# Catalyst 6500 update

Per Jensen

per@cisco.com

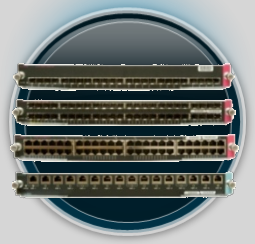
# Agenda

- SUP2T + software update
- 12.2(33)SXI4 update
- 12.2(33)SXJ update

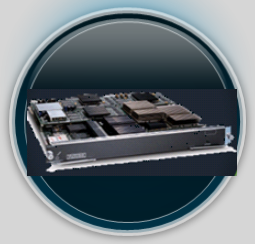
# The New 2 Terabit Catalyst 6500-E

Sup2T and 6513-E

69xx Series 80Gbps
8p 10G
4p 40G/16p 10G
Built-in DFC4



68xx/67xx
Series 40Gbps
1GbE Fiber: 24p/48p
10/100/1000: 48p
10GBASE-T: 16p
10G Fiber: 16p
Built-in DFC4



Service Modules
WiSM-2
ASM-SM
NAM-3
ACE-30

12.2(50)SY

Early Adopter Release:
Feature Parity with 12.2(33)SXI3

Innovation

**Cat6500-E**

Investment Protection

ALL E-Series Chassis

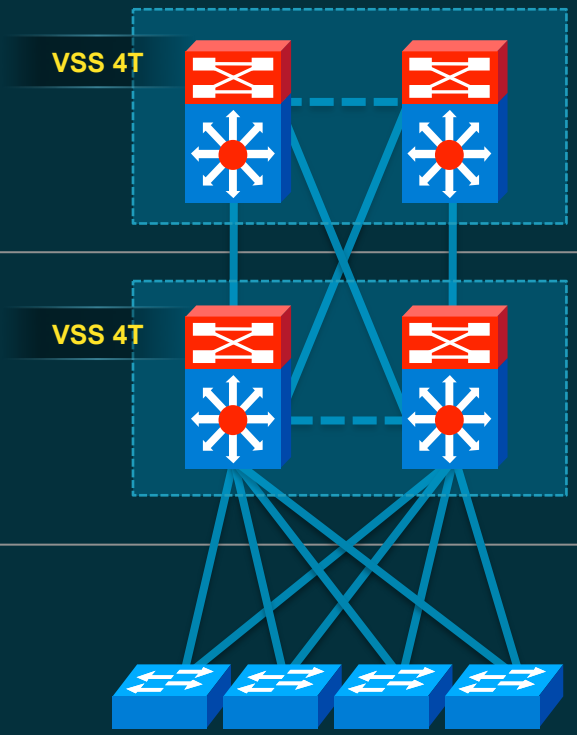
Upgrade Option for 67xx Line Cards

All 61XX POE/ POE+

Legacy Service Modules

# Catalyst Portfolio Campus Refresh

## Performance with Network Services




**CORE**

Next Gen Cat6k/ Sup2T

- 4T VSS (with Quad-Sup VSS*)
- 40G Ready
- Tunnels, L3VPNomGRE
- L3SGT For TrustSec Interoperability
- OTV, Trill Ready
- Sampled Netflow

**DISTRIBUTION**

Next Gen Cat6k/ Sup2T

- 4T VSS
- Integrated NG Svcs (WisM2, ASA, NAM, ACE-30), Multicast HA
- Smart Install Director*
- OTV, Trill Ready
- Flexible Netflow, Egress Netflow

**ACCESS**

Next Gen
Cat4k/ Sup7-E
Cat3k/ 3750X
Cat2K/2960S

- TrustSec
- EnergyWise
- NGPoE (60W) Ready
- Flexible Netflow
- IPv6 First Hop Sec.

Secure Robust Simple VDI Ready

**The New Catalyst 6500**

Resilient Virtualized Video Optimized Turn Key IPv6

# Catalyst 6500 New Service Modules in BN4

MOBILITY

## Wireless Service Module 2 (WiSM 2)

- 500 access points, 1.7x better
- 10 Gbps throughput
- Control and data plane encryption

## Catalyst 6500-E Chassis

- Extended Lifecycle of 7-10 years
- Forward and backward compatible

SECURITY

## Adaptive Security Service Module (ASA-SM)

- 16 Gbps per blade, 3x better
- Industry-leading price/ performance
- Consistency with entire ASA product family

NETWORK MANAGEMENT

## Network Analysis Module 3 (NAM-3)

- 10+ Gbps throughput, 10x better
- Advanced hardware filters
- High performance packet captures

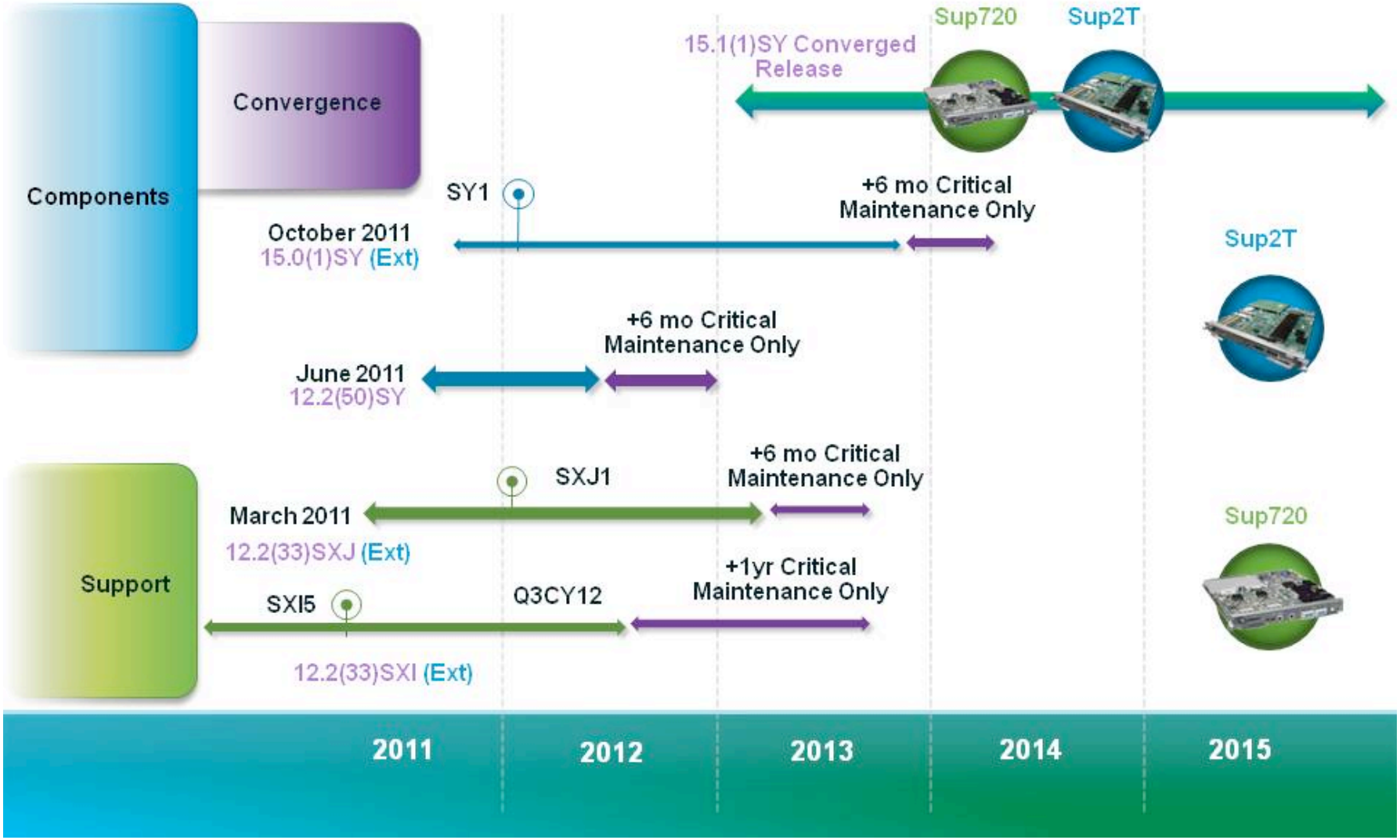
APPLICATION PERFORMANCE

## Application Control Engine 30 (ACE 30)

- 30,000 SSL transactions per second, 2x better
- Lower TCO - industry's only virtualized application delivery controller

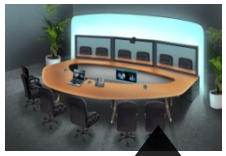
**Designed to Deliver Borderless Services for Next 10 Years**

# Catalyst 6500 Software Release Strategy



# Borderless Networks

## Catalyst 6500 Family Architecture Delivers the Borderless Experience




**Borderless End-Point/User Services**



Mobility

Workplace Experience

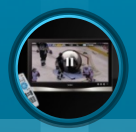
Video

AnyConnect

**Borderless Network Services**

**Borderless Management and Policy**

**Video:** Medianet



**Multicast Service Reflection**

**Green:** EnergyWise


**Energywise Phase 1 Phase 2**

**Security:** TrustSec

**IPv6 security**

**TrustSec** IPv6

**Performance**

**VSS Quad Sup Uplink Forwarding**

**Mobility**

**Service Architecture Framework (SAF)**

Infrastructure

# Catalyst 6500 12.2(33)SXI4 New Borderless Features

## Video Medianet

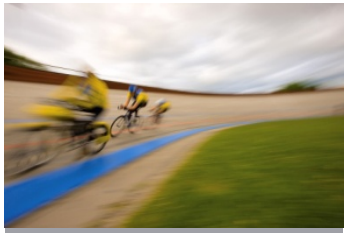
- Service Architecture Framework (SAF)
- Multicast Service Reflection

## Green

- EnergyWise Phase 1 & 2
- Cisco Orchestrator software support

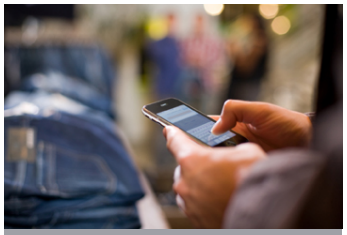
## Security

- IPv6 HSRP Global Address
- IPv6 Port Access Control List (PACL) support
- IPv6 Policy-Based Routing
- IPv6 RA-Guard Host Mode
- TrustSec IPv6 SGT Learning from Data-Path



## Performance Policy

- VSS Quad Sup Uplink Forwarding
- VSS support for SIP-400
- Service Advertisement Framework (SAF)
- Fast UDLD
- Performance Monitoring MIBS
- 10G BASE-T 16-Port 10 Gigabit Ethernet Copper Module
- SFP+ LRM optics
- LACP Auto Interleaved Port Priority
- NAM Visibility into Virtual Machine Networks



## Mobility

- Industrial Ethernet DHCP Server Port Based Address Allocation
- Advanced VPLS support for SIP-400
- VPLS MAC Address Withdrawal
- New support for MPLS Egress netflow.
- Netflow Data Export to a collector in a VRF

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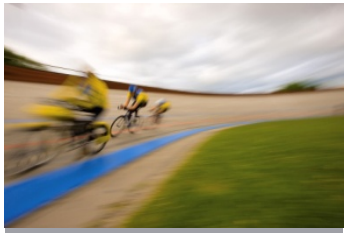

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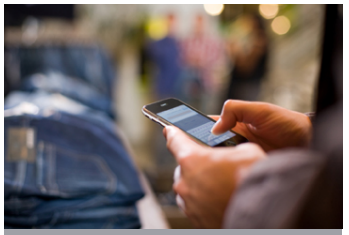

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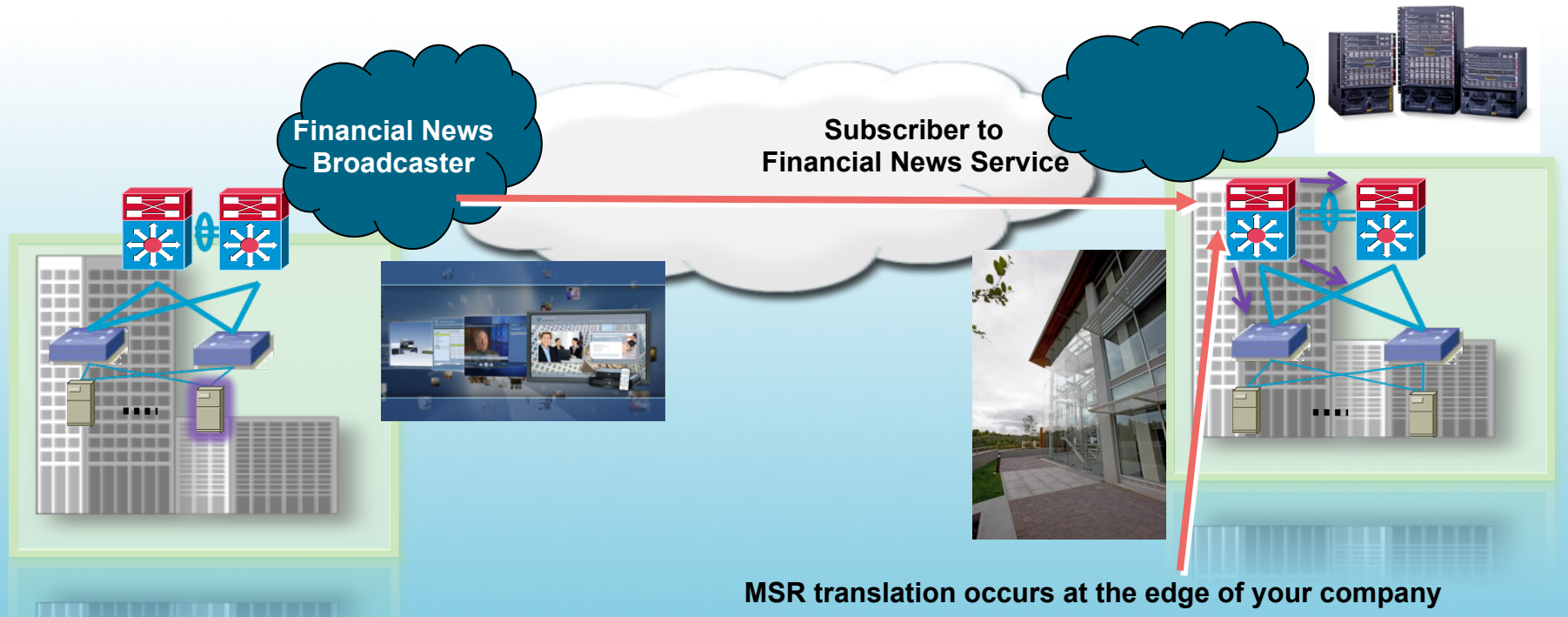
# Multicast Service Reflection

