Cisco Expo 2009

Catalyst 6500 Update

Djordje Vulovic, CCIE #16582

Presentation will start at 13.10h local time

About this WebEx session

1. VoIP usage
2. Recording will be used
3. Local panelists to help
4. Chat possibility
5. Q&A at the end
6. Survey after leaving the session

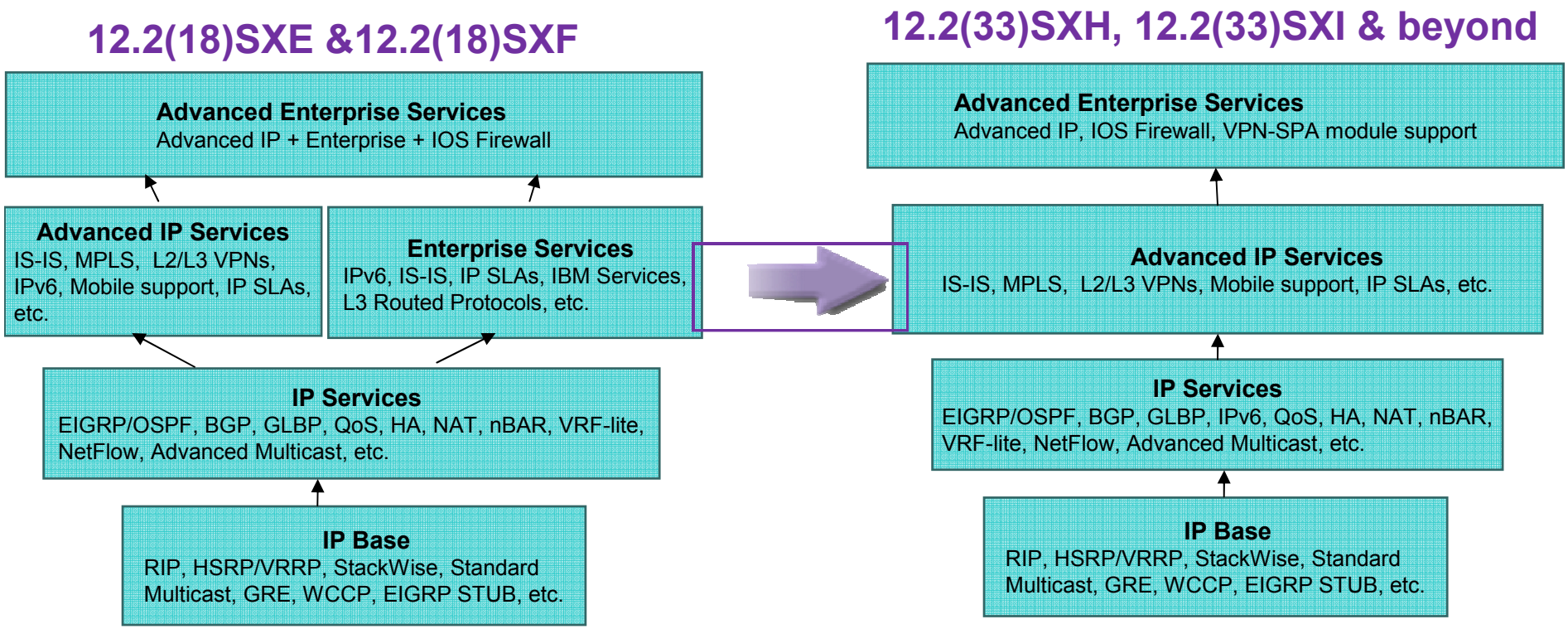
Catalyst 6500 Cisco IOS Software

Recently Shipped Releases - Highlights

12.2(18)SXF September 2005	12.2(18)SXF5 July 2006	12.2(33)SXH August 2007	12.2(33)SXI November 2008
• Sup32 Native • WS-6148A-GETX • WS-6148A-RJ45 • WS-6148A-FE-SFP • WS-6196-RJ-21 • WS-6148X2-RJ-45 • SIP-600 • NAC L2 IP • NetFlow v9 • Show sanity • Show capacity	• Cisco IOS Software Modularity for Sup720 and Sup32 • 8 port 10GE linecard • IGMP Static Group Enh • DHCP Snooping Enh • SRR on Sup32 Uplinks • ME-C6524 (shipped on a 12.2(18)SXF3 base in Aug. 2006) • PISA – 12.2(18)ZY release based on 12.2(18)SXF7	• DFC3C/3CXL • SIP-200, SIP-400, and Enhanced FlexWAN support with Software Modularity • FHRP - Enhanced Object Tracking • GLBP and HSRP NSF/SSO • OER • IPv6 Multicast Enhancements • LLDP-MED	• Enhanced SPA support for SIP-400 & SIP-600 • VPN Services Port Adapter (VSPA) • ISSU – Phase I • BFD Enhancements • EIGRPv6 • EEM Version 2.4 • 802.1x Enhancements • HSRP/GLBP for IPv6 • 6VPE • Pseudowire Redundancy

http://www.cisco.com/en/US/products/hw/switches/ps708/prod_release_notes_list.html

IOS Reformation: Changes and Migration



Beginning with Release 12.2(33)SXH, the Cisco Catalyst 6500 Supervisor 720 Enterprise Services software image is no longer offered.

Existing customers with a *SmartNet* contract who are on 'Enterprise Services' feature set (of older Cisco IOS 12.2SX releases) and seeking to upgrade to Cisco IOS Release 12.2(33)SXI can upgrade to 'Advanced IP Services' feature set *free of cost*.

Right Vertical Third

1. IPv6 support before 12.2(33)SXI is available in Advanced IP Services feature set
2. Cisco IOS Release 12.2(33)SXI provides IPv6 / IPv4 packaging parity
3. IPv6 feature support for a technology will be packaged in the same feature set as IPv4

IPbase image - IPv6 Host features like:
IPv6 addressing
ICMPv6 & redirect
IPv6 Maximum Transmission Unit (MTU) path discovery
IPv6 Neighbor discovery
Syslog over IPv6
Simple Network Management Protocol (SNMP) over IPv6
Telnet over IPv6
SSH over IPv6

IPservices image - Same IPv6 features as supported in Advance IP Services images in prior releases, including:
EIGRPv6
IPv6 multicast
IPv6 tunneling
DHCPv6
6VPE

12.2(33)SXH minor releases

1. SXH1 (FCS Jan 2008)
   - Virtual Switching system (VSS)
   - Support for Detector/Guard modules with Sup720-10GE
2. SXH2 (FCS Apr 2008)
   - Cisco Enhanced PoE
   - WS-X6716-10GE support
3. SXH3 (FCS Jul 2008)
   - No Major features
4. SXH4 (Nov 2008)
   - TACACS+/Radius per-VRF server group

Cisco Enhanced PoE

1. Supports 2 radio 11n mode
2. No limitations on the number of AP1250s that can be used with a card or chassis
3. Chassis power supply must be correctly sized for PoE load
4. Supported hardware:

