

The background features a vibrant, abstract design with overlapping, wavy bands of color in shades of blue, green, yellow, orange, and red. On the right side, a bright white light source radiates outwards, creating a starburst effect with sharp, colorful rays that fan across the entire image.

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The bridge to possible

Designing Highly Available Networks Using Cisco Catalyst 9000 Switches

Minhaj Uddin
Catalyst 9k - Technical Marketing Engineering
BRKENS-2095

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Cisco Webex App

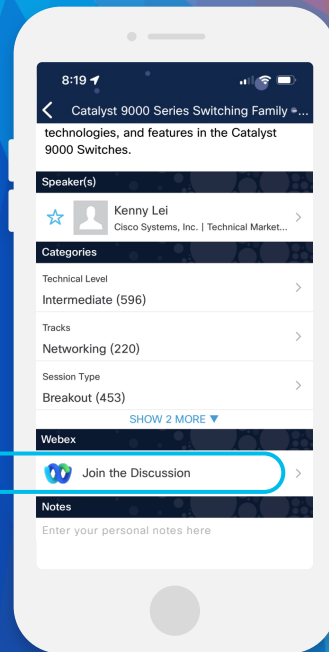
Questions?

Use Cisco Webex App to chat with the speaker after the session

How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until December 22, 2023.

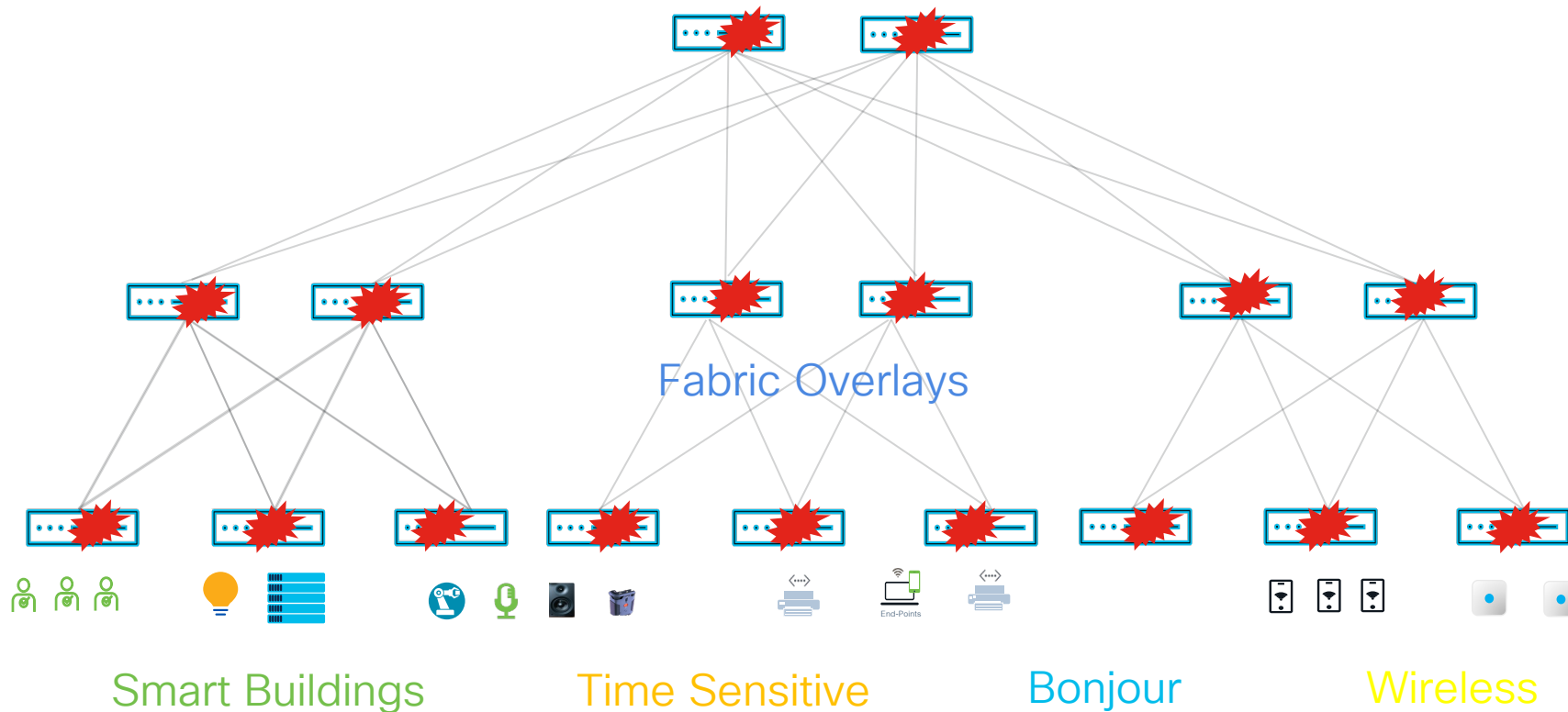


<https://ciscolive.ciscoevents.com/ciscolivebot/#TECENS-2618>

Agenda

- Introduction
- Platform and Design Redundancy
- Device Redundancy
- Link Redundancy
- Software Redundancy
- Customer Case Studies/ Design Options
- Conclusion

Traditional Enterprise Campus Network



Trend: Reliable & Highly Available Networks

99.999% Availability

“Reliability of the network can be measured by availability of the network”

Reliable Networks with Catalyst 9000

$$\text{Availability} = \frac{\text{MTBF}}{\text{MTBF} + \text{MTTR}} = 99.999\% \text{ (5min/yr downtime)}$$

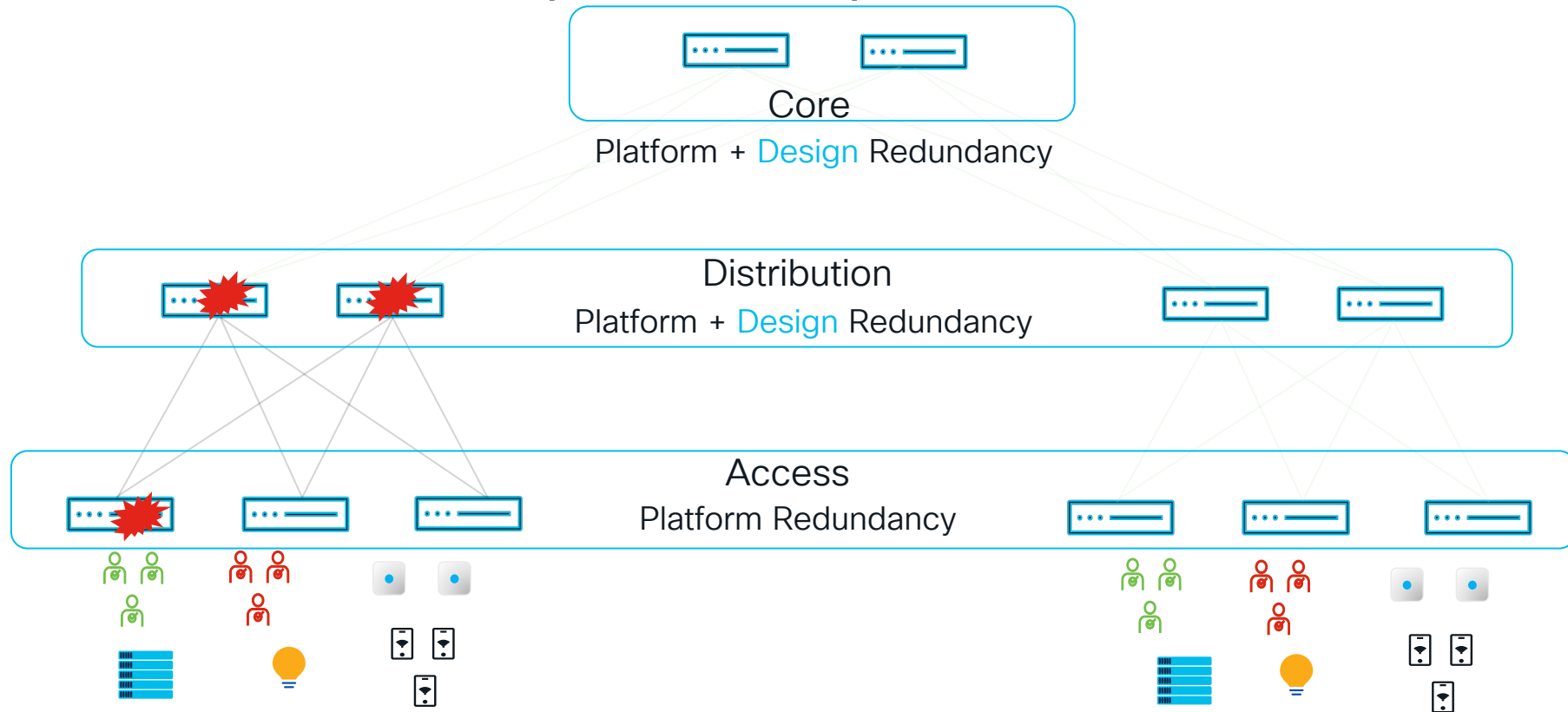
So, **MTBF** should be higher – **Robust Platform**