Translate external multicast feeds

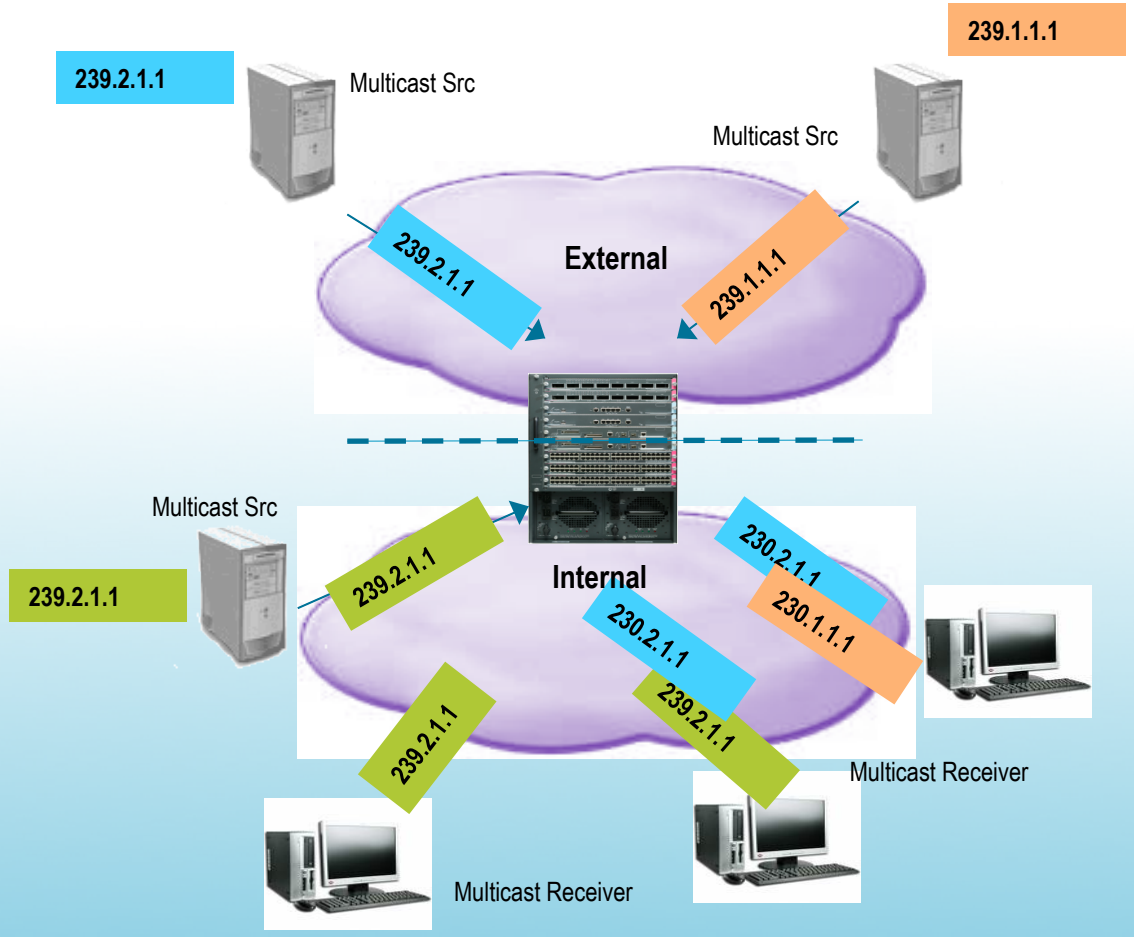
Conform to internal addressing policy

Receive redundant feeds.



# Multicast Service Reflection

Translates multicast source and destination address in the IPv4 header.




Solves multicast address overlap

Receive multicast streams from different companies

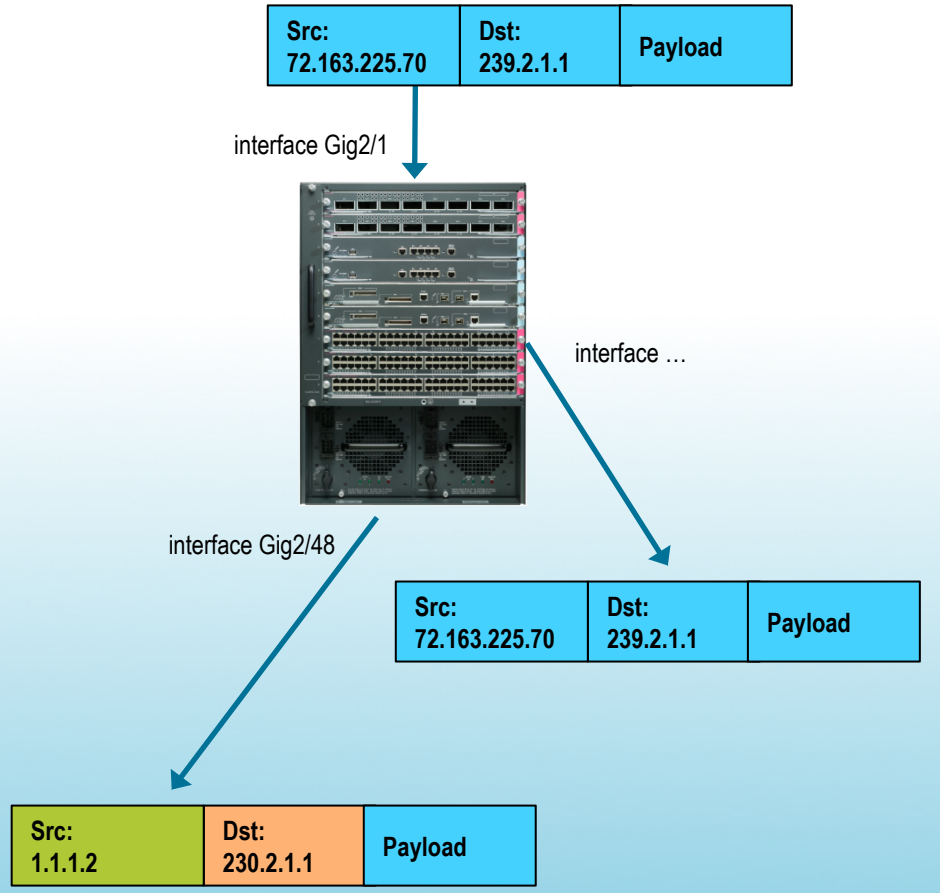
Manage internal multicast groups

Hardware support

**Supported in 12.2(33)SXI4**

# Multicast Service Reflection

```
ip multicast-routing
!
interface Loopback0
  description Rendezvous Point for Public Net
   ip address 2.2.2.2 255.255.255.255
   ip pim sparse-mode
!
interface gig2/1
   description "ip nat inside" not required
   ip address 10.0.0.1 255.255.255.0
   ip pim sparse-mode
!
interface gig2/48
   description "ip nat outside" not required
   ip address 20.20.20.1 255.255.255.0
   ip pim sparse-mode
!
interface Vif1
   ip address 1.1.1.1 255.255.255.0
   ip pim sparse-mode
   ip service reflect Ethernet0 destination
           239.2.1.1 to 230.2.1.1 mask-len 32
           source 1.1.1.2
   ip igmp static-group 239.1.1.239
!
ip pim rp-address 2.2.2.2
```



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## Video Medianet

- Service Architecture Framework (SAF)
- Multicast Service Reflection

## Green

- EnergyWise Phase 1 & 2
- Cisco Orchestrator software support

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- IPv6 RA-Guard Host Mode
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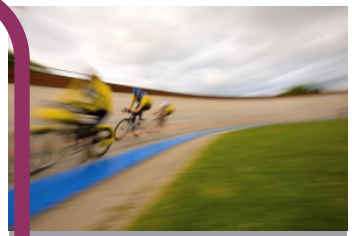

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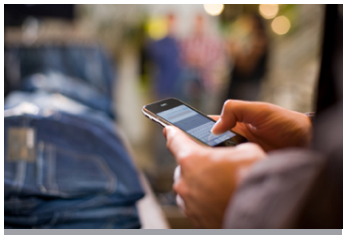

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# IPv6 Market Drivers

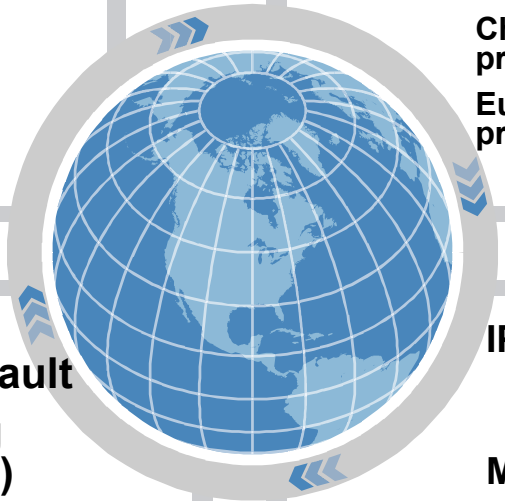
## Address space depletion

- Slow down of Internet Technologies
- Limiting expansion of enterprise into emerging markets

## National IT Strategy

U.S. Federal Mandate

- IPv6 Task Force and promotion councils: Africa, India, Japan, Korea,…
- China Next Generation Internet (CNGI) project
- European Commission sponsored projects



## IPv6 "on" & "preferred" by default

Applications only running over IPv6 (P2P framework)

## MSFT Vista & Server 2008

## IP NGN Architecture Requires IPv6

- DOCSIS 3.0, FTTH, HDTV, Quad Play
- Mobile SP – 3G, WiMax, PWLAN
- Networks in Motion
- Networked Sensors, ie: AIRS
- NAT Overlap – M&A

## Infrastructure Evolution

# Catalyst 6500 IPv6 Software Leadership

## Comprehensive IPv6 Feature Set

### IPv6 Security

- ACL, DHCPv6 Snooping*
- IPv6 First Hop Security*
- TrustSec with IPv6*

### IPv6 Tunneling

- Configured, Automatic & ISATAP tunnels (RFC 2893)
- 6to4 (RFC 3056)
- IPv6 over GRE/IPv4/MPLS (6PE)
- Native IPv6 VPNs (6VPE)

### IPv6 Routing

- Support for following protocols: Static routes, RIPng IS-IS , MP-BGP4, OSPFv3, Neighbor discovery (RFC 2461)
- OSPFv3 Authentication*
- IPv6 PBR, PBR Set VRF*

### Forwarding

- Unicast and Multicast IPv6 in Hardware (RFC 2460), CEFv6/ dCEFv6
- VRF Aware Svcs* , ECMP
- 200Mpps+ HW forwarding


### IPv6 HA

- IPv6 with VSS
- HSRPv6 , GLBPv6
- BFD for OSPFv3*
- NSF/SSO IPv6 forwarding*

### Multicast

- MLDv1, access group, PIM SSM, BSR, PIM embedded RP
- Multicast over 6VPE with Inter-AS and Extranet Support*
- Multicast over GRE

### IPv6 QoS

- Full support for classification policing, queuing of IPv6 packets
- IPv6 CoPP*

### Applications & Mgmt

- Telnet, TFTP, DNS resolver, HTTP, ping, traceroute, SSH, SNMP*, Syslog*, TACACS+*, NTPv4*, Radius*, AAA*, NAM Support*
- FlexNetFlowfor IPv6 in hardware
- ICMPv6 (RFC 2463)
- DHCPv6 and DHCP Relay
- IPv6 Stats and Counters*
- IPv6 DHCP Helper Address MIB*
- WCCP v3 with IPv6 support*

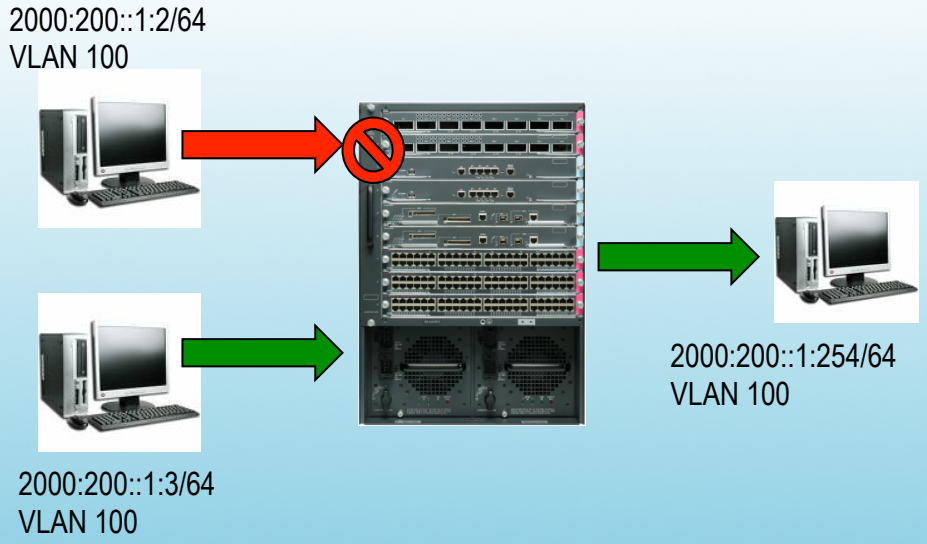
# Security - IPv6 PACL support (IPv4 Parity)

| | IPv4 | | | IPv6 | | |
|---|---|---|---|---|---|---|
| | RACL | VACL | PACL | RACL | VACL | PACL |
| PFC/DFC 3A | ✔ | ✔ | ✔ | ✔ | ✔ | 12.2(33)SXI4 |
| PFC/DFC 3B | ✔ | ✔ | ✔ | ✔ | ✔ | 12.2(33)SXI4 |
| PFC/DFC 3BXL | ✔ | ✔ | ✔ | ✔ | ✔ | 12.2(33)SXI4 |
| PFC/DFC 3C | ✔ | ✔ | ✔ | ✔ | ✔ | 12.2(33)SXI4 |
| PFC/DFC 3CXL | ✔ | ✔ | ✔ | ✔ | ✔ | 12.2(33)SXI4 |
| VSS | ✔ | ✔ | ✔ | ✔ | ✔ | 12.2(33)SXI4 |

- Catalyst 6500 supports IPv6 PACL by programming IPv6 ACEs into layer 3 forwarding engine security TCAM, same capabilities as IPv6 RACL.
- IPv6 PACL is an ingress security feature.
- IPv6 PACL requires advance ip service IOS feature set or above.
- Port based ACL (PACL) provides a mechanism to filer the incoming packets based on layer 2-4 parameters at layer 2 port level. Starting from IOS 12.2(33)SXI4, Catalyst 6500 supports IPv6 PACL continues our leadership in IPv4 to IPv6 transition.

# IPv6 PACL support

Port based ACL (PACL) provides a mechanism to filer the incoming packets based on layer 2-4 parameters.

