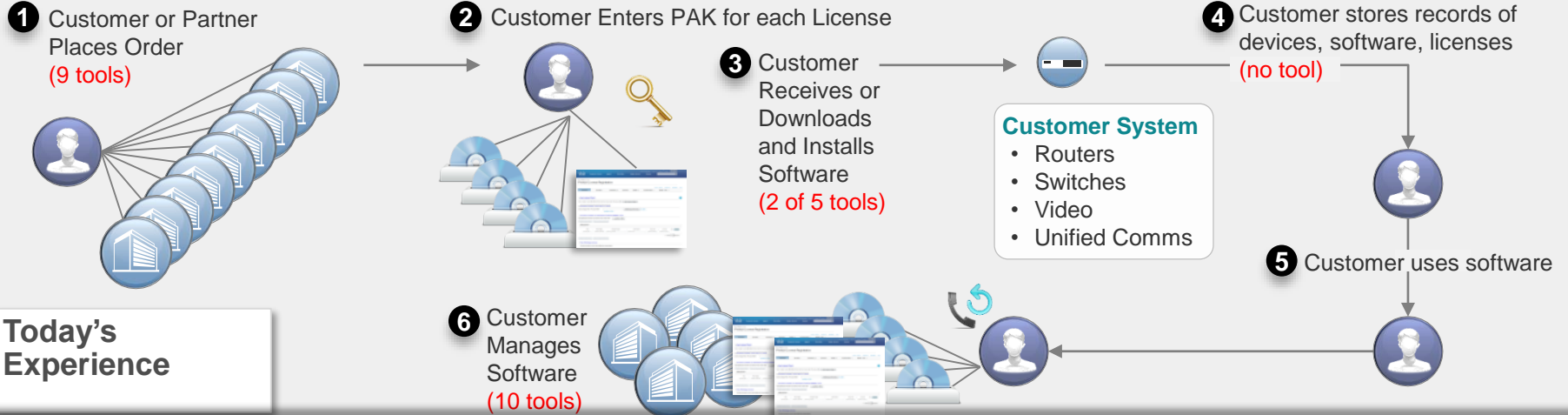
License Pooling and
Portability

The screenshot shows the Cisco Software Central web application. At the top, there is a navigation bar with the Cisco logo and links for Products & Services, Support, How to Buy, Training & Events, and Partners. Below this is a main navigation menu with tabs for Order, Download & Upgrades, Provisioning, License, and Administration. The main content area is divided into four quadrants:

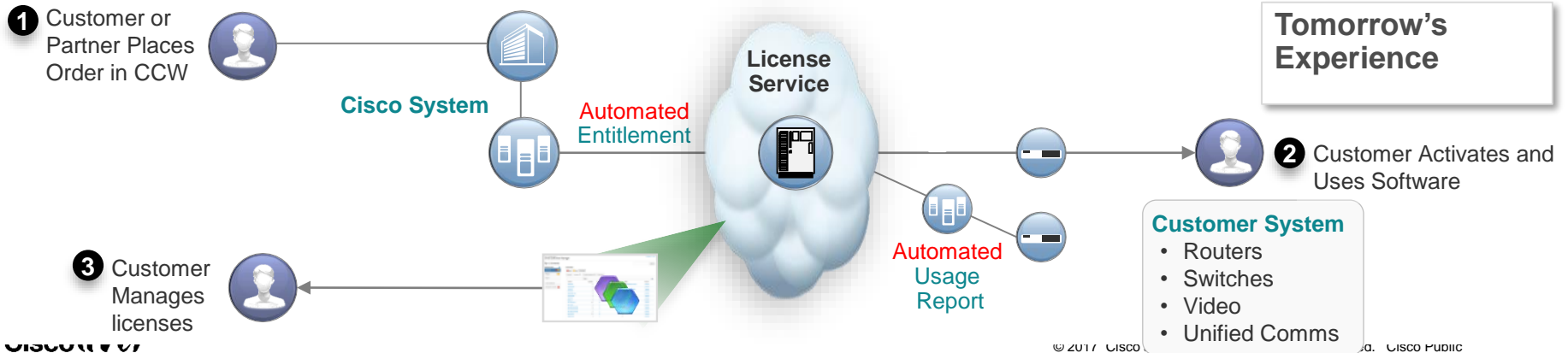
- Download & Upgrade:** Features a download icon and links for Software Download, eDelivery, Product Upgrade Tool (PUT), and Upgradeable Products.
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Today's Experience