MTTR should be smaller – Redundancy

Key is to have Redundancy at every layer of the network

MTBF: Mean Time Between Failures
MTTR: Mean Time To Repair

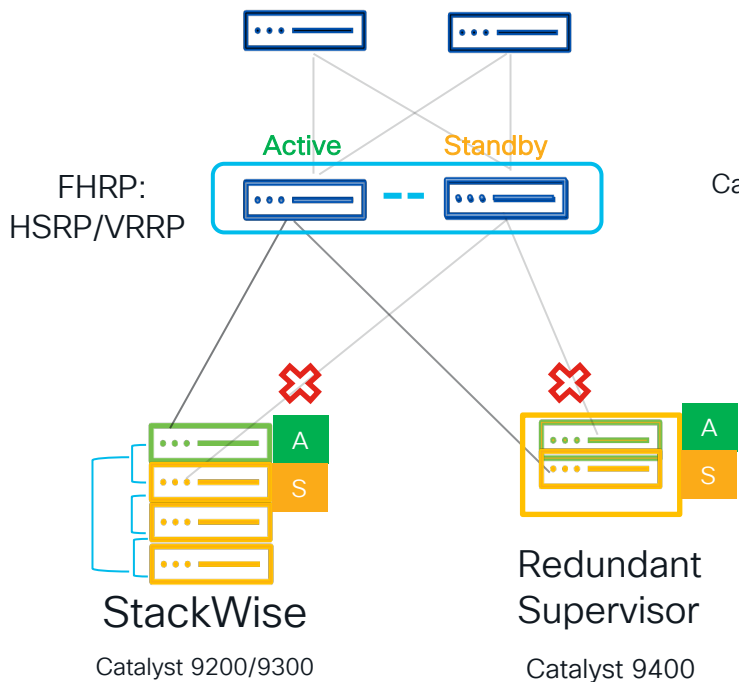
Traditional Enterprise Campus Network



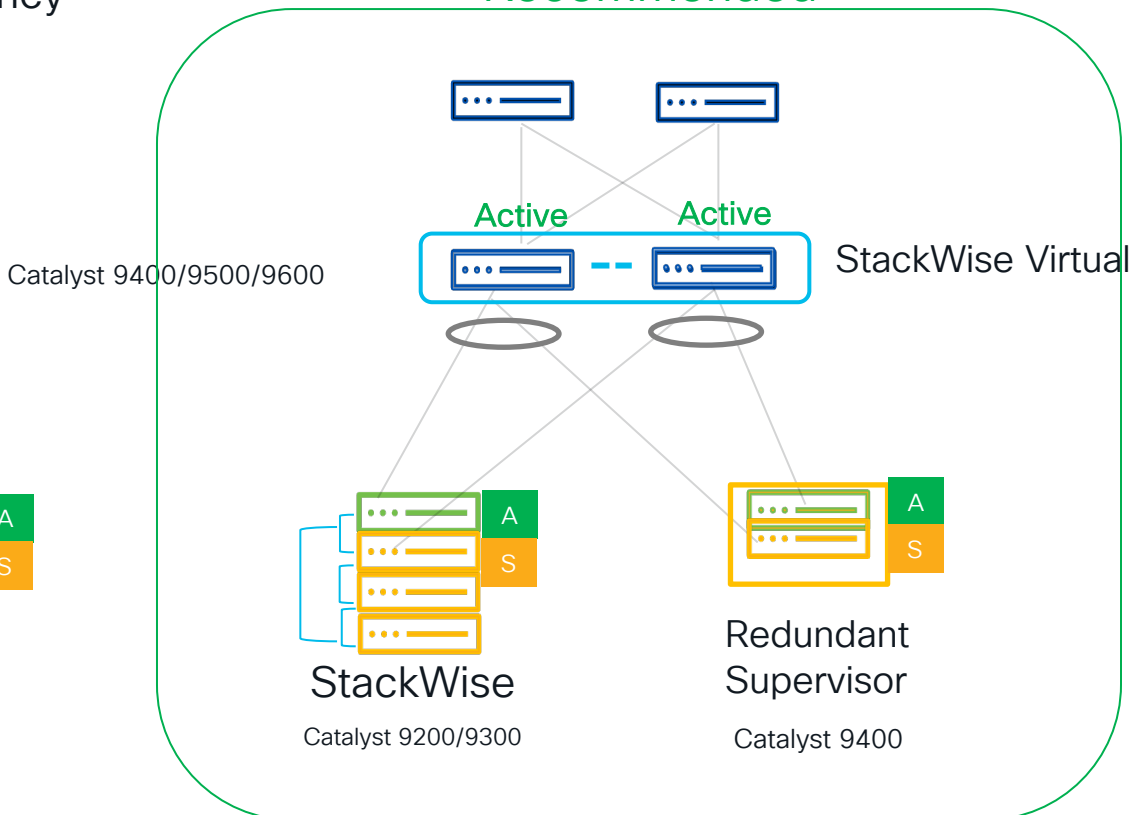