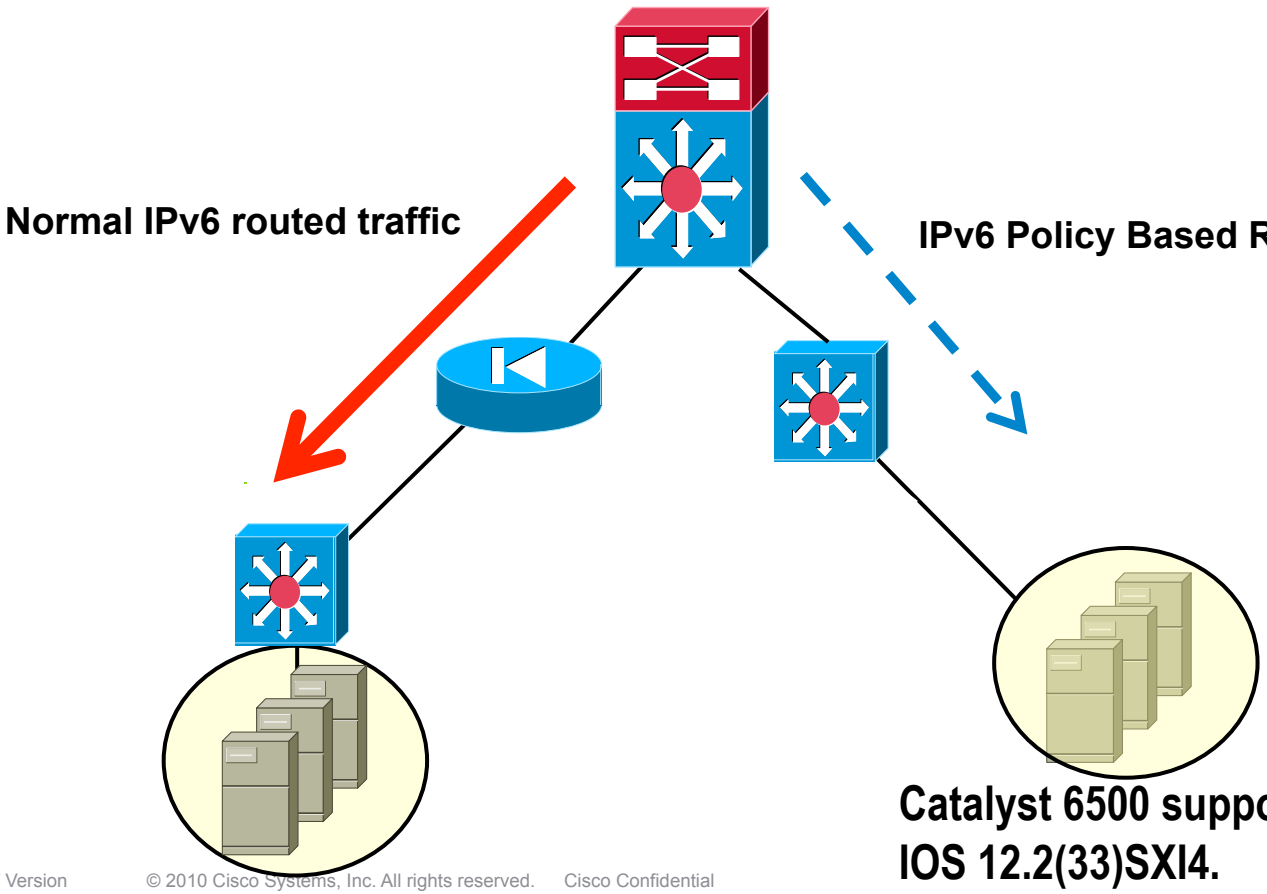



```
……
interface GigabitEthernet2/1
 switchport
 switchport access vlan 100
 switchport mode access
 ipv6 traffic-filter ipv6-pacl in
……
ipv6 access-list ipv6-pacl
 deny ipv6 host 2000:200::1:2 host
2000:200::1:254
 permit ipv6 any any
```

**Supported in 12.2(33)SXI4**

# IPv6 Policy-Based Routing

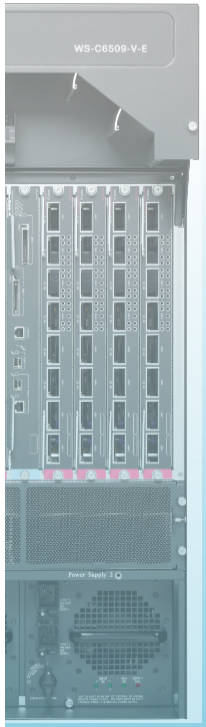
Flexible IPv6 traffic policies




**Catalyst 6500 supports hardware IPv6 PBR IOS 12.2(33)SXI4.**

# IPv6 Policy-Based Routing

IPv6 Policy Based Routing (PBR) provides a flexible mechanism for routing of IPv6 traffic based on user defined policies. Catalyst 6500 adds IPv6 PBR capabilities in IOS 12.2(33)SXI4, with key functionality supported din hardware.



```
C6K(config)#route-map ipv6-pbr-policy

C6K(config-route-map)#match ipv6 address ?
  WORD          IPv6 access-list name
  prefix-list   IPv6 prefix-list

C6K(config-route-map)#set ipv6 ?
  address      IPv6 address
  default      Set default information
  next-hop     IPv6 Next hop
  precedence   IPv6 Precedence

C6K(config-if)#ipv6 policy route-map ?
  WORD  Route-map name
```

Hardware Support

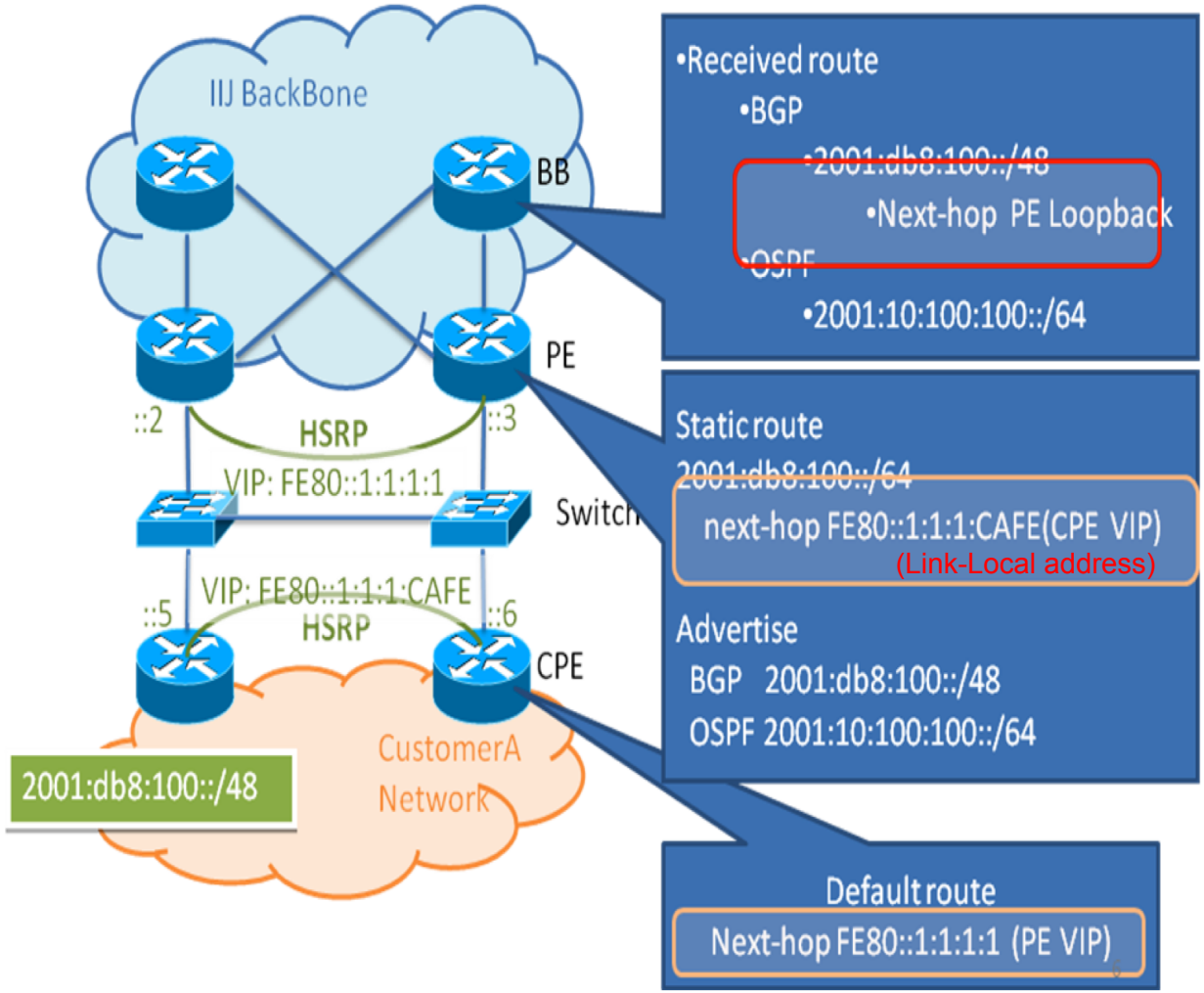
- match IPv6 address
- set ipv6 next hop
- set vrf
- set ipv6 next-hop
- set ipv6 default next-hop

Software Support

- match length
- set interface
- set default interface
- set ipv6 precedence

IPv6 PBR policies are not supported on IPv6 multicast traffic or IPv6 link local addresses
IPv6-PBR not supported in hardware when it is applied to SVI regardless of match and set criteria
Other caveats may apply, check documentation for complete list

# HSRP Global IPv6 Address




- Currently Link-Local (LL) addresses are advertised by HSRP
- New HSRP Global IPv6 feature allows HSRP to advertise a global IPv6 address

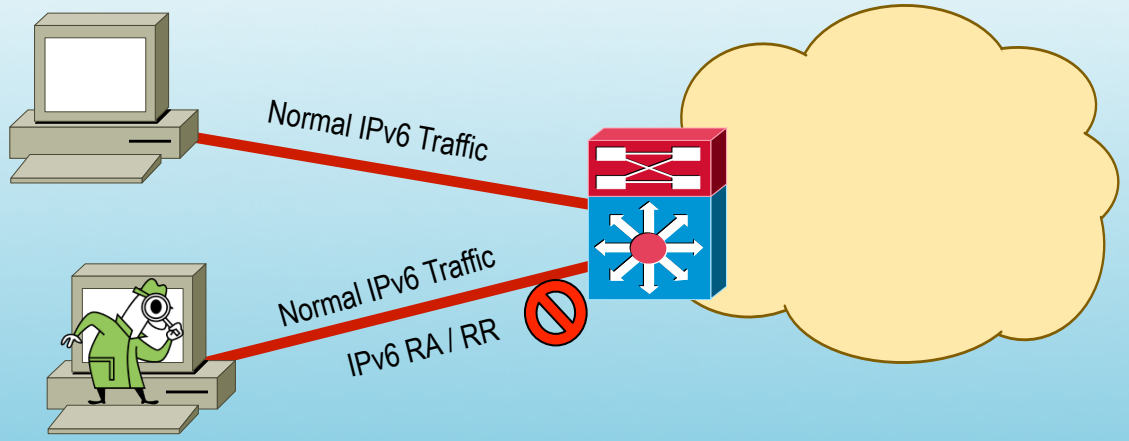
# IPv6 RA-Guard Host Mode

There is always the risk of facing operational problems due to rogue IPv6 router advertisement generated maliciously or unintentionally.

IPv6 RA-Guard allows filtering of Router-Advertisement messages on L2 ports

```
C6K#show run int gig2/4
Building configuration...

Current configuration : 117 bytes
!
interface GigabitEthernet2/4
 switchport
 switchport access vlan 100
 switchport mode access
 ipv6 nd raguard
end
```




**Supported in 12.2(33)SXI4**

# TrustSec IPv6 SGT Learning from Data-Path

Detects IPv6 to SGT mapping

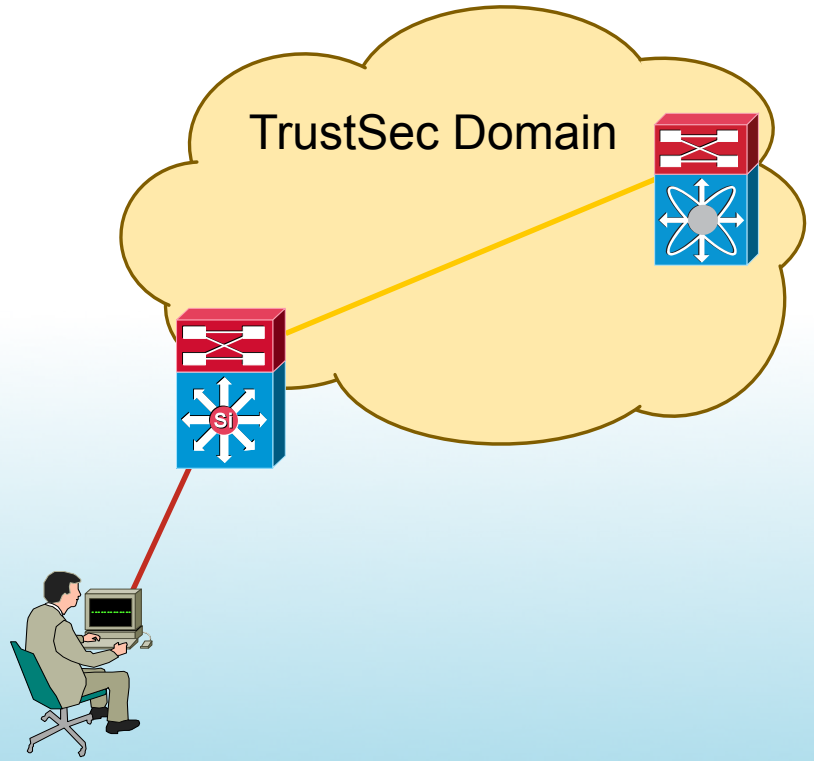
Single stack (IPv6) hosts

Dual stack (IPv4/IPv6) hosts.

Binding to a single SGT

SGACL enforcement

TrustSec SXP SNMP MIB support and Syslogs



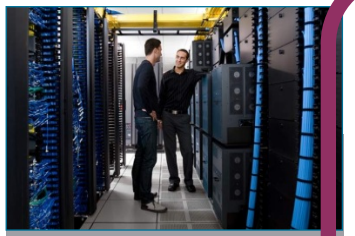
# Catalyst 6500 12.2(33)SXI4 New Borderless Features

## Video Medianet

- Service Architecture Framework (SAF)
- Multicast Service Reflection

## Green

- EnergyWise Phase 1 & 2
- Cisco Orchestrator software support



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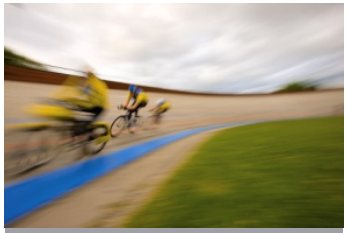

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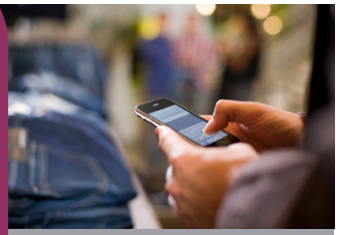

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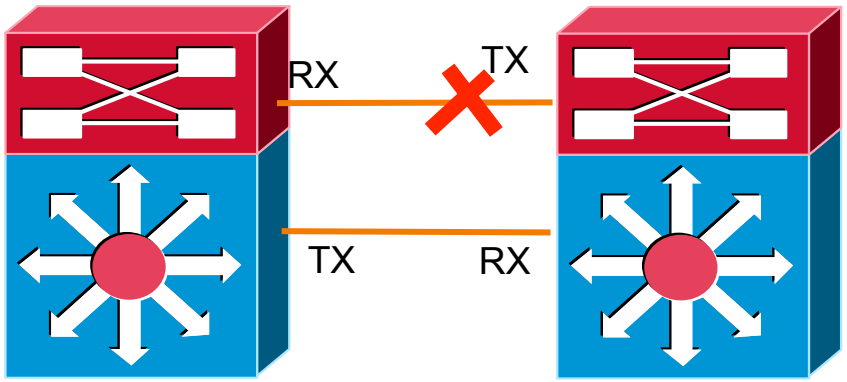
# Fast UDLD

Change the timers with "fast-hello" from 200 milliseconds to 1000 milliseconds

Normal UDLD is 7 seconds to 90 seconds.