   Line Cards

   WS-X6148A-GE-45AF

   WS-X6148-GE-45AF

   WS-X6548-GE-45AF

   PoE daughter cards:

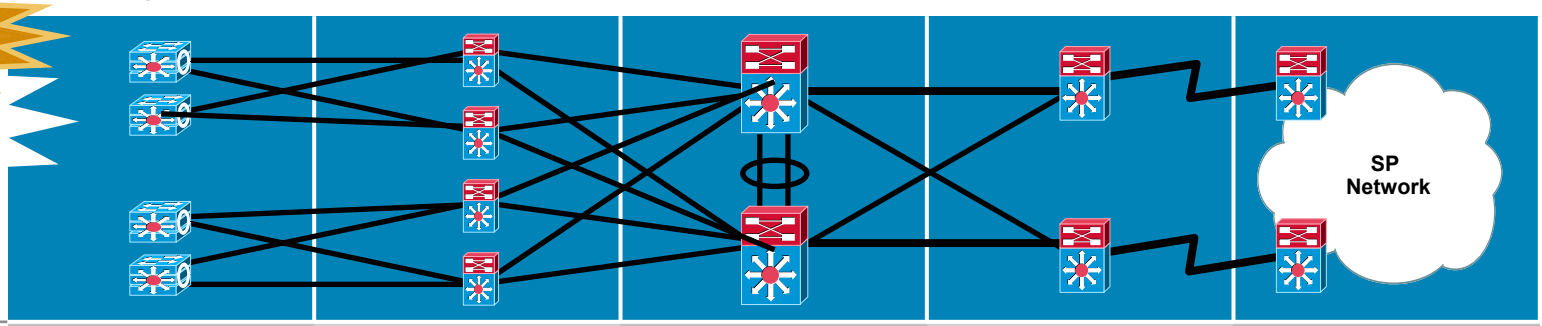
   WS-F6K-48-AF=

   WS-F6K-GE48-AF=

WS-X6716-10GE

1. New high-density 16-port 10GE line card
   - Up to 130 ports of 10GbE in a single chassis
   - DFC3C/DFC3CXL included with 1GBDRAM
   - X2 optics based
   - Compatible with all chassis (E- and non-E series)
2. Port Groups (4x4 ports) operate in two modes:
   - Transparent (1-port non-blocking); VSL Support
   - Muxed (4-ports over-subscribed)
   - Mix mode operation supported for maximum flexibility

12.2(33)SXI Key Features



	Wiring Closet	Backbone	Data Center	EWAN	Metro
Unified Network Services	▪ EIGRPv6 ▪ CTS Infrastructure	▪ WiSM support on VSS ▪ IPv6 Support on VSS ▪ EIGRPv6	▪ Service advertisement Framework ▪ FWSM, ACE, IDSM support on VSS	▪ IPSec Leadership with Granikos ▪ Static VTI ▪ IPSec for IPv6	▪ VTPv3 ▪ E-LMI
Non-Stop Communication	▪ ISSU Phase-1	▪ VSS ▪ ISSU ▪ HSRP/GLBPv6	▪ VSS ▪ ISSU	▪ ISSU support for SIP modules, MPLS-TE, VSS.	▪ ISSU support for MPLS-TE ▪ Pseudowire redundancy
Operational Manageability	▪ SNMP, Syslog over IPv6 ▪ LLDP-MIB ▪ Syslog Granularity	▪ SNMP, Syslog over IPv6 ▪ Mini-protocol analyzer ▪ Netconf over SSH	▪ Show health, Syslog Granularity ▪ Mini-protocol analyzer	▪ Call-Home Phase 2 ▪ IPSLA integration with E-OAM	▪ 802.1ak (MRP) ▪ E-OAM 802.1ag
Virtualization	▪ 802.1x, MAC Auth, Web Auth for Access Control ▪ HSRPv6 on VRF	▪ HSRPv6 on VRF ▪ VRF-Lite Aware PBR ▪ PBR set VRF	▪ BFD VRF awareness	▪ VRF Aware PBR ▪ 6vPE	▪ OAM RFI link fault fast recovery
Application Intelligence	▪ IPv6 DHCP relay	▪ IPv6 DHCP relay	• VSS support for 512 Ether-channels	▪ IPSec QoS ▪ NetFlow for GRE/GRE-IPSec	▪ 802.1ad
Integrated Security	▪ 802.1x enhancements ▪ Multihop SXP ▪ CTS infrastructure	▪ CTS Infrastructure ▪ Multihop SXP ▪ PACL support on VSS interface	▪ PACL support on VSS interface ▪ FWSM support on VSS	▪ Encrypt multicast over IPSec	▪ 802.1ak (MRP)

New Hardware Support

New SPAs for SIP-600

SPA-2XOC48POS/RPR
SPX-4XOC48POS/RPR
SPA-OC192POS-VSR
SPA-OC192POS-LR
SPA-OC192POS-XFP
SPA-5X1GE
SPA-10X1GE
SPA-1XTENGE-XFP
SPA-10X1GE-V2
SPA-1X10GE-L-V2

New SPAs for SIP-400

SPA-8XCHT1/E1
SPA-2XT3/E3
SPA-4XT3/E3
SPA-2XCT3/DS0
SPA-4XCT3/DS0

Service Modules

Services SPA Carrier-600

VPN Services Port Adapter (VSPA)

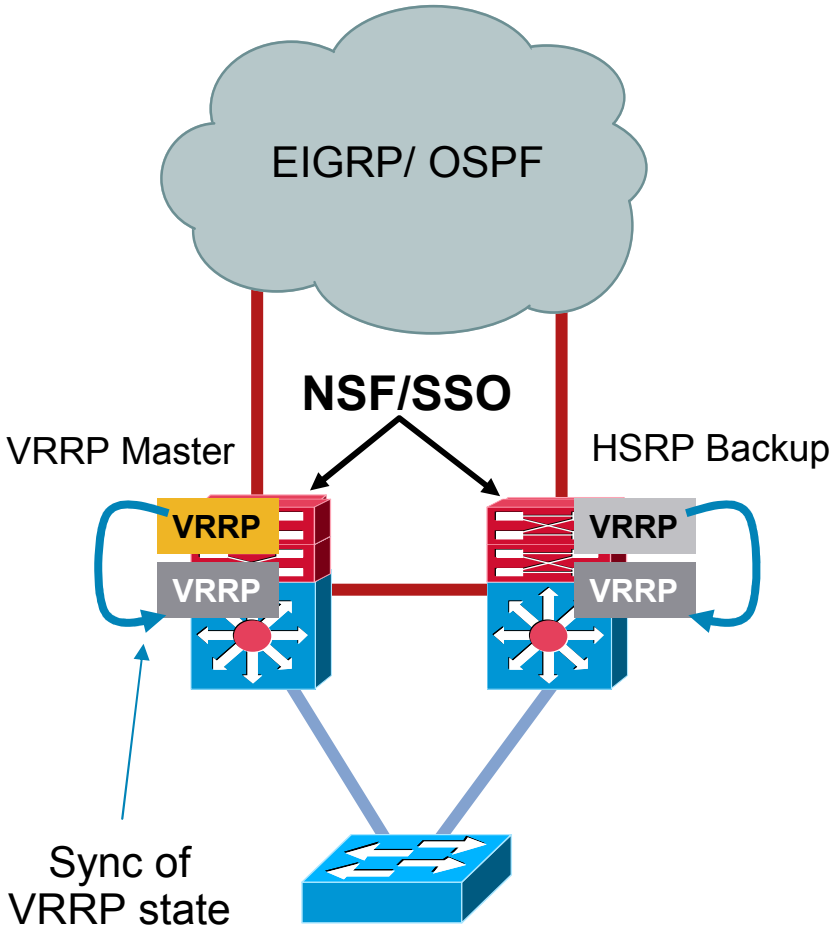
FWSM & ACE module support with VSS

SSO Support for VRRP

12.2(33)SXI

1. Use case — Ultra-redundant deployments where both in-box and network redundancy desired
2. Before Release 12.2(33)SXI, VRRP was not SSO-aware