From Today to Tomorrow...

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Unlock with license key.

Device Specific

Licenses specific to only one device.

Locked

You cannot use more than you paid for.



Complete View

Software, services, devices in one easy to use portal.

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No PAKs. Easy activation.
Device is ready to use.

Company Specific

Flexible licensing, use across devices.

Unlocked

Add users and licenses as needed.



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Browse a list of all available software updates.

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Ordering and EULA Tools

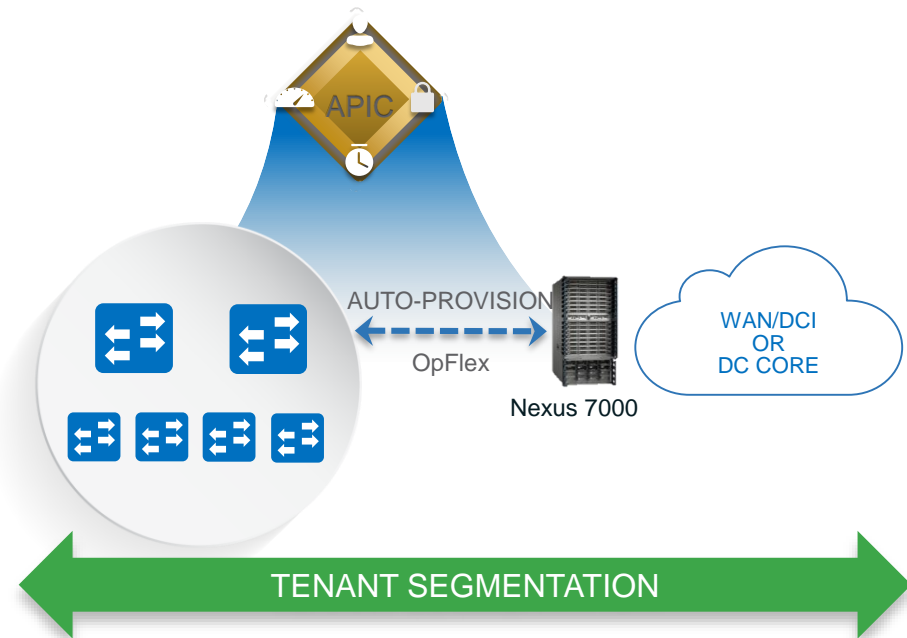


Administration

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Get a Smart Account for your organization.
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Modify the properties of your Smart Accounts and associate individual Cisco Accounts with Smart Accounts.
- [Learn about Smart Accounts](#)
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Smart Account Management