Enable normal (non-aggressive/aggressive) UDLD on the global config mode & on the interface if it is copper based port.

```
Router(config)#udld enable
Router(config)#interface gig1/1
Router(config-if)#udld port
Or
Router(config)#udld aggressive
Router(config)#interface gig1/1
Router(config-if)#udld port
```

Enable fast-UDLD on the interface with the following CLI:

```
Router(config-if)#udld fast-hello ?
<200-1000>  Time in milliseconds between sending of messages in steady state
Router(config-if)#udld fast-hello 200
```

# LACP Auto Interleaved Port Priority

- The feature distributes the bundled ports dynamically by changing the way ports are numbered

  *System Id (system priority, system MAC)*

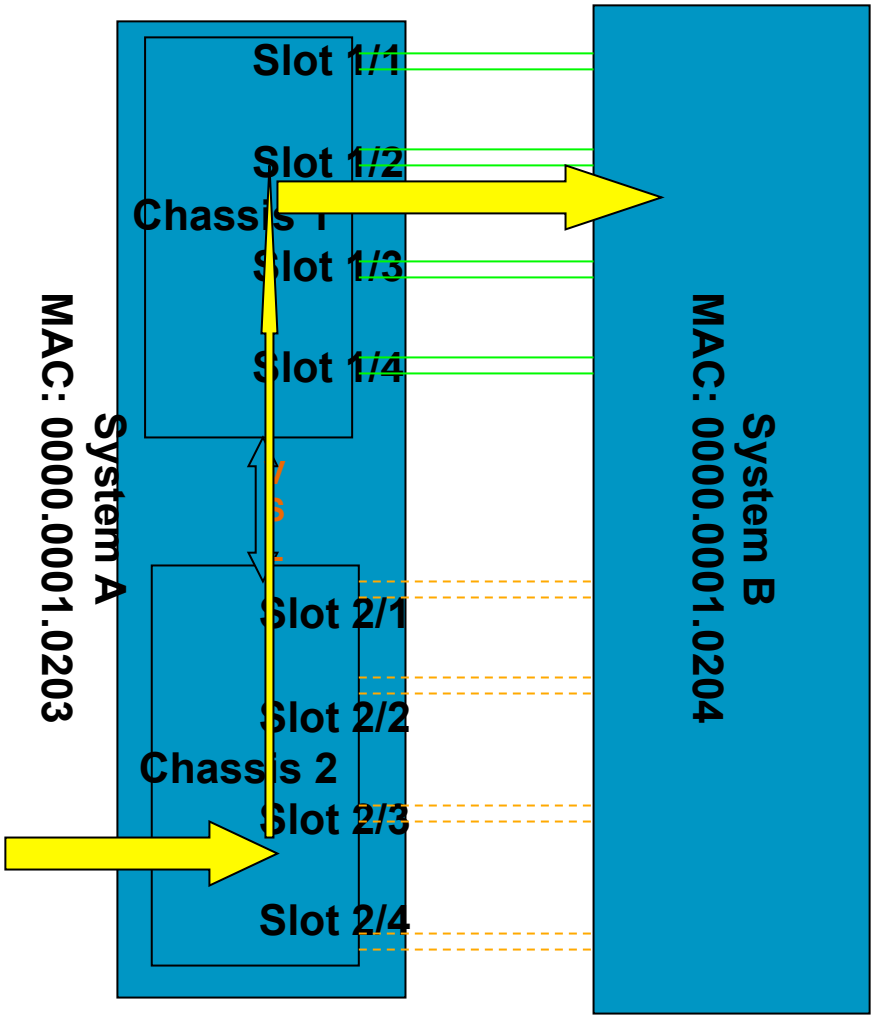
  *Port Id (port priority, port number)*

  ***Port number = position + slot***

- 'Port number' is based on <position, slot> where 'position' is link-up position of port in the corresponding slot
- Ports from different slots are guaranteed to be bundled ahead of ports from the same slot
- The logic could be applied irrespective of L2/L3 ports and hence L2/L3 etherchannels.
- No manual intervention needed
- Optional CLI knob to enable it on per etherchannel basis

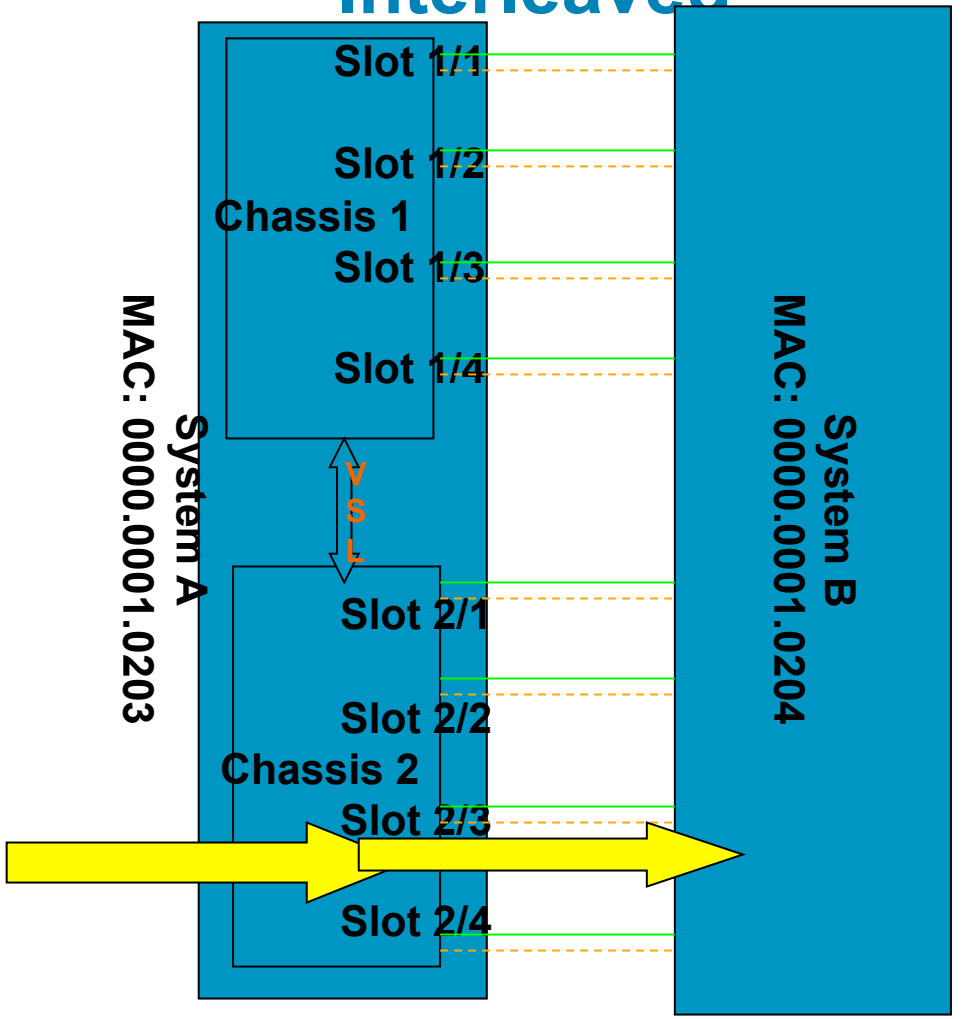
# VSS MEC

## Without Auto Interleaved




- All 8 ports from chassis 1 are active and 8 from chassis 2 remain hot standby.
- Incoming traffic to chassis 2 cross VSL to reach peer.

## With Auto Interleaved




- One port from each LC become active and the other hotstandby.
- Unnecessary traffic through VSL is avoided.

# Example of Configuration

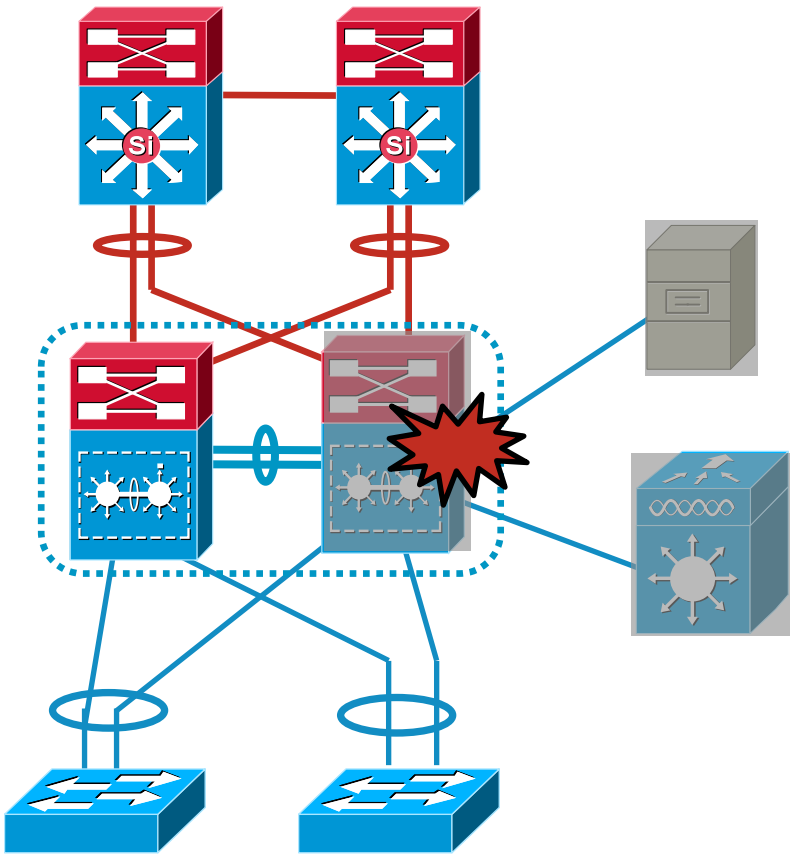
Example of configuration on port-channel 23

```
interface Port-channel23
ip address 10.0.0.1 255.255.255.0
lacp max-bundle 4
lacp active-port distribution automatic
end
```

# VSS Redundant Supervisor Support

## Why Redundant Supervisors Are Needed

- A Supervisor failure event will down the affected chassis decreasing the VSS bandwidth by 50%
- Certain devices may only single-attach to the VSS for various reasons
  - Service Modules/Servers
  - Geographic separation of VSS chassis
  - Costs $$
- Supervisor failure events therefore require manual intervention for recovery of the affected chassis
  - Uplinks are not active when the Supervisor is in ROMMON mode
  - Undeterministic outage time
  - Relies on manual process to install and convert the new Supervisor with current VSS configuration



# VSS Quad-Sup Uplink Forwarding

## Provides Active Uplinks with Deterministic Recovery From a Supervisor Failure

- In the initial VSS release a redundant In-Chassis Supervisor is not supported

  Will stop its boot process at the ROMMON stage

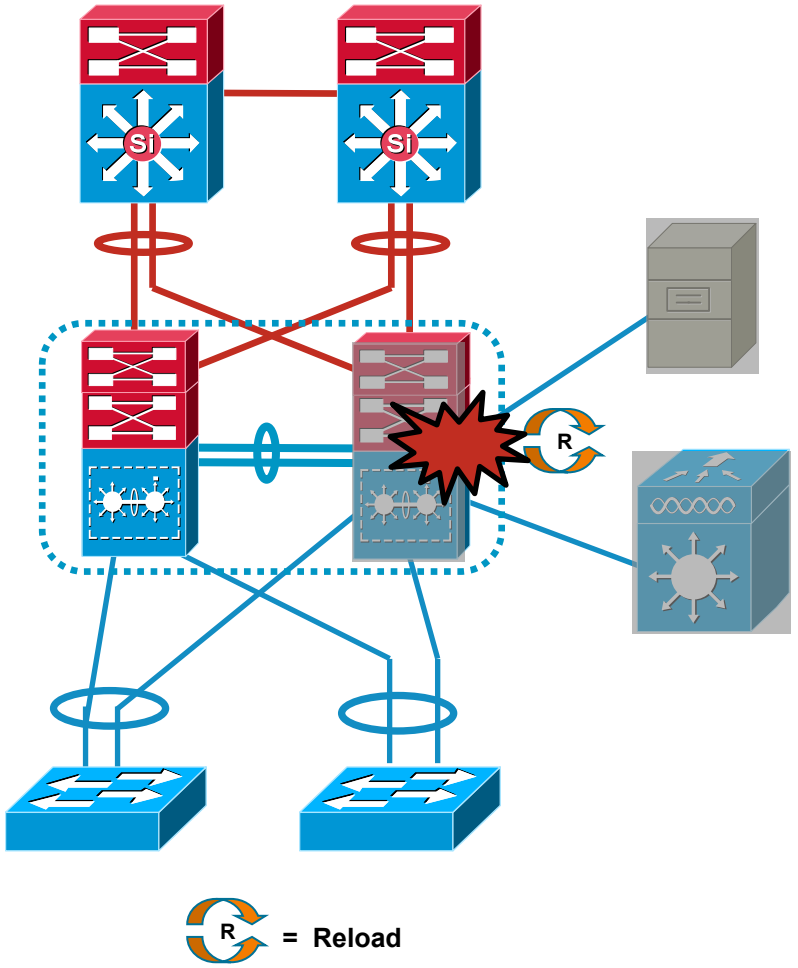
- Quad-Sup Uplink Forwarding

  A Second Supervisor installed in the chassis will boot as a Linecard with all of its ports active

  New in 12.2(33)SXI4

- If the active Supervisor in the chassis should fail the In-Chassis Standby will reload and then take over the chassis Supervisor functions without human intervention

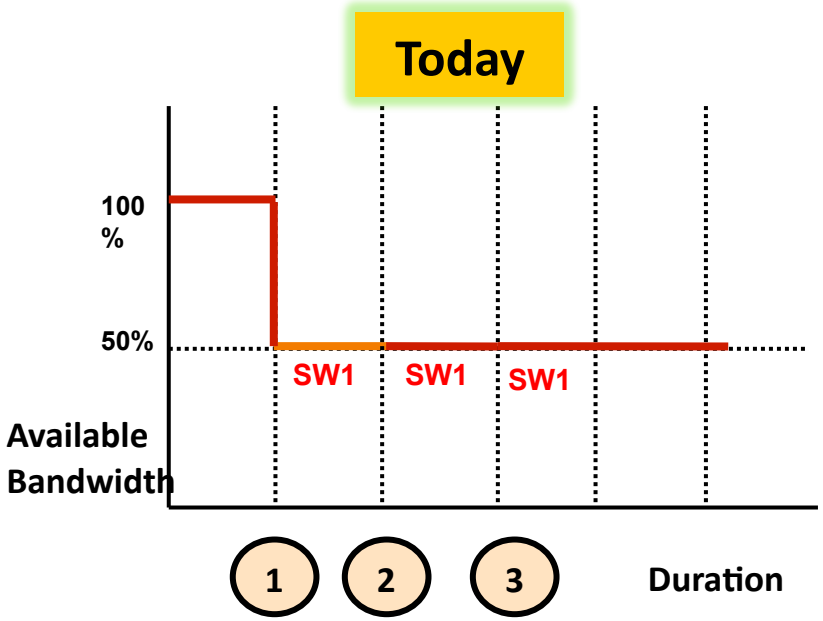
  1. Supervisor Failure event
  2. Chassis reloads
  3. In-chassis Standby now becomes VSS standby and chassis dataplane is active again