   System relinquishes Master role on SSO switchover
3. Release 12.2(33)SXI delivers SSO awareness



Bridge Assurance

1. Prevents STP loops and improves L2 network reliability
    - STP process not functioning as expected
    - Unidirectional link failure – BPDU tx/rx issues
2. Cisco proprietary enhancement to STP
3. Uses bidirectional BPDU exchange as a keepalive mechanism. All ports (non-designated) send and receive BPDUs.
4. Available in rapid-pvst and mst modes
5. No special BPDU format

Bridge Assurance (cont'd)

1. Needs to be explicitly configured on both ends a point-to-point link.
2. Port goes into "Bridge Assurance Inconsistency" if BPDUs are not received for (3 * hello_time) time interval.
3. Inconsistency will be cleared 2 BPDUs have been received in the last (3 * hello_time) after the inconsistency was seen.

Bridge Assurance feature can be enabled/disabled globally

```
Router(config)# [no] spanning-tree bridge assurance
```


Multi-Domain Authentication (MDA)

12.2(33)SXI

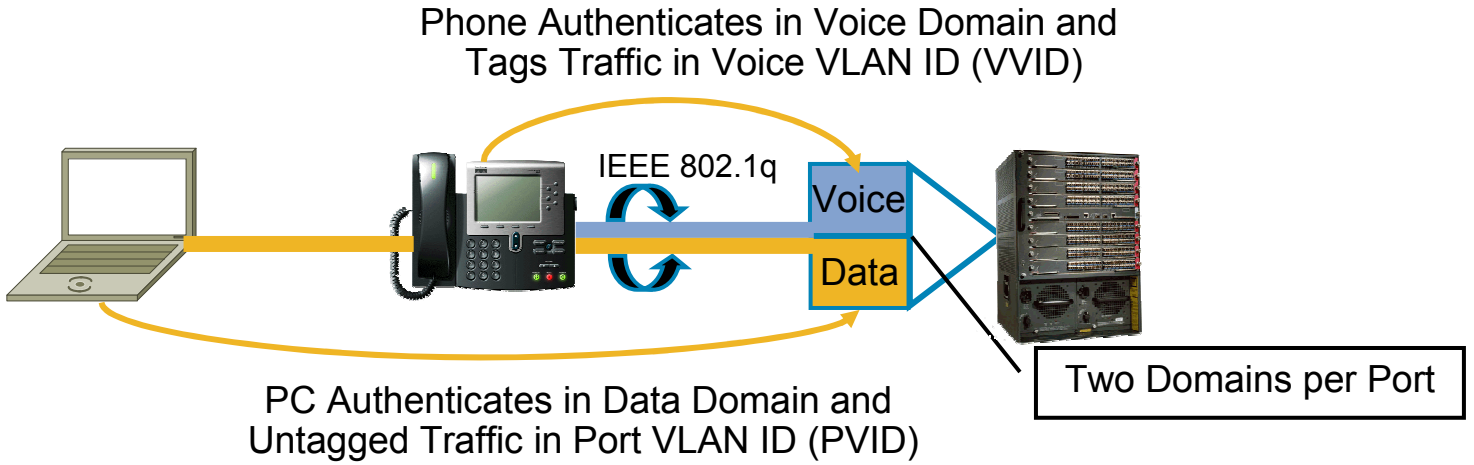
1. MDA Replaces Cisco Discovery Protocol Bypass
2. Supports Cisco and Third-Party Phones
3. Phones *and* PCs Use IEEE 802.1X or MAB

IEEE 802.1X

Single Device per Port

MDA

Single Device *per Domain* per Port



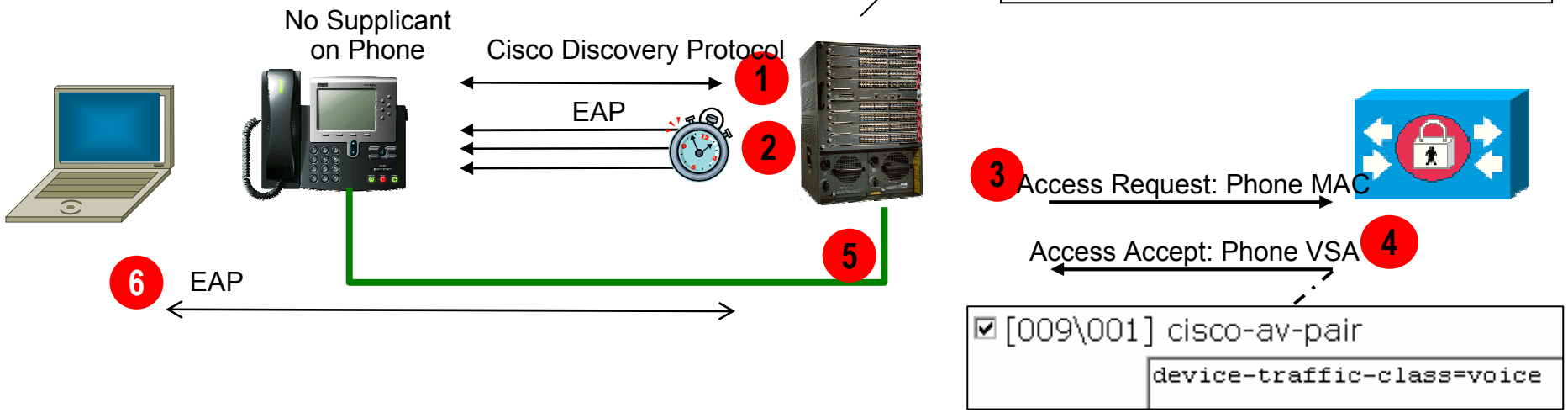
MDA Example (Cisco IP Phones)

12.2(33)SXI

1. Phone learns VVID from Cisco Discovery Protocol
2. IEEE 802.1X times out
3. Switch learns phone's MAC address and initiates MAB
4. Cisco Secure ACS returns Access Accept with phone VSA
5. Phone traffic is allowed on either VLAN until it sends tagged packet; then only voice VLAN traffic is allowed
6. (Asynchronous) PC authenticates using IEEE 802.1X or MAB