Redundancy at the Platform + Design Level

Enterprise Campus Network

Platform + Design Level Redundancy

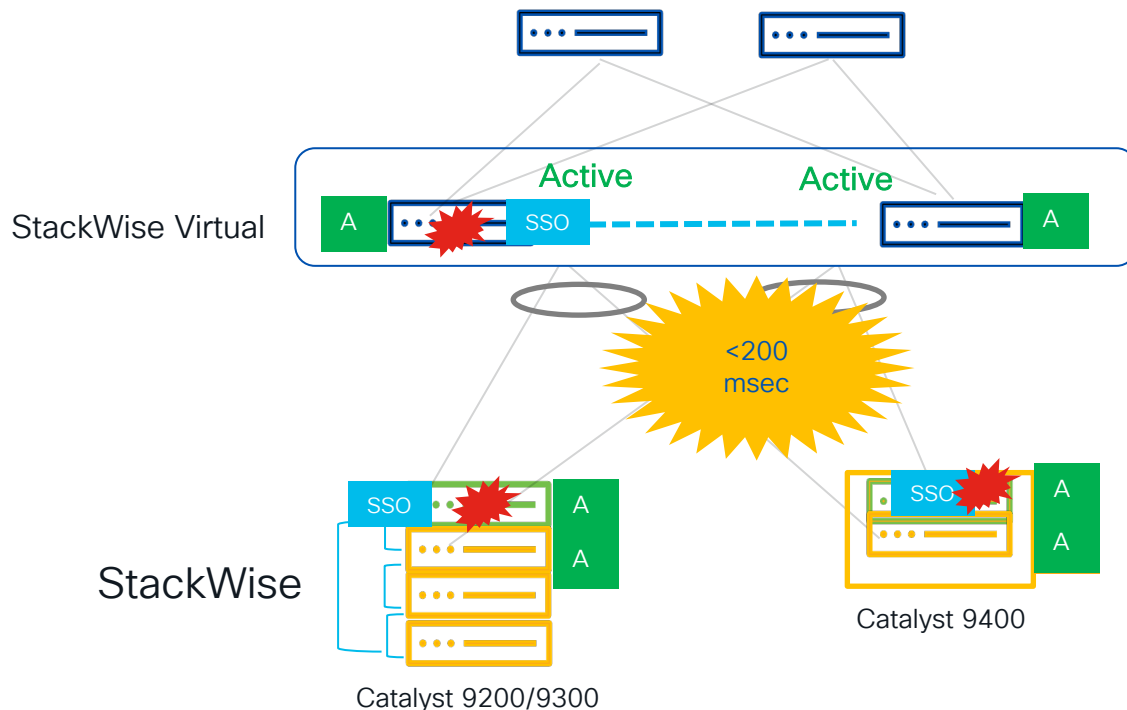


Recommended



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Device Failures with Stateful Switchover (SSO)