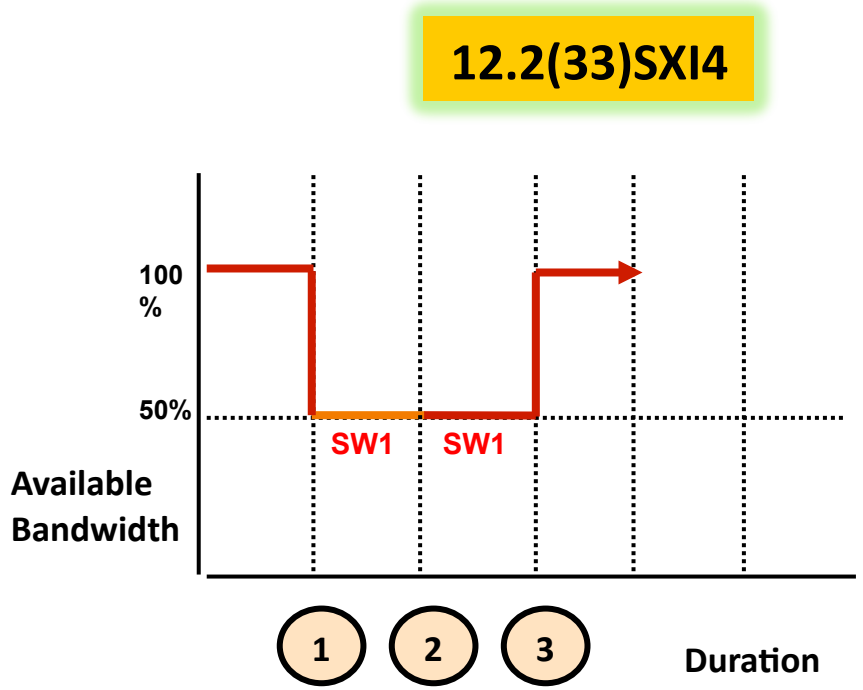
# Virtual Switching System (VSS)

## Active Supervisor Failover

The following graph illustrates the aggregate traffic for the VSS system during the active supervisor failover with and without dual supervisor support.



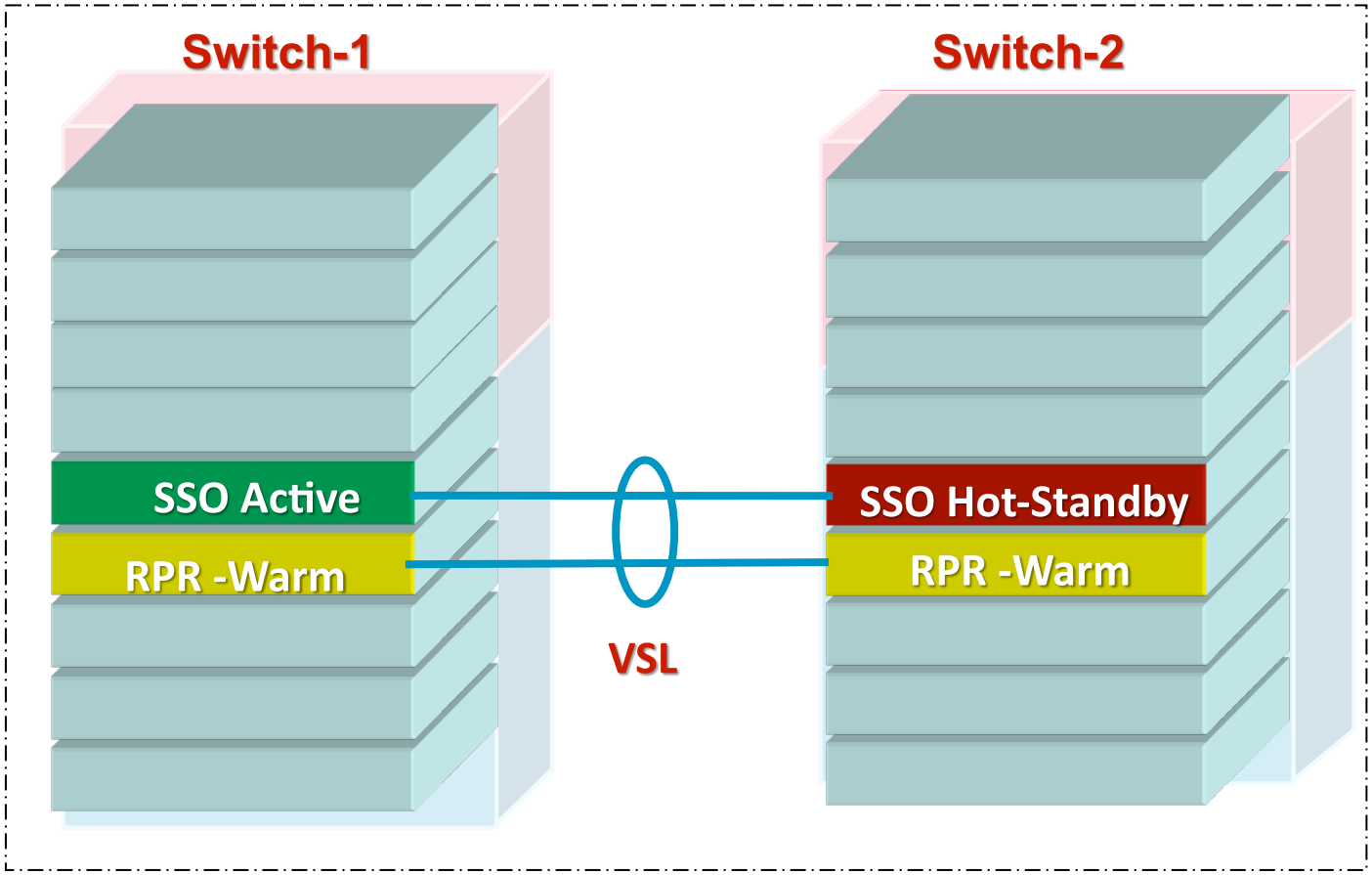

Un-deterministic supervisor failure recovery




Deterministic supervisor failure recovery

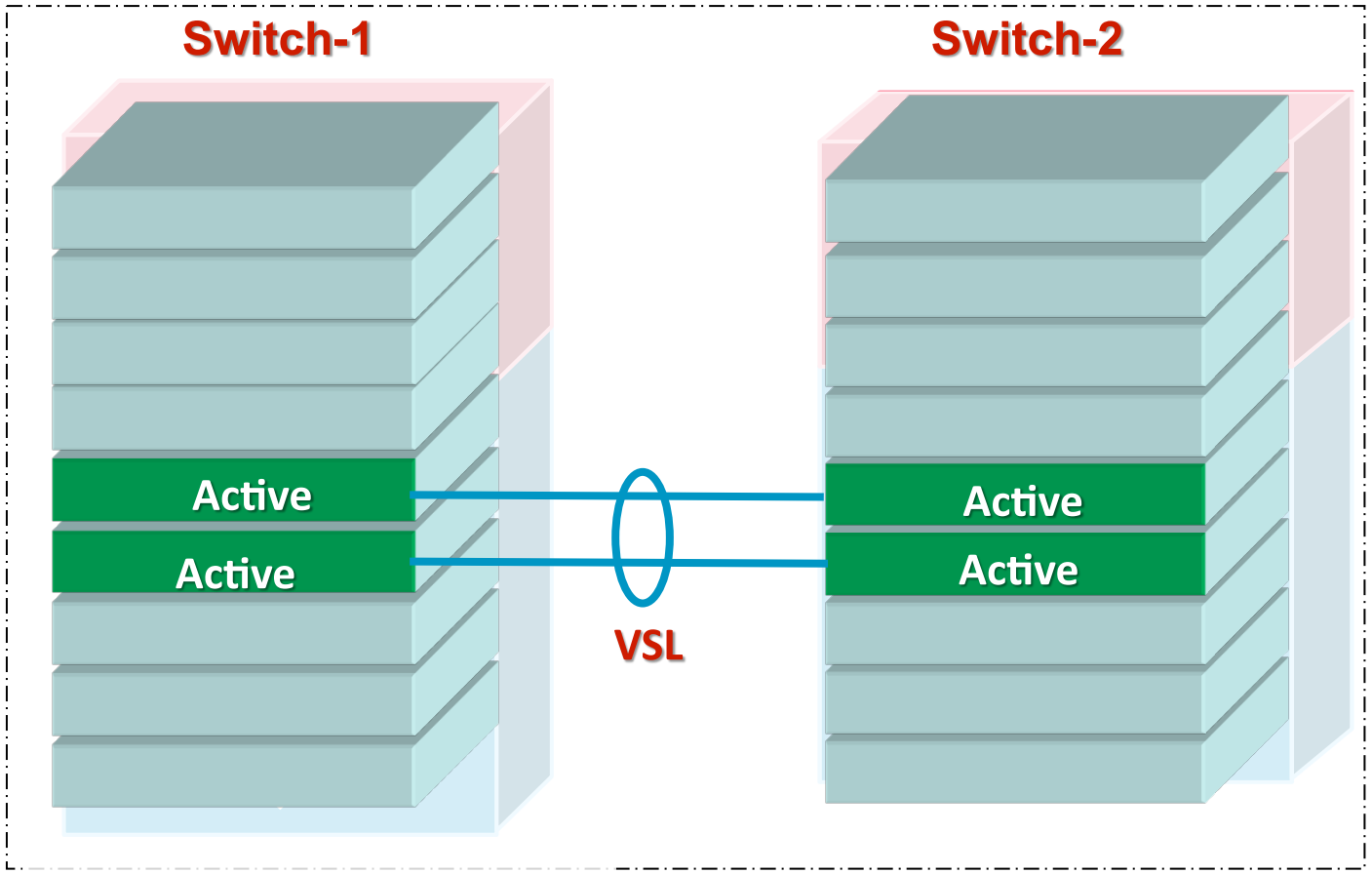
# Virtual Switching System (VSS)
## Dual-Supervisor – Control Plane

Redundant supervisors fully boot Cisco IOS to RRP-WARM redundancy mode



# Virtual Switching System (VSS)
## Dual-Supervisor- Data plane

From data plane perspective the RRP-Warm supervisor operates similarly to a DFC-enabled line card. Forwarding tables are in sync and data plane is active for module uplinks

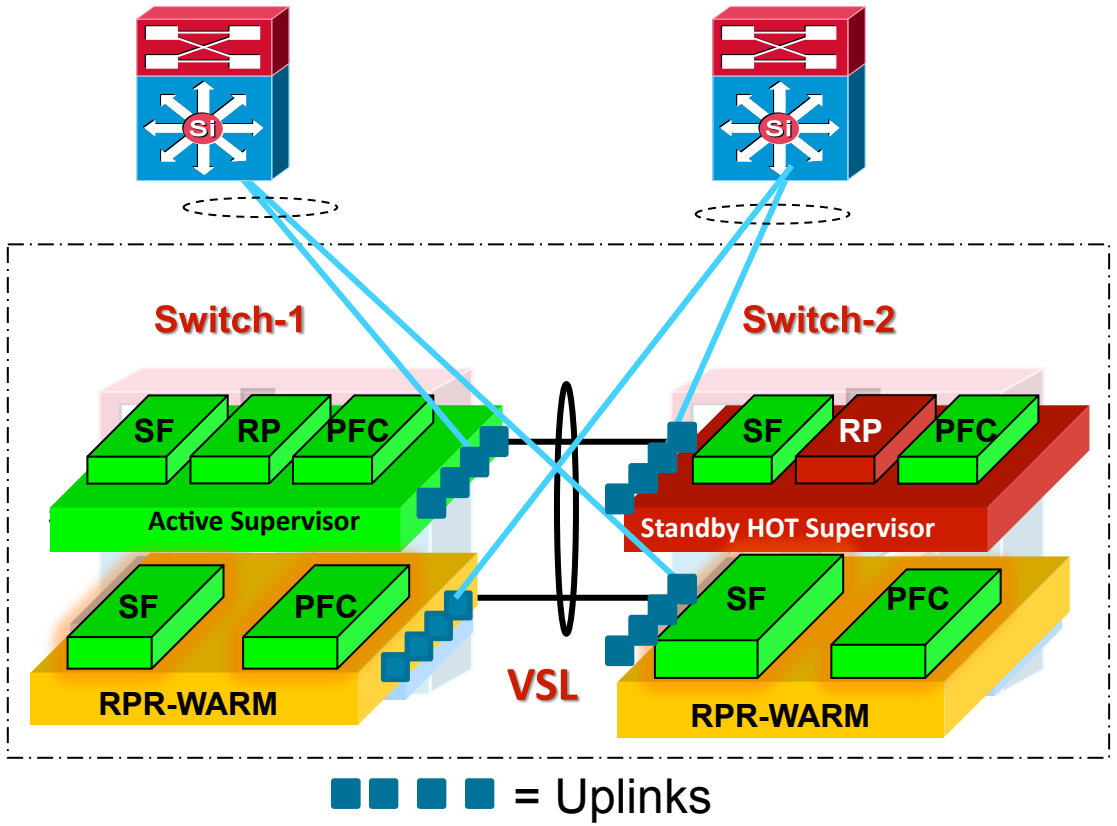


# Virtual Switching System (VSS)

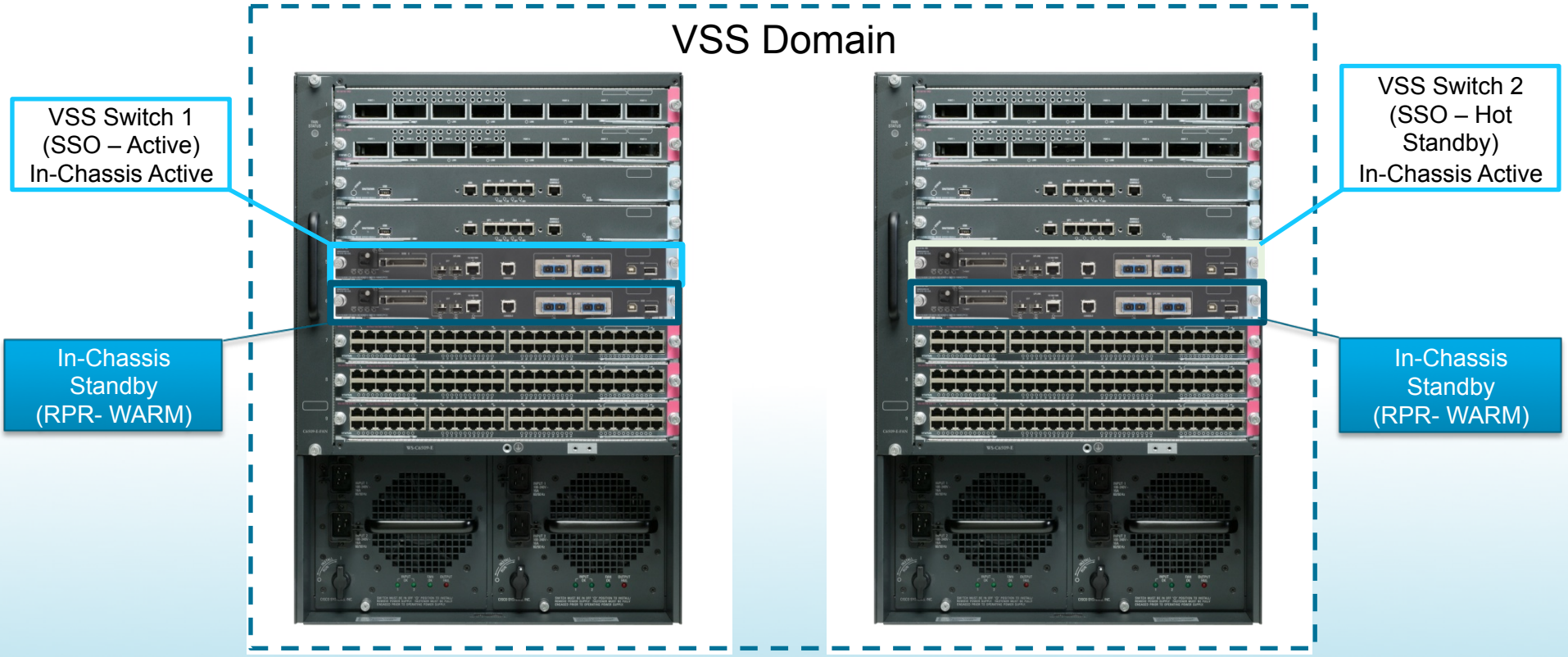
## All Uplinks Active in RPR-WARM Redundancy Mode

PFC and crossbar fabric of the In-chassis standby supervisor are active.