Nexus 7000 Series – ACI WAN/DCI Handoff



SOLUTION

GROUP POLICY AUTOMATION WITH OPFLEX

PER-TENANT REACHABILITY WITH MP-BGP

SECURITY POLICY ENFORCEMENT AT ACI LEAF

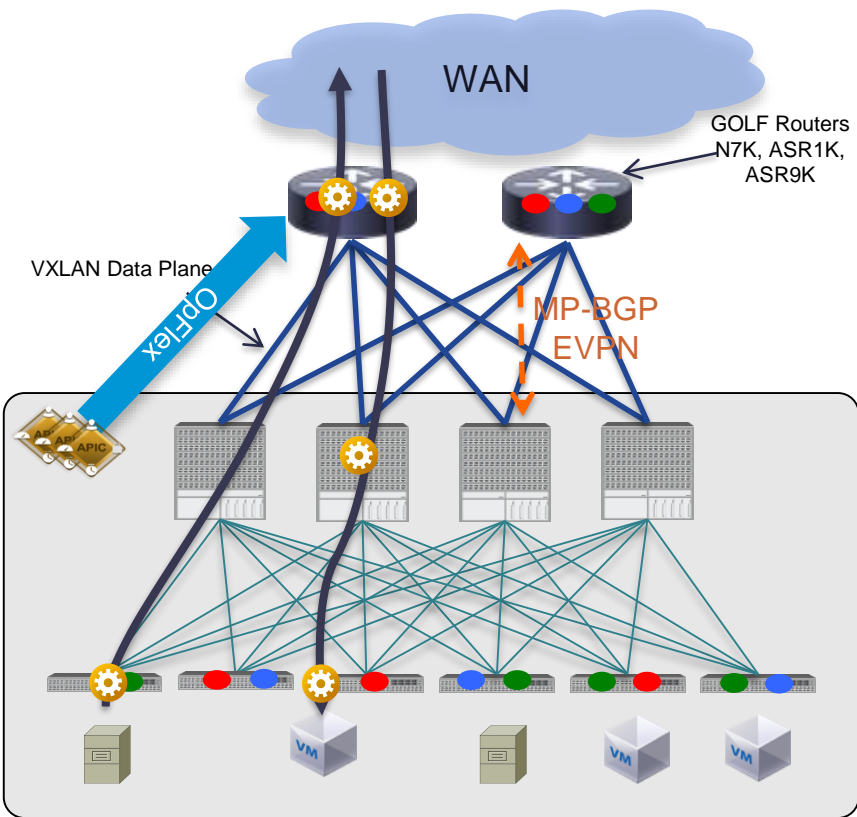
BENEFITS

MULTI-DC WORKLOAD MOBILITY

LEVERAGE PROVEN/MATURE DCI TECHNOLOGIES AND IMPLEMENTATIONS

Layer 3 EVPN Services for Fabric WAN

'GOLF' Design (ACI 2.0 Release – N7K 7.3(1)D1(1))



- Connect an ACI Fabric to the **external L3 domain** (no support for L2 GOLF with ACI)
 - WAN Edge devices functionally behave as ACI 'border leaves'
 - Control plane and data plane scale
 - OpFlex for automating the exchange of config parameters (VRF names, BGP Route-Targets, etc.)
- VXLAN handoff with MP-BGP EVPN control plane
- Better scalability, one protocol session for all VRFs, no longer constraint by border leaf HW table
- Simplified tenant L3Out configuration

Python on Nexus

- Python provides
 - Advanced language constructs: loops, conditions
 - Robust selection of libraries
- Python on Nexus provides
 - Extensive support on-box and off-box
 - Interactive and non-interactive modes
 - NX-OS Python package
 - Integration with NX-OS Embedded Event Manager (EEM)
 - Sandboxing
- Python on Nexus is useful for automating tasks
 - CLI commands
 - Generate syslog
 - Process information and act upon it quickly



Python Cisco CLI Command Module

- cli.cli
 - Passes CLI configurations
 - Returns the raw output of CLI commands, including control/special characters
- cli.clid
 - Returns JSON of command output
 - Can be converted to dictionary
- cli.clip
 - Prints command output to stdout

```
>>> import cli
```

```
>>> cli.cli("conf t ; interface eth4/1 ; shut")
```

```
>>> cli.cli('show switchname')
'Nexus9k-A \n'
```

```
>>> cli.clid('show switchname')
{'hostname': "Nexus9k-2"}
```

```
>>> cli.clip('show switchname')
Nexus9k-2
```