Stateful Switchover (SSO)

SSO Aware Applications

Forwarding Information Base

IEEE 802.1x

PAgP / LACP

...and more

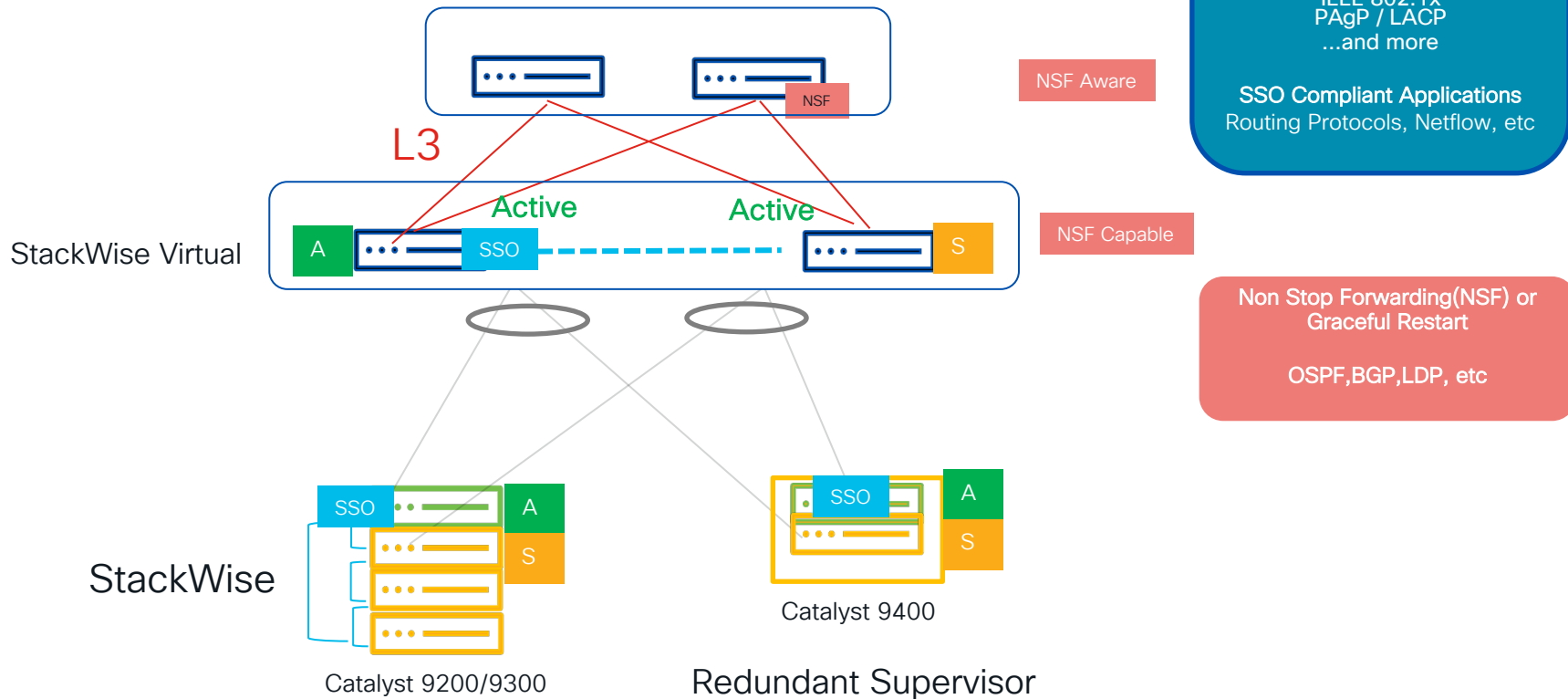
SSO Compliant Applications

Routing Protocols, Netflow, etc

FIB Table	
Prefix	Next HOP
10.1.1.1	aabbcc:ddee32
10.1.1.2	adbb32:d34e43
192.168.0.0	aa25cc:ddeee8