Use at least one of the ten gigabit interfaces from each supervisor to build the VSL. Remaining ports can be used for other purposes including uplinks.



# VSS Quad-Sup Uplink Forwarding Redundancy Mode




"RPR-Warm" is a new redundancy mode created for the VSS In-chassis Standby Supervisor

RPR-Warm mode allows the Supervisor to operate primarily as a linecard, but with some synchronization with the In-Chassis Active Supervisor (Synchronization does not occur across chassis)

Supervisor uplink ports are operational and active just like on a linecard

# VSS In-Chassis Standby RPR-WARM Redundancy Mode

VSS Chassis with Dual Supervisors Running Quad-Sup Forwarding

- In-Chassis Standby Supervisor
  - Downloads and boots new image file Sup720-LC
  - SP runs the Sup720-LC image
  - RP is in ROMMON
  - Operates mostly as a DFC enabled line card
  - Some Supervisor subsystems are synched between In-Chassis Active and Standby
- Subsystems synched include
  - Startup-config
  - Vlan.dat
  - BOOT ROMMON variable
  - CONFIG_FILE ROMMON variable
  - BOOTLDR ROMMON variable
  - DIAG ROMMON variable
  - SWITCH_NUMBER ROMMON variable

# Catalyst 6500 12.2(33)SXI4 New Borderless Features

## Video Medianet

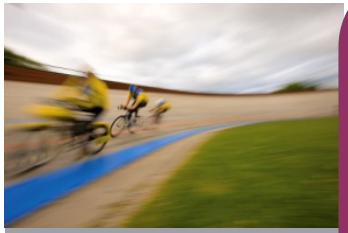
- Service Architecture Framework (SAF)
- Multicast Service Reflection

## Green

- EnergyWise Phase 1 & 2
- Cisco Orchestrator software support

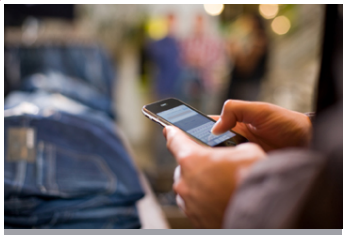
## Security

- IPv6 HSRP Global Address
- IPv6 Port Access Control List (PACL) support
- IPv6 Policy-Based Routing
- IPv6 RA-Guard Host Mode
- TrustSec IPv6 SGT Learning from Data-Path



## Performance Policy

- VSS Quad Sup Uplink Forwarding
- VSS support for SIP-400
- Service Advertisement Framework (SAF)
- Fast UDLD
- Performance Monitoring MIBS
- 10G BASE-T 16-Port 10 Gigabit Ethernet Copper Module
- SFP+ LRM optics
- LACP Auto Interleaved Port Priority
- NAM Visibility into Virtual Machine Networks



## Mobility

- Industrial Ethernet DHCP Server Port Based Address Allocation
- Advanced VPLS support for SIP-400
- VPLS MAC Address Withdrawal
- New support for MPLS Egress netflow.
- Netflow Data Export to a collector in a VRF

# Data Center Interconnect
## Technology Selection Criteria

**Ethernet**

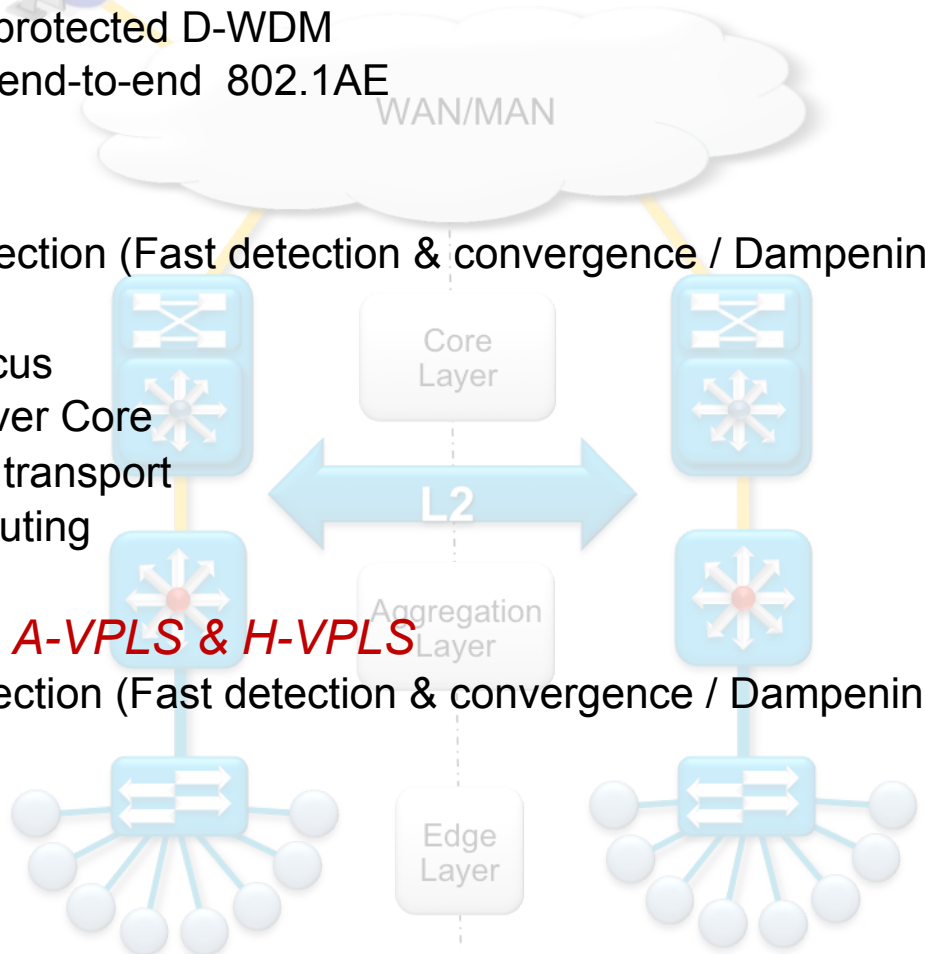
- *VSS & vPC or FabricPath (TRILL)*
  - Applies easily for dual site interconnection
  - Over dark fiber or protected D-WDM
  - Easy crypto using end-to-end 802.1AE

**IP**

- *OTV*
  - L2oL3 for link protection (Fast detection & convergence / Dampening)
  - CE style
  - Enterprise / DC focus
  - Easy integration over Core
  - Works over MPLS transport
  - Innovative MAC routing

**MPLS**

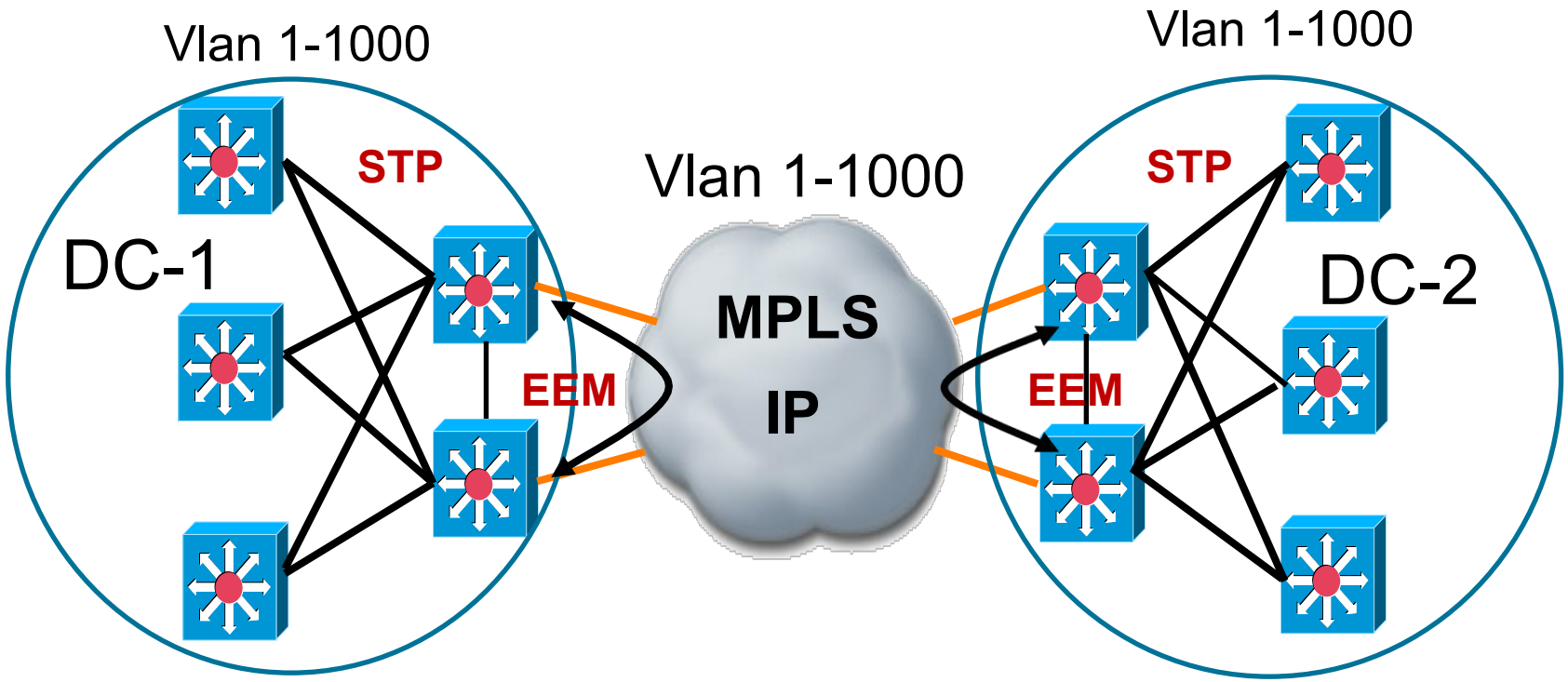
- *EoMPLS & VPLS & A-VPLS & H-VPLS*
  - L2oL3 for link protection (Fast detection & convergence / Dampening)
  - PE style
  - Large scale
  - Multi-tenants
  - Works over GRE
  - Most deployed today



# Solution to Product Portfolio Table

| | ASR 1000 | Cat 6500 | Nexus 7000 | ASR 9000 |
|---|---|---|---|---|
| **Ethernet Based** | | | | |
| VSS | NA | ✓ | NA | Roadmap |
| vPC | NA | NA | ✓ | NA |
| FabricPath | NA | NA | ✓ | NA |
| **IP Based** | | | | |
| OTV | Roadmap (2HCY11) | Radar | ✓ | NA |
| **MPLS Based** | | | | |
| EoMPLS | ✓ (Including EoMPLSoGRE w/ and w/out IPSec) | ✓ (EoMPLSoGRE requires SIP card support) | Roadmap (1HCY12) | ✓ |
| VPLS | Roadmap (2HCY11) | ✓ | Roadmap (1HCY12) | ✓ |