   Authenticated PC traffic is allowed on the data VLAN only

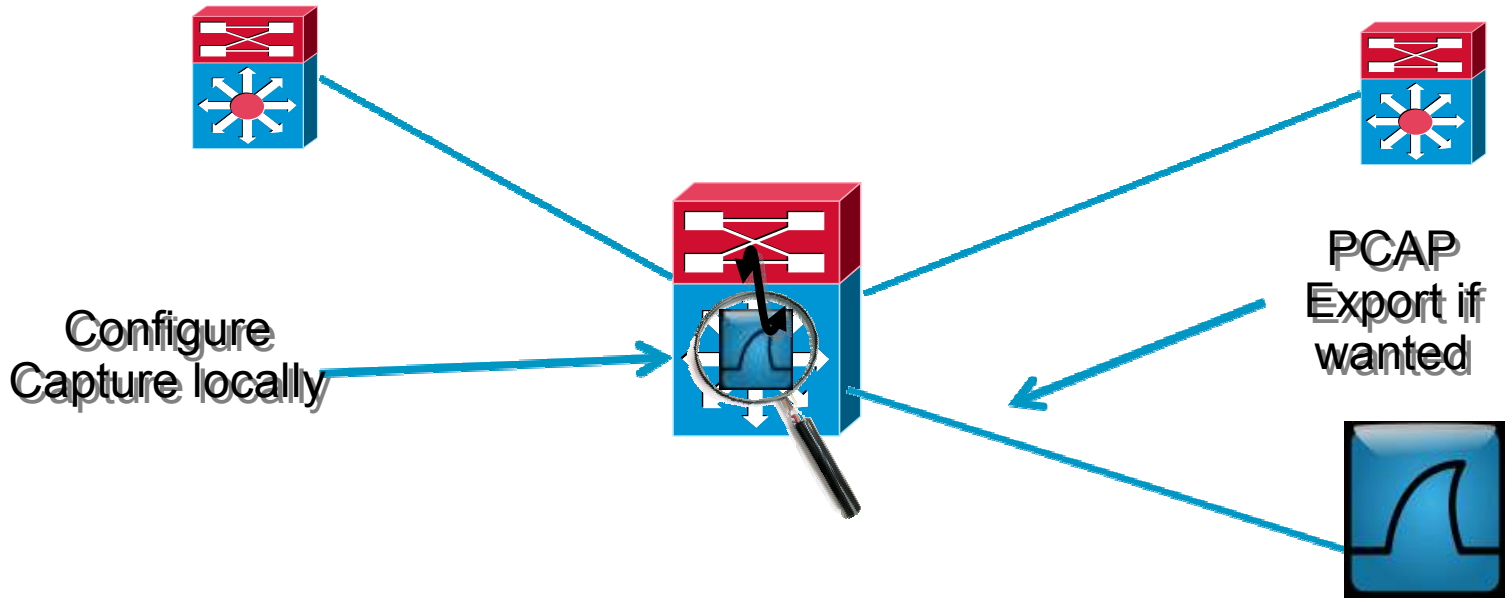
```
interface GigE 1/0/5
 switchport mode access
 switchport access vlan 2
 switchport voice vlan 12
 authentication host-mode multi-domain
 authentication port-control auto
 dot1x pae authenticator
 mab
```



MPA (Mini Protocol Analyzer)

12.2(33)SXI

1. Packet Analyzer inside the box
2. Analyze can be filtered using ACL, Ethertype, packet length and Vlan
3. Files saved locally as pcap or can be exported



MPA - CLI configuration

12.2(33)SXI

Router(config)# monitor session type capture

```
router(config)#monitor session type capture
router(config-mon-capture)#?
Monitor sess type capture config commands:
buffer-size  Capture buffer size
description  Properties for this session
exit         Exit from capture session mode
filter       Capture filter
no           Negate a command or set its defaults
rate-limit   Packets per second value
source       SPAN source Interface/VLAN
```

2 MB default Buffer Linear or Circular

ACL, Ethertype, packet length or Vlan

On by default Set up to 10000 kpps

MPA - CLI configuration (cont'd)

1. Start and Stop a capture session

   monitor capture [buffer size <size>] [length <bytes>] [linear | circular] [dot1q] [filter <acl_num>| <acl_name>] [start [for <secs>] | schedule at <time>]

   monitor capture stop

   monitor capture clear [filter]

2. Schedule a capture to occur

   monitor capture schedule at <time>

3. Show captured packets

   show monitor capture status

   show monitor capture buffer

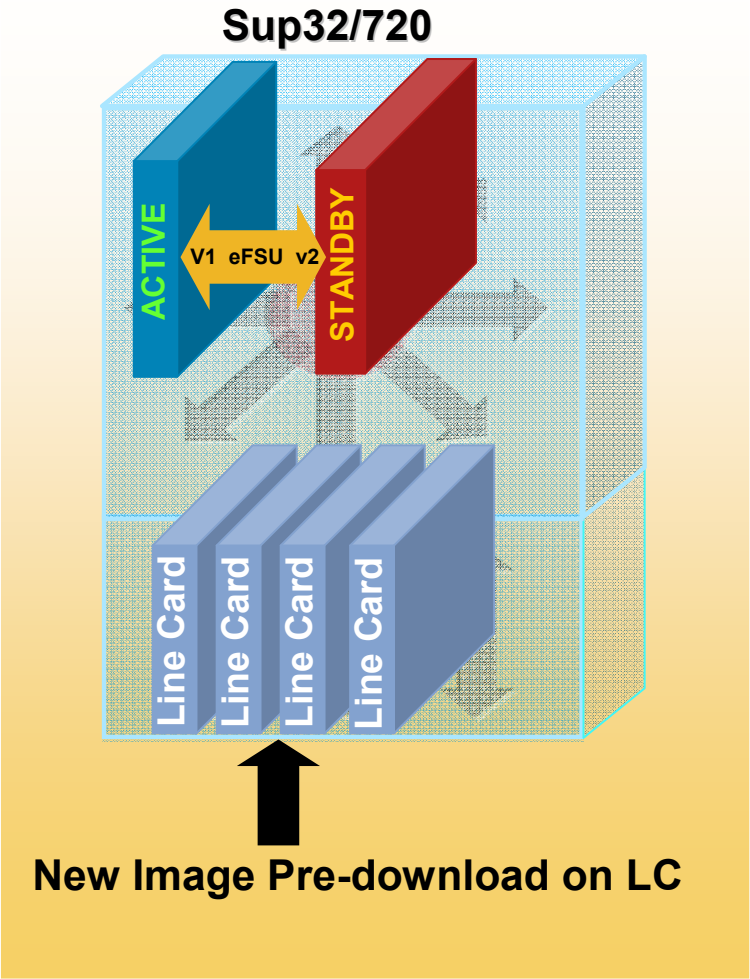
ISSU Phase 1 - eFSU

1. Phase I implements Enhanced Fast Software Upgrade (eFSU)
2. Ability to upgrade/downgrade complete IOS software image
   - With minimal system downtime
3. Leverages dual supervisor Cisco SSO architecture
4. Comprehensive upgrade solution covering maintenance-fixes as well as new features
   - Rapid deployment of new features/services
5. Reduces planned downtime and operational expenses
   - Ability to streamline and minimize planned downtime windows

eFSU Operation

12.2(33)SXI

1. Details
   - System is in SSO mode
   - Features w/o NSF/SSO support coexist
   - Full image upgrade for major and maintenance releases
   - Select Line Cards undergo image pre-download (for warm upgrade)
   - Upgrade outage is close to RPR+
2. Supported Hardware
   - Sup32-GE, Sup32-10GE, Sup720-GE and Sup720-10GE
   - New Image Pre-download on LC (Line Cards with Warm Reload Support: 67xx series cards, SIP400, and SIP600 with 512MB minimum memory)
   - Chassis: All