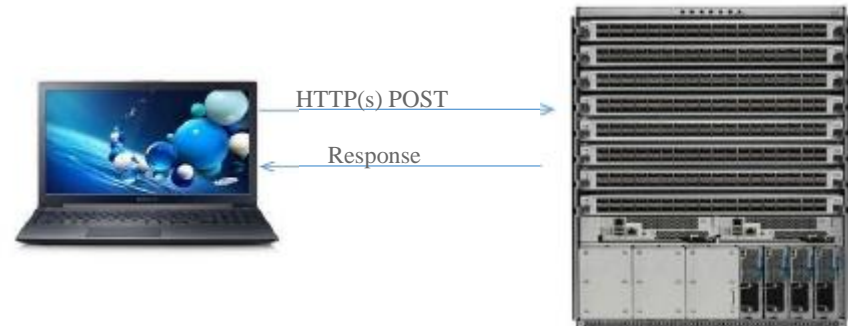
Python IDE on Nexus7K

```
switch# python
Python 2.7.5 (default, Oct  8 2013, 23:59:43)
[GCC 4.6.3] on linux2
Type "help", "copyright", "credits" or "license" for more informatior
>>> from cli import *
>>> import json
>>> cli('configure terminal ; interface loopback 5 ; no shut')
''
>>> intflist=json.loads(clid('show interface brief'))
>>> i=0
>>> while i < len(intflist['TABLE_interface']['ROW_interface']):
...     intf=intflist['TABLE_interface']['ROW_interface'][i]
...     i=i+1
...     if intf['state'] == 'up':
...         print intf['interface']
...
mgmt0
Ethernet2/7
Ethernet4/7
loopback0
loopback5
```




NX-API

- Supports off-box Python scripting
- Open RPC API – Extensible to support REST
- HTTP(S) interface to standard NXOS commands on switch
- CLIs are encoded into the HTTP/HTTPS POST body
- Allows read/write with RBAC support
- Data encoding formats include XML/JSON*





NX-API Usage

- Enabling NXAPI
- Send well-formed XML/JSON to `http(s)://<switch-ip-address>/ins`
- NX-API Sandbox via web browser at: `http://<switch-ip-address>/`
- Online help and user interface via switch web interface

```
Nexus9k(config)# feature nxapi
Nexus9k # show nxapi
enabled Listen on
port 80 Listen on
port 443
```

Generating Python Code Using the NX-API Sandbox

The screenshot displays the Cisco NX-API Developer Sandbox interface. At the top, the browser address bar shows the URL `10.1.150.11`. The page header includes the Cisco logo and the text "NX-API Developer Sandbox", along with "Quick Start" and "Logout" links.

The main content area features a large text input field containing the following configuration commands:

```
interface ethernet2/1
description nx-api sandbox
```

To the right of the input field, there are controls for "Message format" (with buttons for `json-ipc`, `xml`, and `json`) and "Command type" (with buttons for `cli_show`, `cli_show_bin`, `cli_conf`, and `bash`). Below the input field are "POST" and "Reset" buttons.

Below the main area, there are two panels: "REQUEST" and "RESPONSE".

The "REQUEST" panel shows the following Python code:

```
import requests
import json

****
Modify these please
****
url='https://YOURIP/ins'
switchuser='USERID'
switchpassword='PASSWORD'

myheaders={'content-type': 'application/json'}
payload={
  "ins_api": {
    "version": "1.0",
    "type": "cli_conf",
    "crunk": "0",
    "aid": "1",
    "output": "interface ethernet2/1 description nx-api sandbox"
```

The "RESPONSE" panel shows the following JSON output:

```
{
  "ins_api": {
    "sid": "eoc",
    "type": "cli_conf",
    "version": "1.0",
    "output": {
      "output": [
        {
          "code": "200",
          "msg": "Success",
          "body": {}
        },
        {
          "code": "200",
          "msg": "Success",
          "body": {}
        }
      ]
    }
  }
}
```

At the bottom right of the interface, there is a copyright notice: "© 2017 Cisco and/or its affiliates. All rights reserved. Cisco Public".