# MPLS-based LAN Extensions



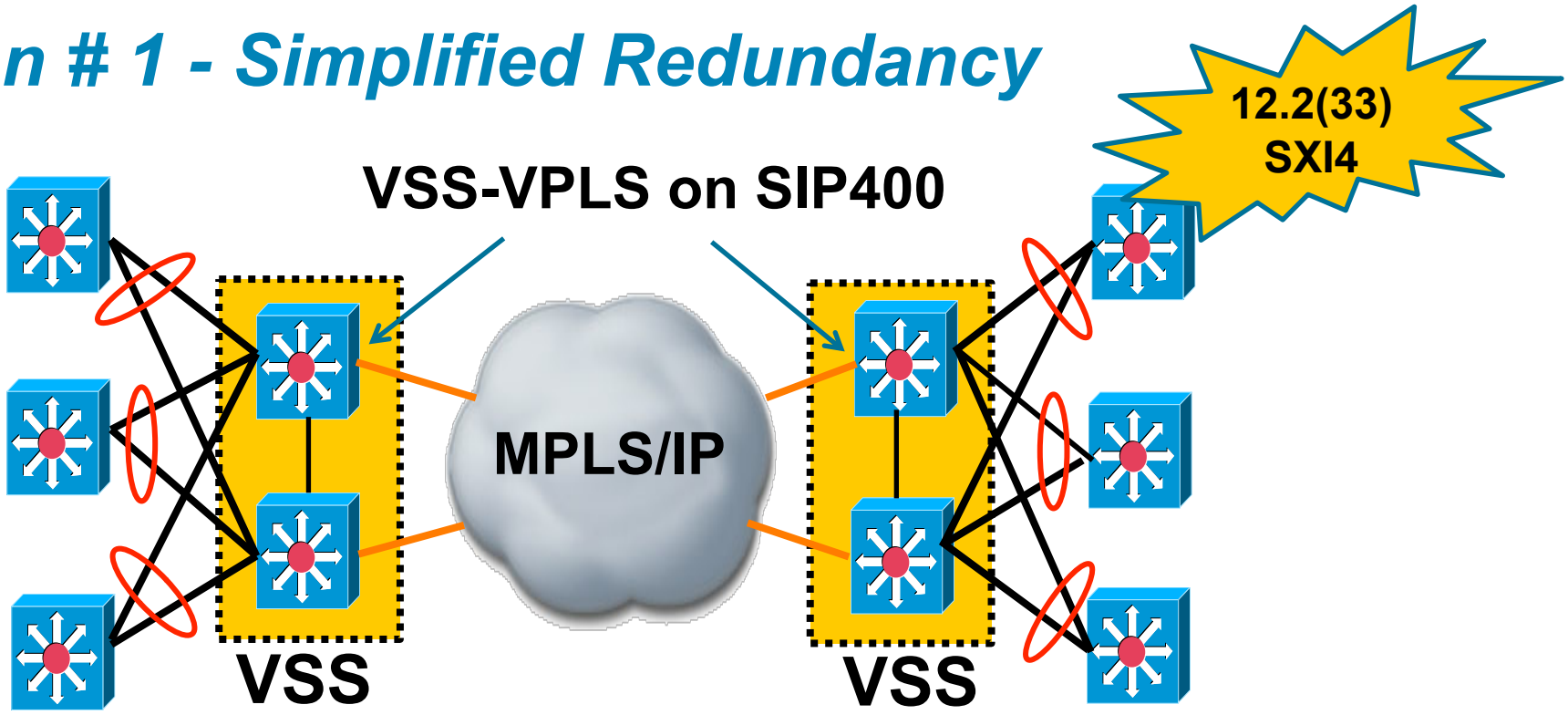

## Main Issues

#1. Complex Edge Redundancy

#2. Sub-optimal Bandwidth Utilization

#3. VPLS Configuration Complexity

# Solution # 1 - Simplified Redundancy

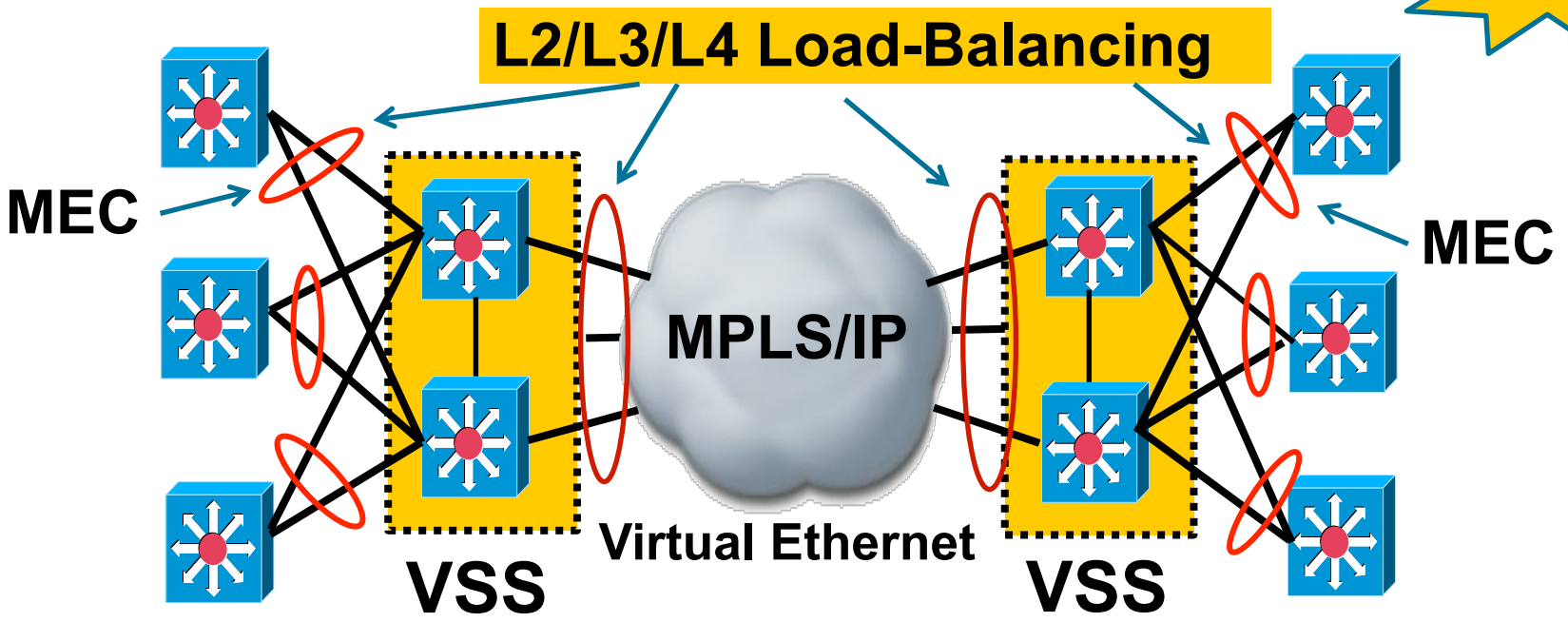



## Benefits

- ✓ Single VSS Box for DC Edge Redundancy
- ✓ Native VSS/MEC Failover – No scripts!!
- ✓ Sub-second Failover - No STP or EEM Dependency

# Solution # 2 : Optimal Load-Balancing

12.2(33) SXI4




✓Port-Channel Load-Balancing from DC Agg-DC Edge

**Introducing Advanced-VPLS/VPLSoGRE**

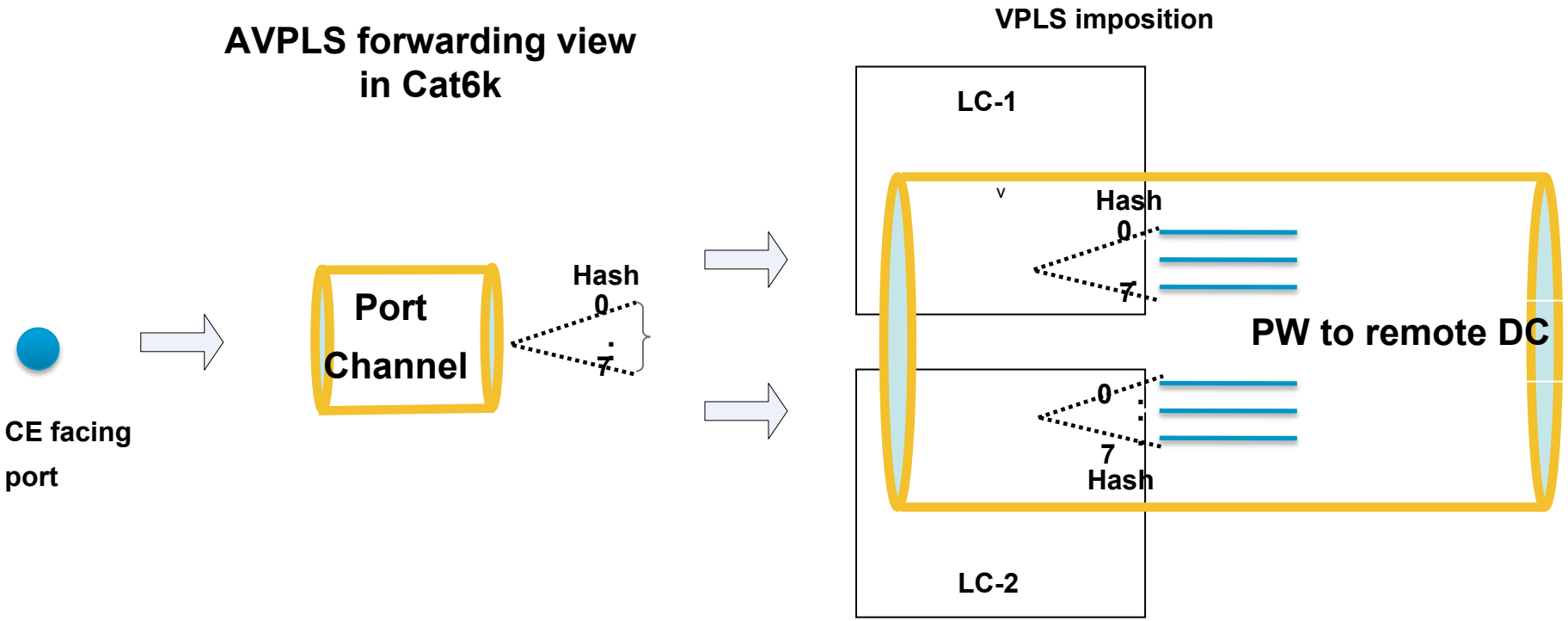
"**Virtual Ethernet**" Port-Channel of MPLS/IP links

✓Port-Channel Load-Balancing from DC Edge-DC Edge

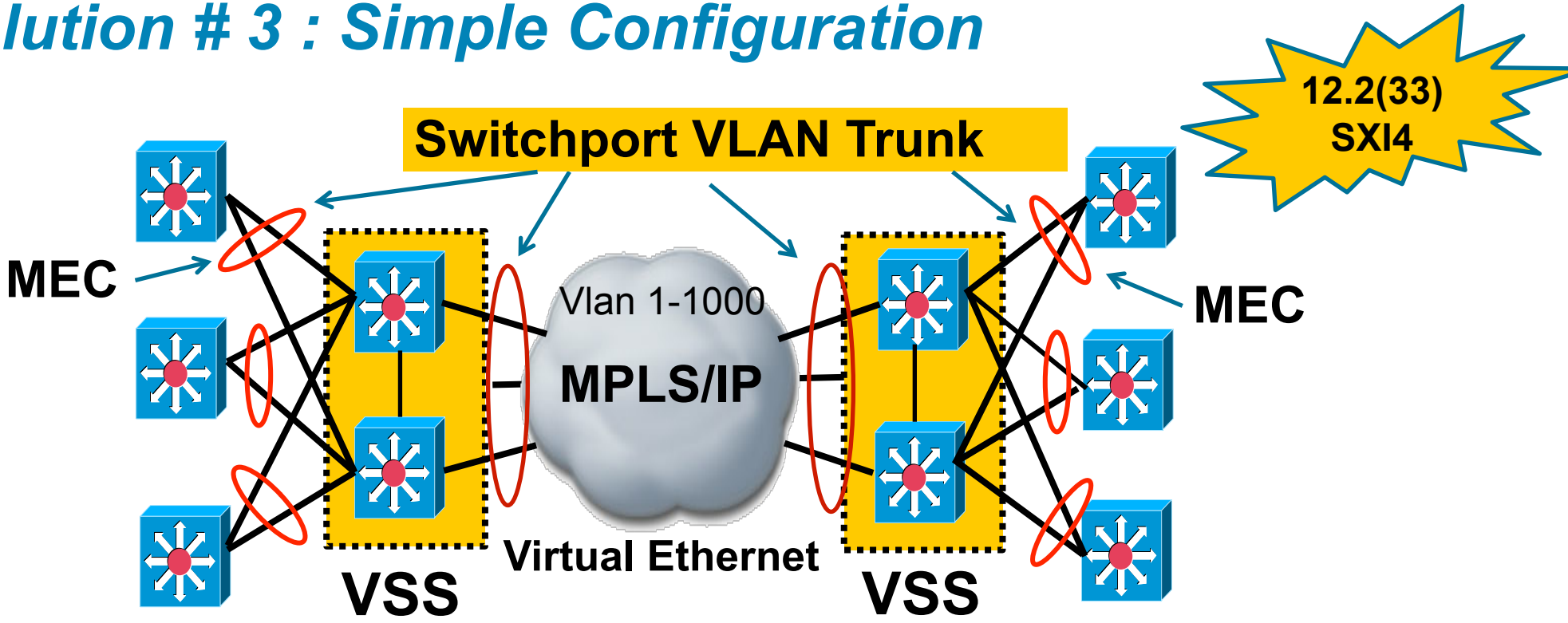
# A-VPLS Load balancing … The key differentiator

- A-VPLS Load balancing works on the same principle as L2 Port Channel (RBH based).
- Uses EARL RBH (3-bits) hashing logic to do L2, L3 & L4 based load balancing

- CWAN A-VPLS creates internal L2 port-channel for every A-VPLS neighbor
- CWAN A-VPLS adds core-facing ECMP paths as port-channel members.
- Earl learns remote site MACs over A-VPLS PW using internal port-channel LTL i.e. Bundle LTL.



# Solution # 3 : Simple Configuration




**VPLS LAN extension Config.**

Interface Vlan 1

xconnect vfi …

:

Interface vlan 1000

xconnect vfi …

**Advanced-VPLS Configuration**

interface virtual-ethernet 1

switchport

switchport trunk allowed vlan 1-1000

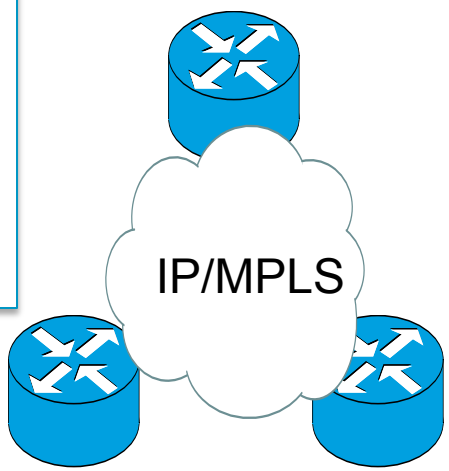
# A-VPLS Simplified Configuration

**Traditional VPLS Config (Repeat per VLAN)**

```
l2 vfi for_10 manual
   vpn id 10
   neighbor 2.2.2.2 encap mpls
   neighbor 3.3.3.3 encap mpls
!
l2 vfi for_20 manual
   vpn id 20
   neighbor 2.2.2.2 encap mpls
   neighbor 3.3.3.3 encap mpls
!
……..
!
interface Vlan10
   xconnect vfi for_10
!
interface Vlan20
   xconnect vfi for_20
……..
```

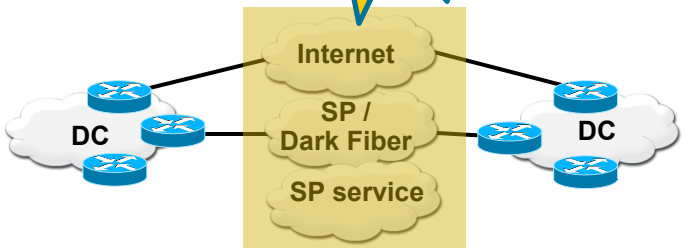
**A-VPLS Simplified Config (Configure once)**

```
pseudowire-class cl1
   encap mpls
   ! enable ML PW (ECMP LB)
   load-balance flow
   ! enable FAT PW
   flow-label enable
!
interface virtual-ethernet 1
   ! transport configuration
   transport vpls mesh
     neighbor 2.2.2.2 pw-class cl1
     neighbor 3.3.3.3 pw-class cl1
  ! service configuration
   switchport
   switchport mode trunk
   switchport trunk allowed vlan
   range 10 to 2000
```