BFD Enhancements

1. BFD - VRF aware support

   New BFD features which extends BFD failure detection capability within a VRF context

   Provides a comprehensive solution to improve and enhance end-to-end reliability and availability of Layer 3 VPN networks

2. BFD - WAN interfaces support

   Extends BFD support to the most commonly used WAN interface type

   Allows a single standard protocol to be used as failure detection for divers interface types

Interface Type	Encapsulation
ATM	ATM interface with AAL5 MUX, AAL5 SNAP, AAL0 encapsulations ATM sub interface
POS	POS interface with HDLC and PPP Encapsulations POS sub interface
Serial	Serial interface, Serial interfaces with FR Encapsulation Serial sub interface with FR Encapsulation
VLAN	802.1q

12.2(33)SXH/SXI – VSS Features

12.2(33)SXH

- VSL on sup uplink or WS-6708-10G
- 128 portchannel
- PACL support for L2 interfaces
- Dual-active protocols: enhanced PAGP & IP BFD
- Module support 67xx series
- Service module support: NAM-1 & NAM-2
- Feature parity with standalone except MPLS & IPv6

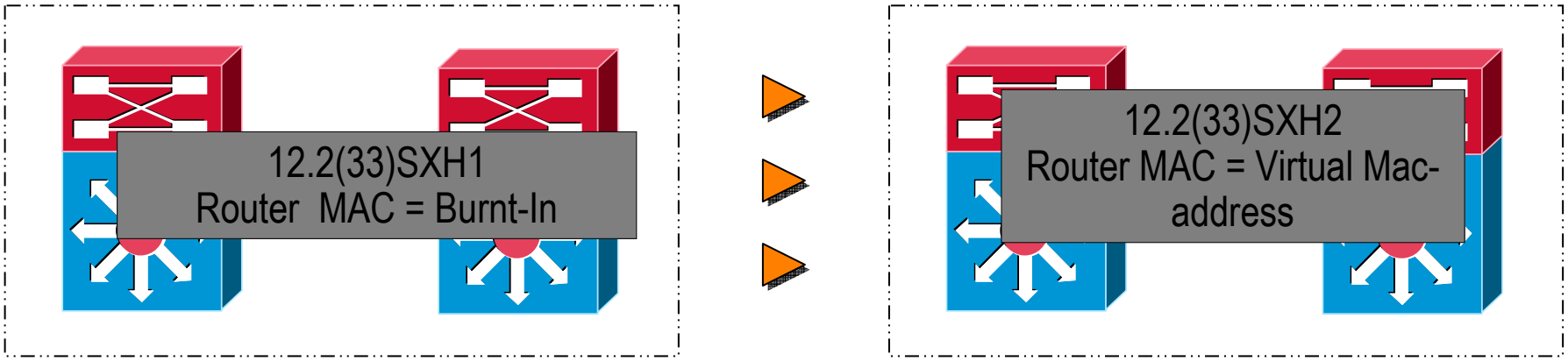
12.2(33)SXI

- ISSU phase-1
- Service module support: FWSM,ACE,IDSM & WiSM
- Dual-active protocol: Fast hello
- VSL on WS-6716-10G
- 512 portchannel
- QOS and Security ACL support for all interface types

Router MAC Address Assignment

12.2(33)SXH2

1. In a Virtual Switching System, there is only ONE router MAC address to represent both physical chassis as one logical device.
2. Virtual mac-address is recommended configuration for VSS environment




```
VSS(config-vs-domain)# switch virtual domain 100
VSS(config-vs-domain)# mac-address use-virtual
Configured Router mac address is different from operational value.Change
will take effect after config is saved.
```

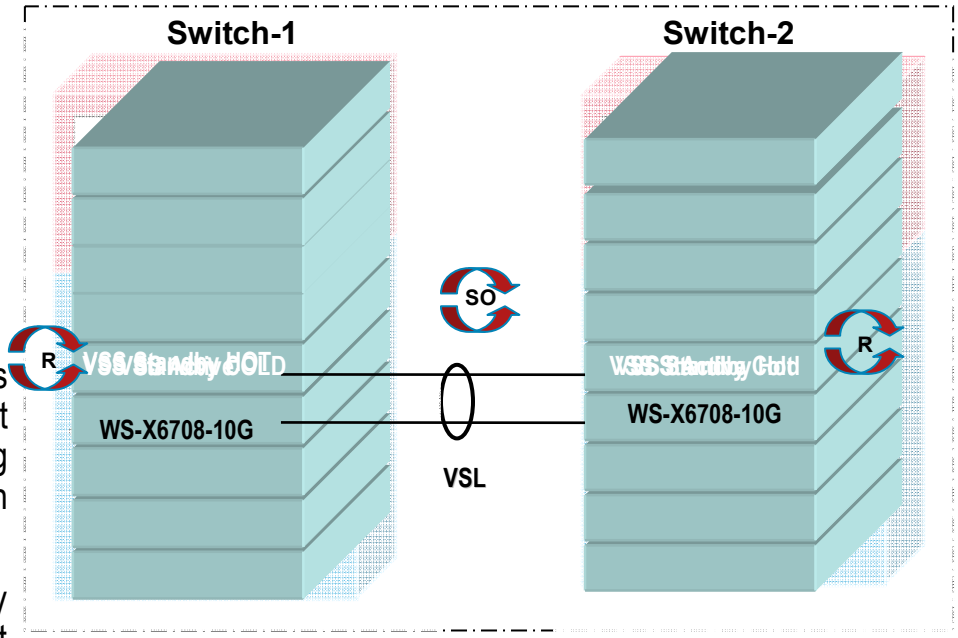
VSS Software Upgrade, 12.2(33)SXH1

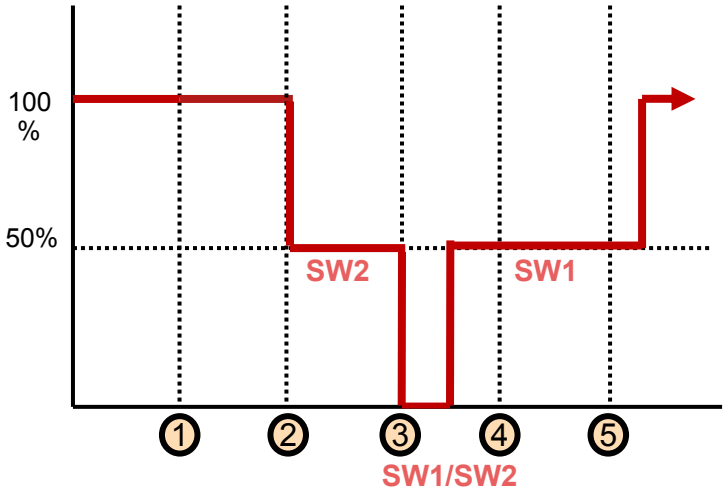
Preparation Steps

1. Preparation Steps
   a) Ensure the old image and new image files are installed to the local file systems on both Supervisor modules
   b) Configure the boot register to auto-load the specified software image file
   c) Configure the boot string to load the new software image