Popular Configuration Management Tools

Chef is a configuration management tool used for writing system configuration “recipes” and is used to streamline the task of configuring & maintaining a company's servers.

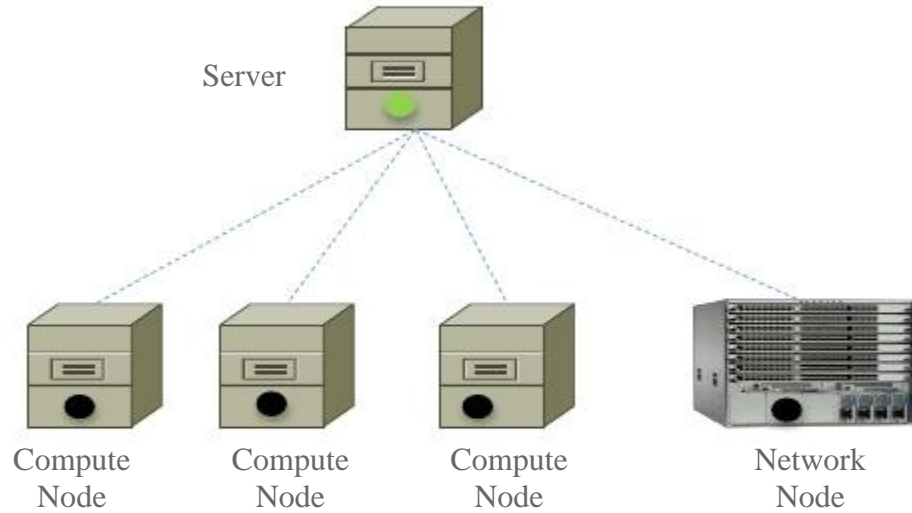


Puppet is a tool designed to manage the configuration of Unix-like and Microsoft Windows systems. It includes its own declarative language to describe system configuration.

Ansible is an open source software platform for configuring and managing computers using “playbooks”. Similar to Chef and Puppet, it is used to automate the configuration of a company’s compute resources.



Configuration Management Tools Overview



----- Inter-Process Communication (IPC)