# A-VPLS Summary for DCI

12.2(33) SXI4




**Simplified CLI for VLAN extn.**
**No VPLS Config. Complexity!**

Simplified Configuration

DCI A-VPLS

**L2/L3/L4 flow based Balancing**
- DC Edge to Aggregation
- DC Edge to WAN
- WAN Core

Optimal Bandwith Utilization

- **VSS Single Chassis Redundancy**
- **Fast Sub-second Convergence**

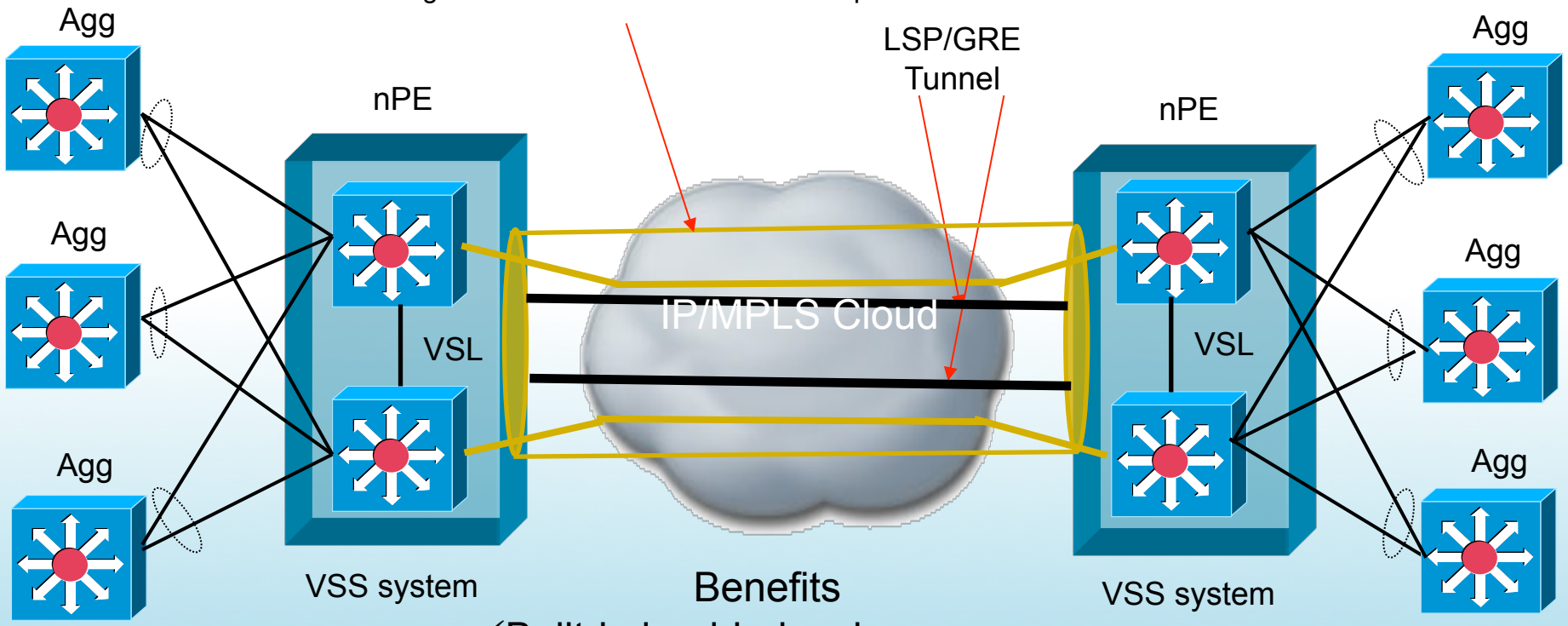
Simplified Edge Redundancy

Ethernet LAN extension over MPLS or IP
**"Any flow Any Link" Load-balancing**
Multipoint loop-free connectivity

# Advanced VPLS (A-VPLS) for IP/MPLS

Data Center Interconnect

A-VPLS – Single Virtual Interconnect across Multiple Interfaces




Benefits

- ✓Built-in load-balancing
- ✓Built-in Failover and loop avoidance
- ✓Simplified configuration with Virtual Ethernet CLI
- ✓Supported on 6500 SIP400 with NSF/SSO

Pseudo wire

Available in 12.2(33)SXI4

# Borderless Networks in 12.2(33)SXJ

## Video Medianet

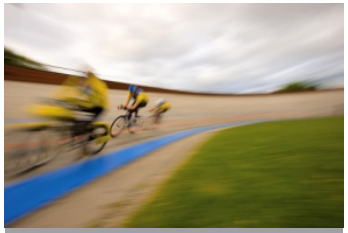
- PoE Plus*
- Critical Voice VLAN support
- Sup720 IGMP snooping Querier support
- IGMP snooping last-member-query-interval- to 32768 ms

## Green

- Support for Energywise Orchestrator

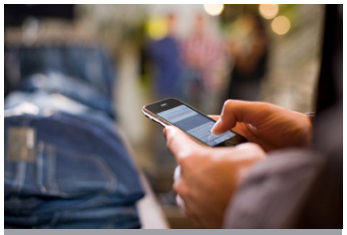
## Security

- Network Edge Authentication Topology (NEAT)
- Multi-auth with Vlan assignments
- TACACS+ for IPv6
- ASA Service Module support*
- VRF/VLAN aware TrustSec
- Storm control errdisable option
- Storm control with SNMP trap
- VPN SPA VSS
- NAM-3



## Performance

- NTPv4 - NTP for IPv6
- ES+XT-4TG3C & ES+XT-4TG3CXL support with VSS*
- A-VPLS/A-VPLSoGRE Support on ES +XT*
- X2-10GBaseT & SPA-5X1GE-V2*
- EoMPLS and VPLS NSF/SSO with VSS
- Flexible Vlan translations on Sup720/Earl7
- VRF Aware Syslog Loopback Feature *



## Mobility

- WISM-2

**12.2(33)SXJ Shipping since March 21, 2011**

**Feature on future rebuild ***

# ES+ Line cards
## A Future-proof Investment for WAN on the 6500

Hardware

**Enterprise / Data Center WAN**
**High Performance DC Interconnect**

**Full L3 & MPLS**
- Advanced VPLS (A-VPLS)
- EoMPLS, VPLS, H-VPLS
- MPLS/VPN, MVPN

**High Perf QoS**
- 32k Ingress AND 32k egress Queues
- 3-level H-QoS
- Fully flexible QoS capability as SIP400

10G Density

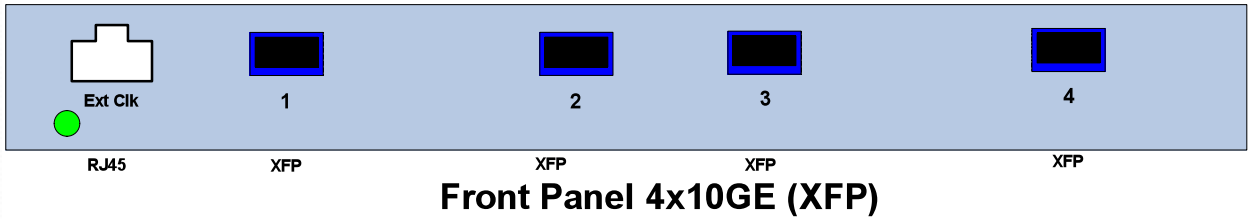
Full 40G Linerate Performance

IPoDWDM

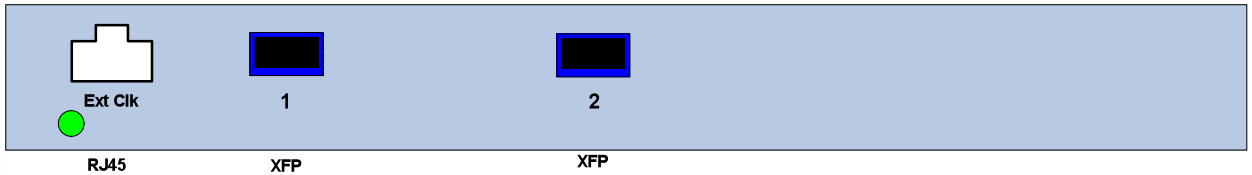
IRB
IGMP Snooping for A-VPLS

Feature Parity with SIP400

# ES+ Line cards


Front Panel 4x10GE (XFP)




Front Panel 2x10GE (XFP)

# Restrictions

- ES+ on 6500 platform is supported with Sup720-3B, Sup720-3BXL, VS-Sup720-3CXL. (not supported with PFC3A, Sup2, Sup32)
- Supported in all E-series Chassis (non-E, 6513[not supported in slots 1-8]).
- Only 10 Gig flavors of ES+ supported in 6500. (no 1 Gig, Combo and Low Queue ES+ flavors)
- Only XFP transceivers supported (no SFP, GBIC, XENPAK, X2 on ES40 but can interoperate these on the linecards which support them).

# Routed PseudoWire (RPW)

- The Datacenter Interconnect specifies that the servers in one datacenter should be able to send/ receive both L2 and L3 traffic to/from servers in the peer datacenter.

# Solution: Use VPLS PW

- VPLS PWs are traditionally used to transport L2 traffic between the datacenters. Here, the VPLS PWs function as virtual L2 trunk links between the datacenters, carrying L2 traffic only.

- By tying the VPLS PW to an IP-subnet, Cat6500 allows L3 traffic also to be sent over the PW.

- Cat6500 needs SIP400 or ES40 Linecards to support RPW functionality.

# Benefits

- Under the SVI having xconnect, just one line of additional configuration (ip subnet configuration) enables RPW.
- Along with AVPLS, the RPW configuration is extremely simplified (using VE configs)
- VPLS PWs can be used for both L2 and L3 traffic.

- RPW can be configured in two modes:

1. RPW Mode 1:

   Here the L3 traffic from DC1 to DC2 flows as explained below:

   > In DC1, traffic first gets routed from source vlan to vpls-enabled vlan

   > Then undergoes VPLS PW imposition in DC1 and reaches DC2.

   > In DC2, the traffic undergoes regular vpls disposition and L2 bridging from PW to access port.

2. RPW Mode 2:

   Here the L3 traffic from DC1 to DC2 flows as esplained below:

   > In DC1, traffic gets bridged from access port to VPLS PW

   > Then undergoes VPLS PW imposition in DC1 and reaches DC2.

   > In DC2, the traffic undergoes regular vpls disposition.

   > Then traffic gets routed from vpls-vlan to destination vlan.

**Vlan 100,200**

**Interface Vlan 100**

**Ip address 100.1.1.1/24**

**Interface Vlan 200**

**Ip address 200.1.1./24**

**Pseudowire-class** avpls-pw

**Loadbalance flow** *enable*

**interface Virtual-Ethernet 200**

**Switchport mode trunk**

**Switchport trunk allowed vlan 200**

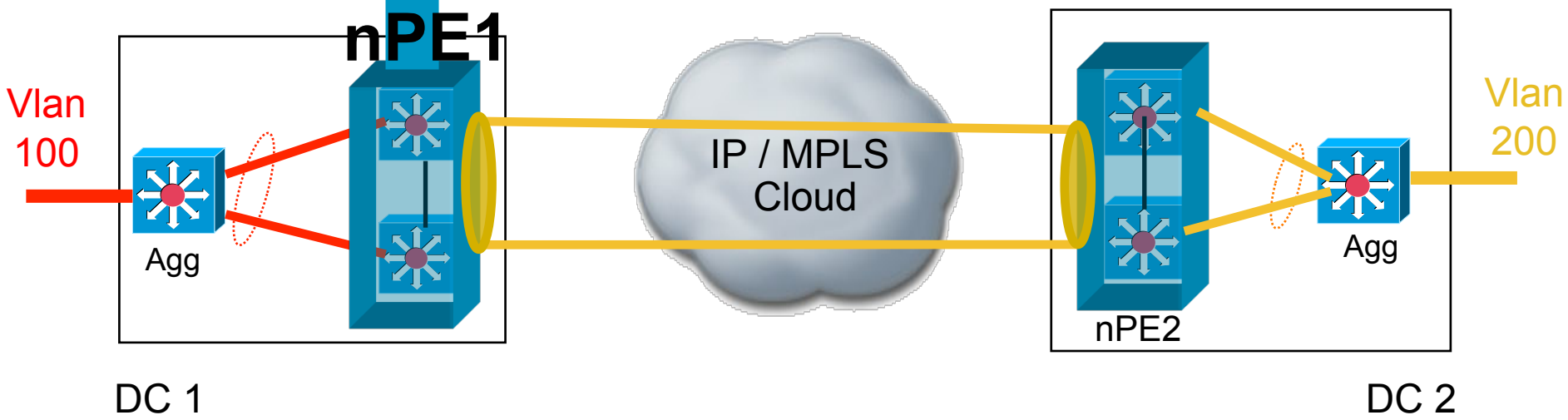
**Transport vpls mesh**

**neighbor 2.2.2.2 pw-class** *avpls-pw*

**At nPE1:**

**Routing First**

**VPLS Imposition next**




# RPW Mode 1

At nPE2:

VPLS Disposition first

Routing next

**Vlan 100,200**

**Interface Vlan 100**

**Ip address 100.1.1.2/24**

**Interface Vlan 200**

**Ip address 200.1.2/24**

**Pseudowire-class** avpls-pw

**Loadbalance flow** *enable*

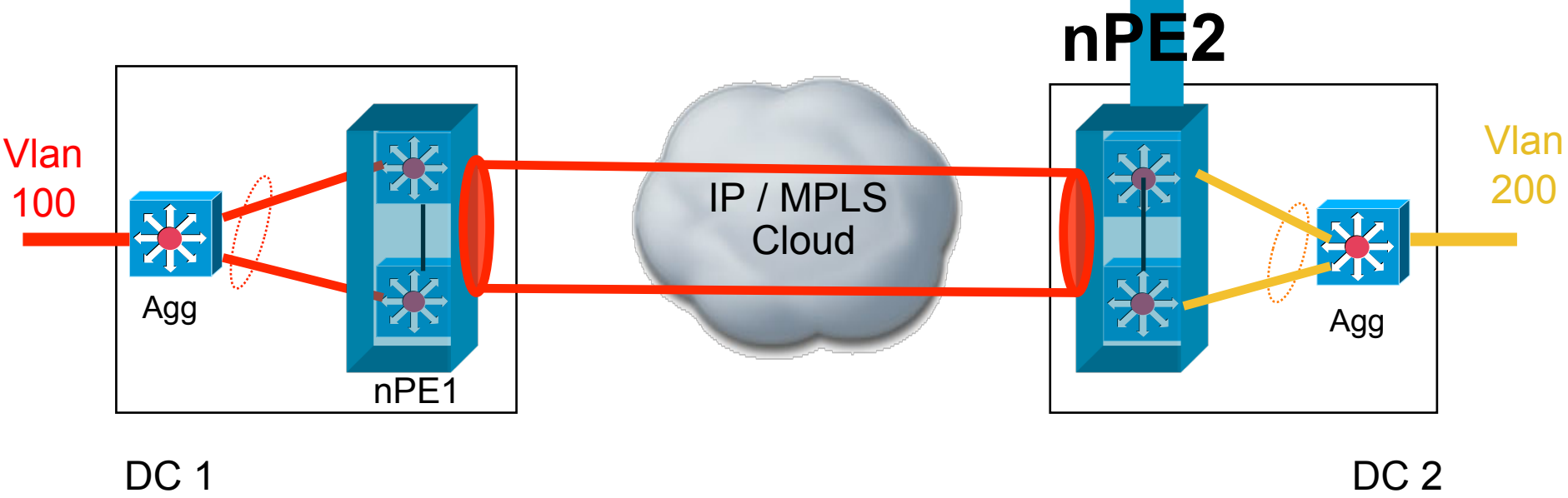
**interface Virtual-Ethernet 100**

**Switchport mode trunk**

**Switchport trunk allowed vlan 100**

**Transport vpls mesh**

**neighbor 1.1.1.1 pw-class** *avpls-pw*




# RPW Mode 2