Execute Upgrade

2. Reset the standby Supervisor and ensure it boots successfully to RPR mode (STANDBY COLD). Hot Standby modules are power down and not forwarding traffic at this point , forwarding capacity will be down to 50%
3. Force a Supervisor switchover, forwarding capacity drops to 0%. Standby Supervisor continue to boot and become the new ACTIVE. Old active Supervisor will reset and load the old image and boot to STANDBY COLD (RPR) state
4. Trial Phase
5. Modify boot variable on Switch-1 and reload switch-1 such that it boots up with new software image. Forwarding capacity will resume back to 100%





R = Reset

SO = Switchover

= Old Version

= New Version

VSS Software Upgrade, 12.2(33)SXI

Preparation Steps

1. Before ISSU software upgrade, VSS Switch-1 and 2 will be running Old software image. Make sure Active and Standby running a software version that is compatible to perform ISSU

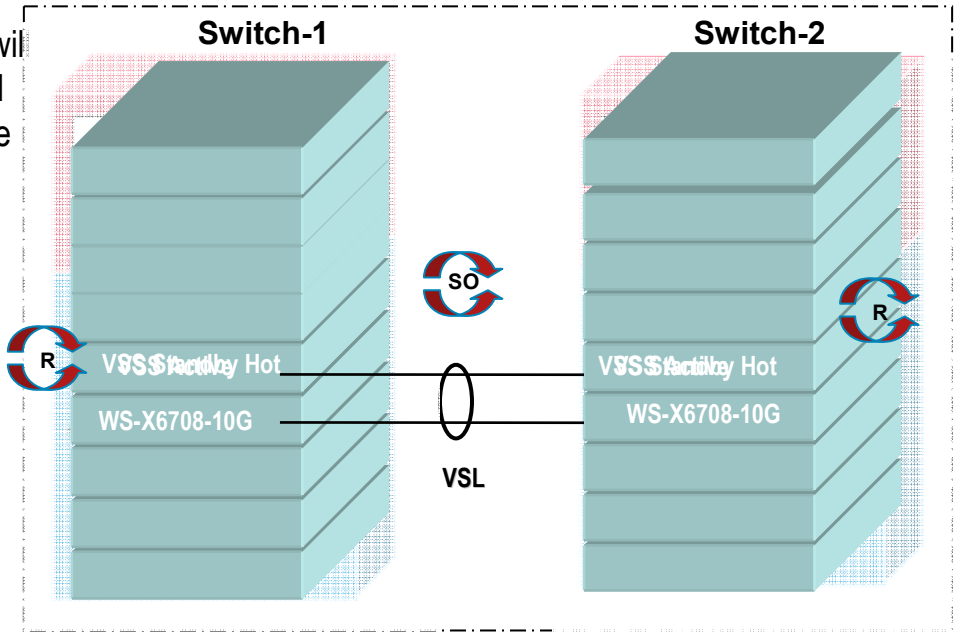
Execute Upgrade

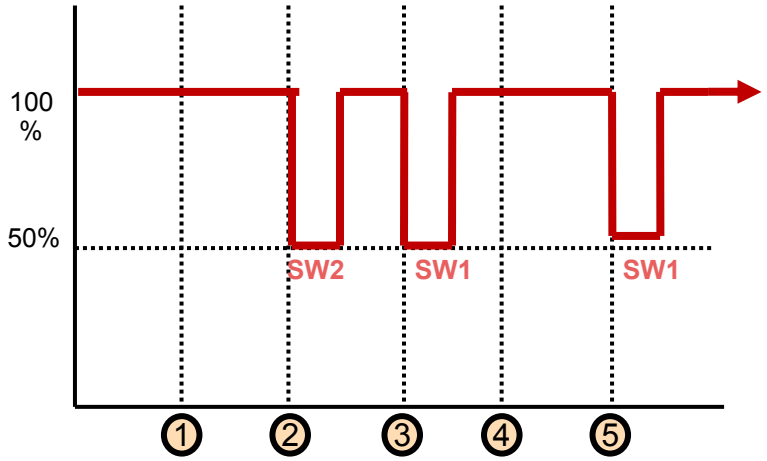
2. **ISSU loadversion** standby is reloaded to boot new software image and it will be initialized on SSO mode. ISSU infrastructure allows co-existence of different software version now

3. **ISSU runversion** switchover to the Standby supervisor which is already booted with the new software version … Old active reloads with old software image and becomes SSO Hot Standby ..

4. **ISSU Acceptversion** If network is stable issue "ISSU acceptversion" which stops the rollback timer, otherwise ISSU process will aborted intermediately.

5. **ISSU Commitversion** Once the image is tested and ready to be rolled out .. ISSU commitversion will reload the standby to boot up with new software version