● Server

● Agent*

Nexus 7000 M3 Series Roadmap

Nexus 7004 Support

L2-L2 Gateways

FEX Support

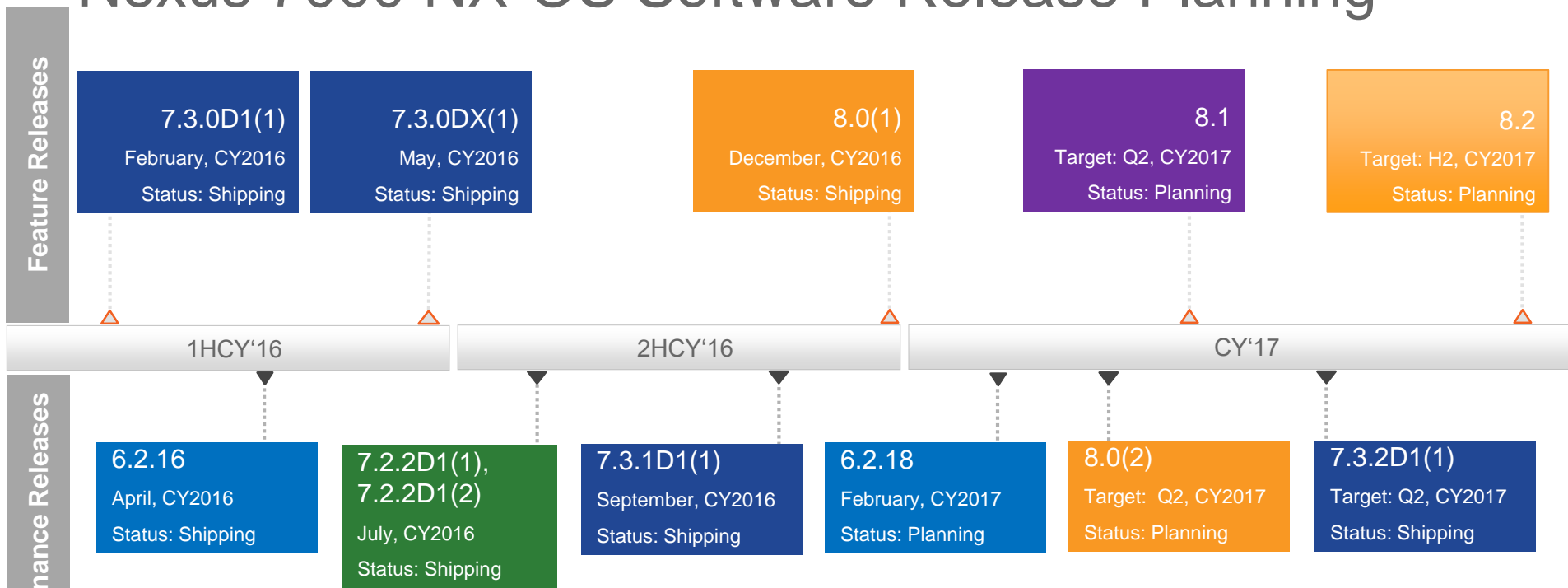
FabricPath

Campus Fabric

LISP

MKA Key Exchange for MACsec

Nexus 7000 NX-OS Software Release Planning



Terms Used

Planning – A committed date is not established

Commit – Engineering/QA has high confidence in the target FCS date

Shipping – Code can be downloaded on CCO

Nexus 7000 NX-OS Software Roadmap

	Q1CY2016	Q2CY2016	Q4CY2016	Q2CY2017(Planning)	Q3CY2017 (Planning)
	7.3(0)D1(1), 7.3(0)DX(1)		8.0(1)	8.1	8.2
Hardware	<ul style="list-style-type: none"> Nexus 7700 M3 40G I/O Module Nexus 7700 M3 1/10G I/O Module GTP Hashing 256 bit AES MACSec (M3) FCoE over FEX with F3 		<ul style="list-style-type: none"> Nexus 7700 M3 100G I/O Module Nexus 7000 M3 40G I/O Module Nexus 7000 M3 1/10G I/O Module M3 parity with NX-OS 7.3 and NX-OS 7.2 features (VXLAN OAM, VXLAN-EVPN, GIR, Link OAM) 		
Programmable Fabric	<ul style="list-style-type: none"> VxLAN/EVPN, VXLAN OAM DCI – MPLS L3VPN, L2, LISP DNA-SA Border router handoff (Q3 CY2016) ACI Integration with GOLF (F3) 		<ul style="list-style-type: none"> DNA-SDA ACI Integration 		
DCI WAN Converged LAN and SAN	<ul style="list-style-type: none"> MPLS TE Enhancements IPv6 BGP PIC Edge for IPv6 Link OAM 802.1ag 		<ul style="list-style-type: none"> BFD MultiHop for IPv4 OTV - Loopback Join Interface, Private VLAN support (Q2 CY2017) Inter-AS Option B Scale improvements IPv6 FHS features Smart Licensing 		
Security, Availability, Serviceability	<ul style="list-style-type: none"> RFC7130 BFD LAG member link Light Weight DHCP v6 Relay BFD support for HSRP IPv6 GIR – Protocol Isolate CTS Enhancements ITD – Include ACL 		<ul style="list-style-type: none"> GIR enhancements <ul style="list-style-type: none"> Syslogs, Snapshot, CLI Indicator, SNMP Trap SXP IPv4 Speaker and Listener SGACL & Egress Policy Override from ISE Per interface SGACL enforcement DHCPv6 Guard & IPv6 RA Guard iCAM, Catena & Integrity Measurement Architecture (IMA) 		

Q & A