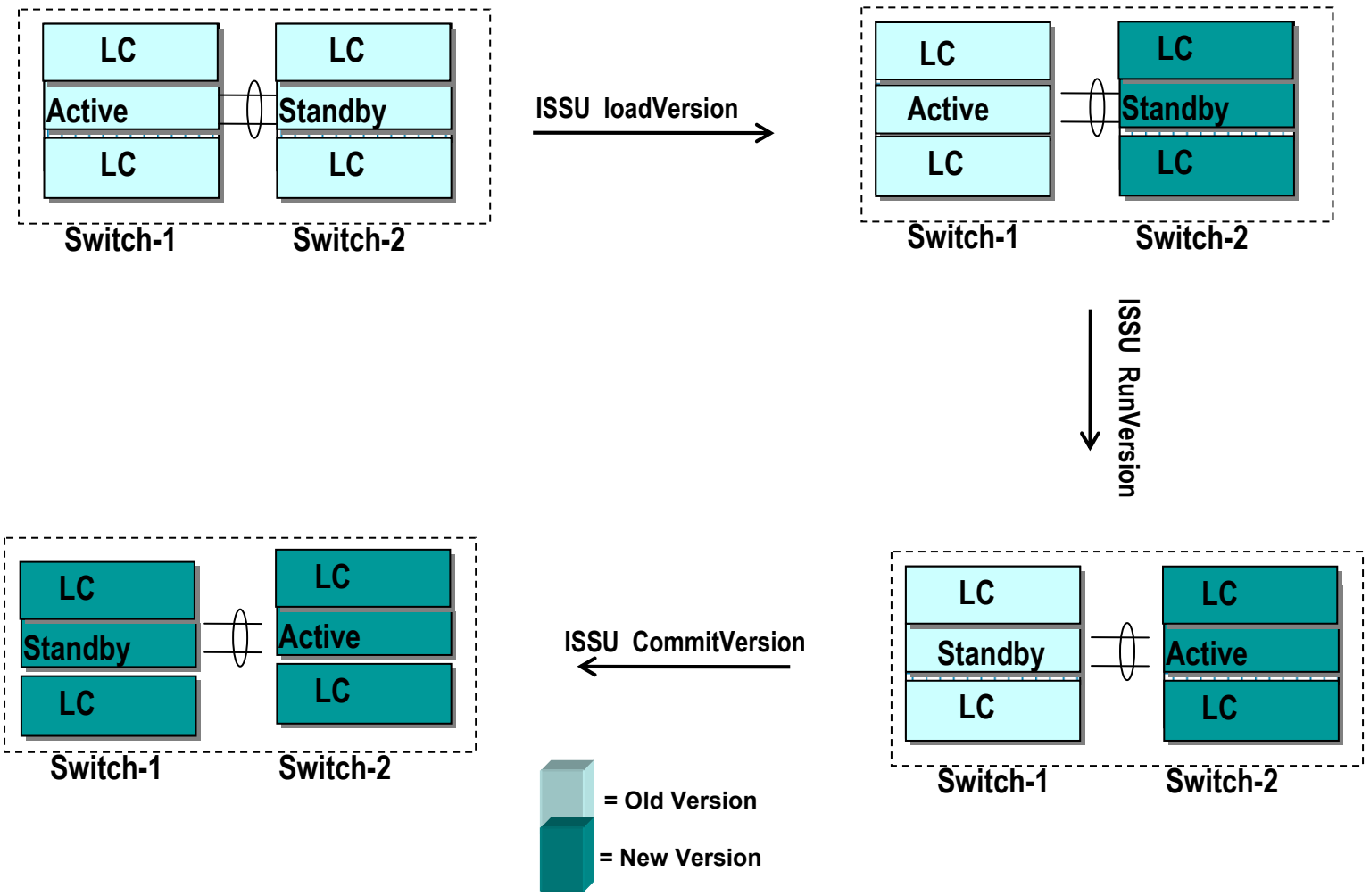
= Old Version

= New Version

R = Reset

SO = Switchover

VSS Software Upgrade, 12.2(33)SXI (cont'd)



VSS Service Module Integration in 12.2(33)SXI

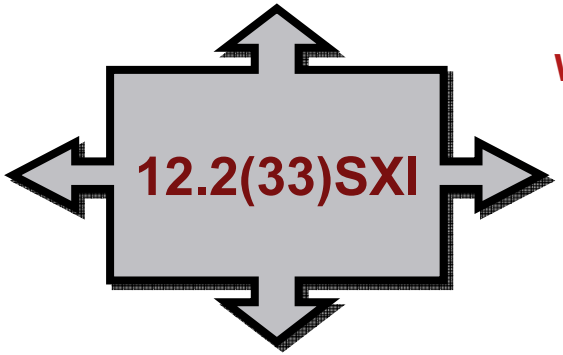
NAM Supported in 12.2(33)SXH1

Application Control Engine (ACE)

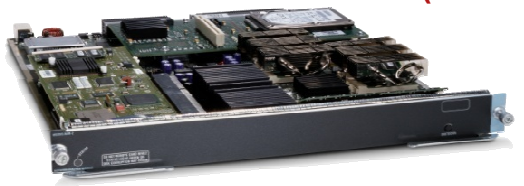
ACE10/ACE 20-6500-K9

Firewall Services Module (FWSM)

WS-SVC-FWM-1-K9



Wireless Services Module (WiSM)



WS-SVC-WISM-1-K9

Intrusion Detection System Services Module (IDSM-2)

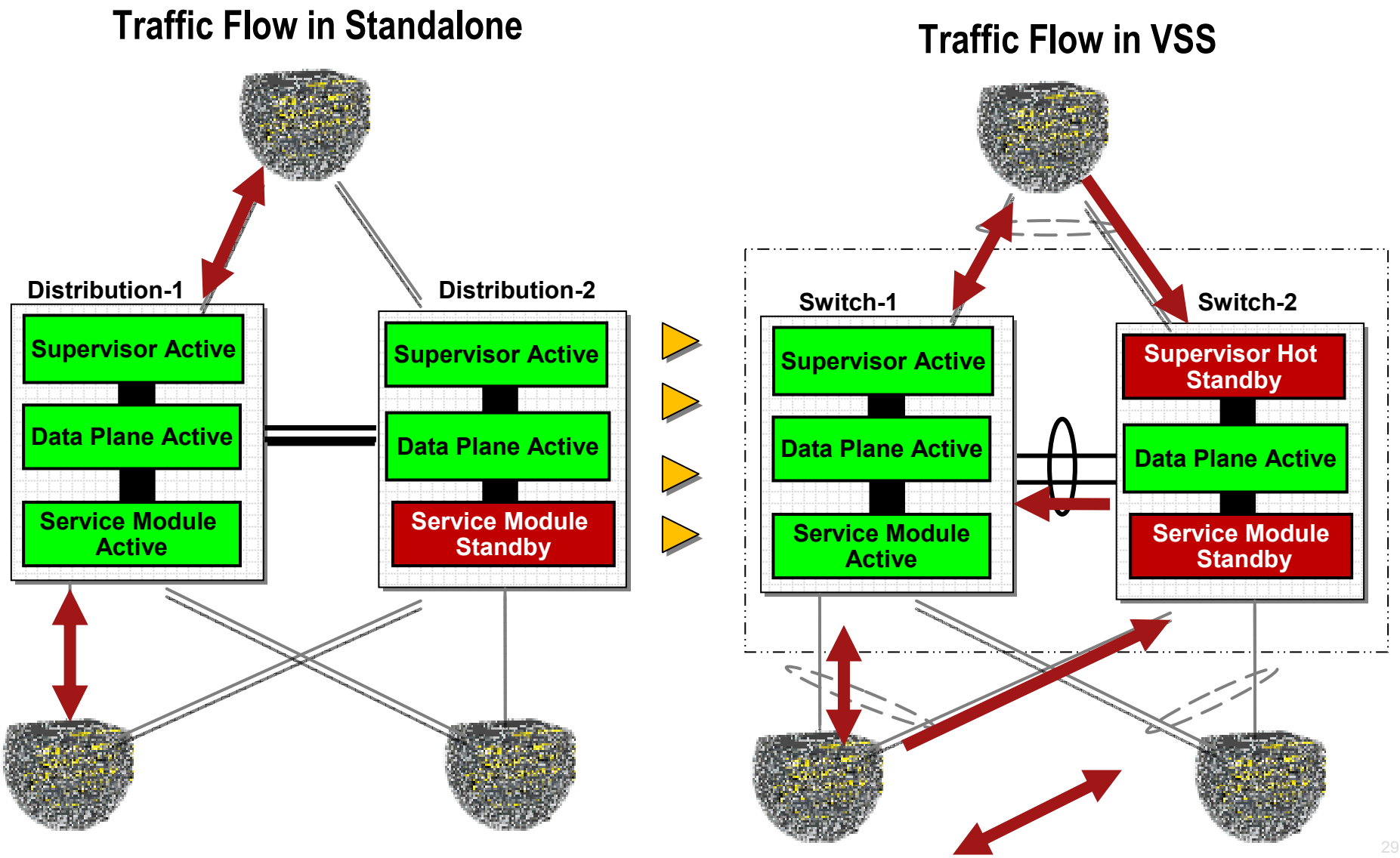
WS-SVC-IDSM2-K9

VSS Service Module Integration - Summary

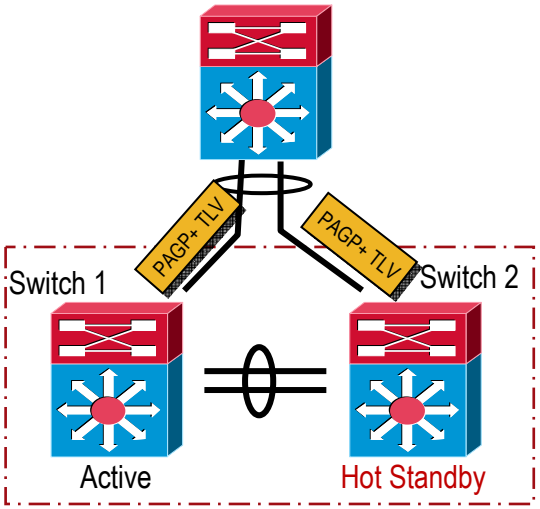
1. Service Module HA modes (Active-Active, Active-Standby) will be supported in VSS
   - Independent of the Supervisor HA roles
2. Etherchannels favor locally attached interfaces
   - This has implications for Service Modules utilizing internal etherchannel interface
3. VSL will carry traffic under normal and failover scenarios
   - VSL bandwidth must be engineered accordingly

Service Module	Software version
WS-SVC-FWM-1-K9	4.0.4
ACE10/ACE 20-6500-K9	A2(1.2)
WS-SVC-WISM-1-K9	6.0(2)E1
WS-SVC-IDSM2-K9	3.2.171.6

ACE/FWSM Packet Flow comparison

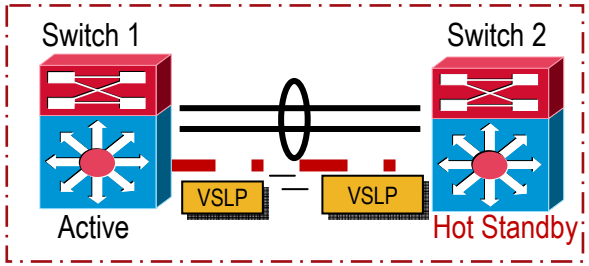


VSL Failure Recovery Protocols



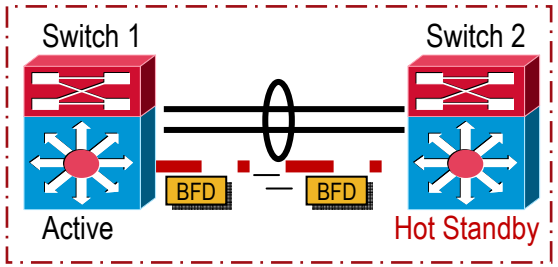
Enh PAGP (SXH1)

- Requires PAGP+ capable neighbor (3750 w/ 12.2(46)SE, 4500 w/ 12.2(44)SE, 6500 w/ 12.2(33)SXH)



VSLP Fast Hello (SXI)

- L2 Heart Beat Link



IP BFD (SXH1)

- L3 Heart Beat Link

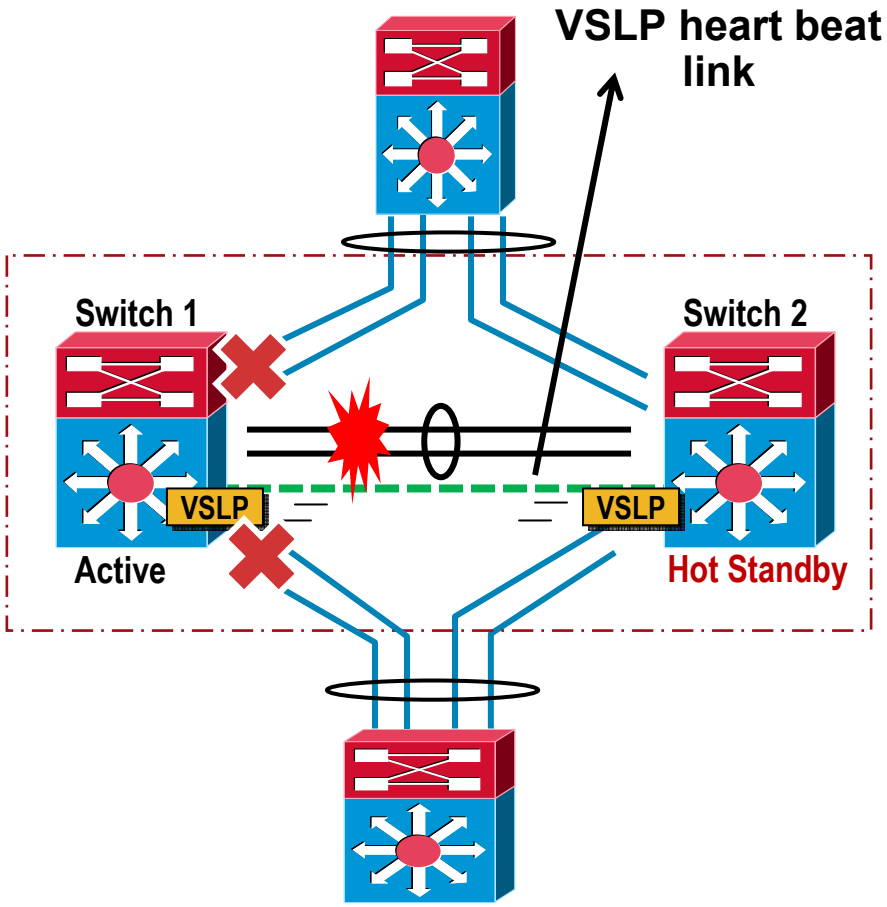
VSLP Fast Hello

1. VSLP Hellos contain Information such as switch-id, priority and peer state information exchanged to deterministically decide the switch role.
2. In case VSL fails:

   Checks the active status though heartbeat link

   If both switches are active, then previous active disables it's interfaces

   Data continue to forward on the rest of the portchannel interfaces.



VSL Link loss convergence