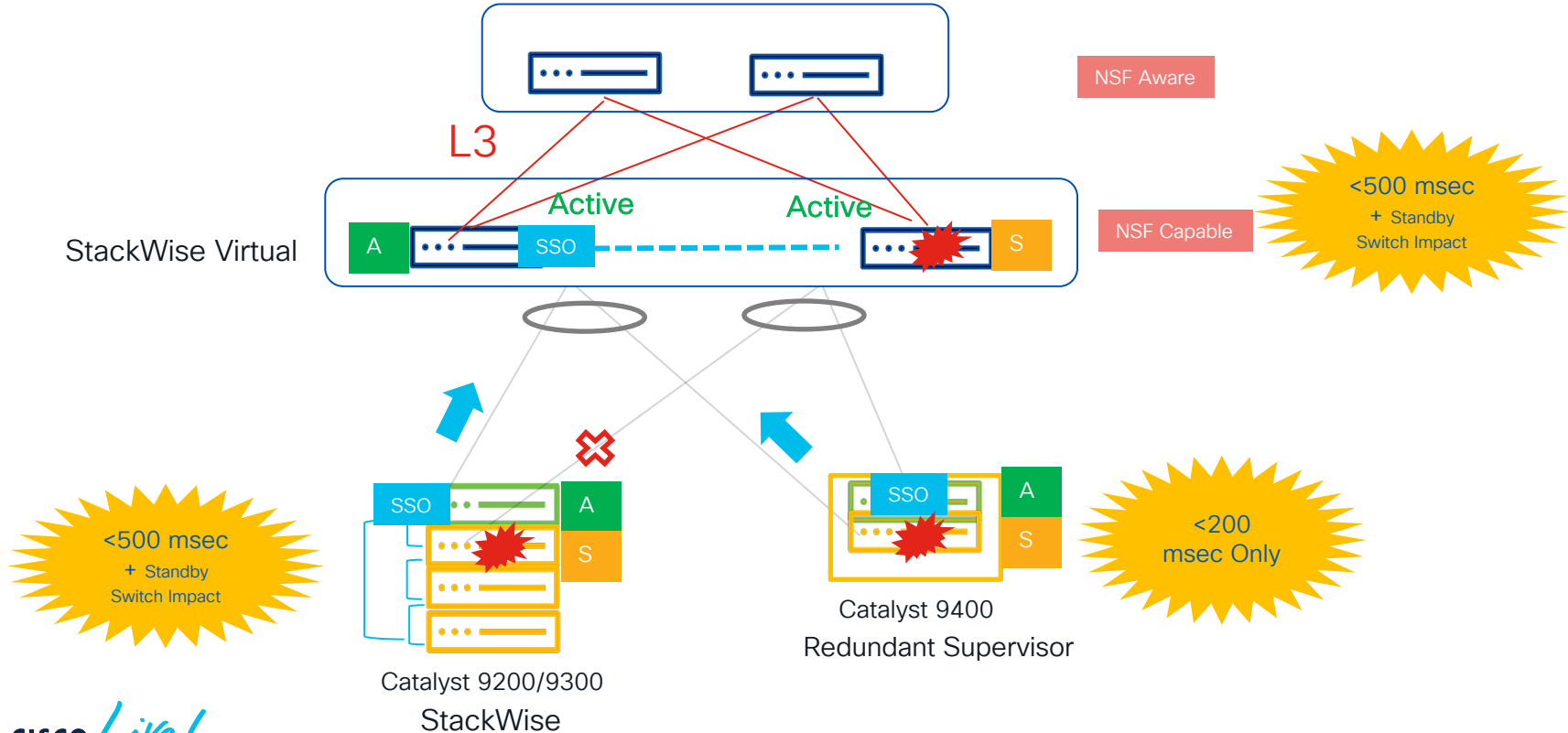
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Non-Stop Forwarding for L3



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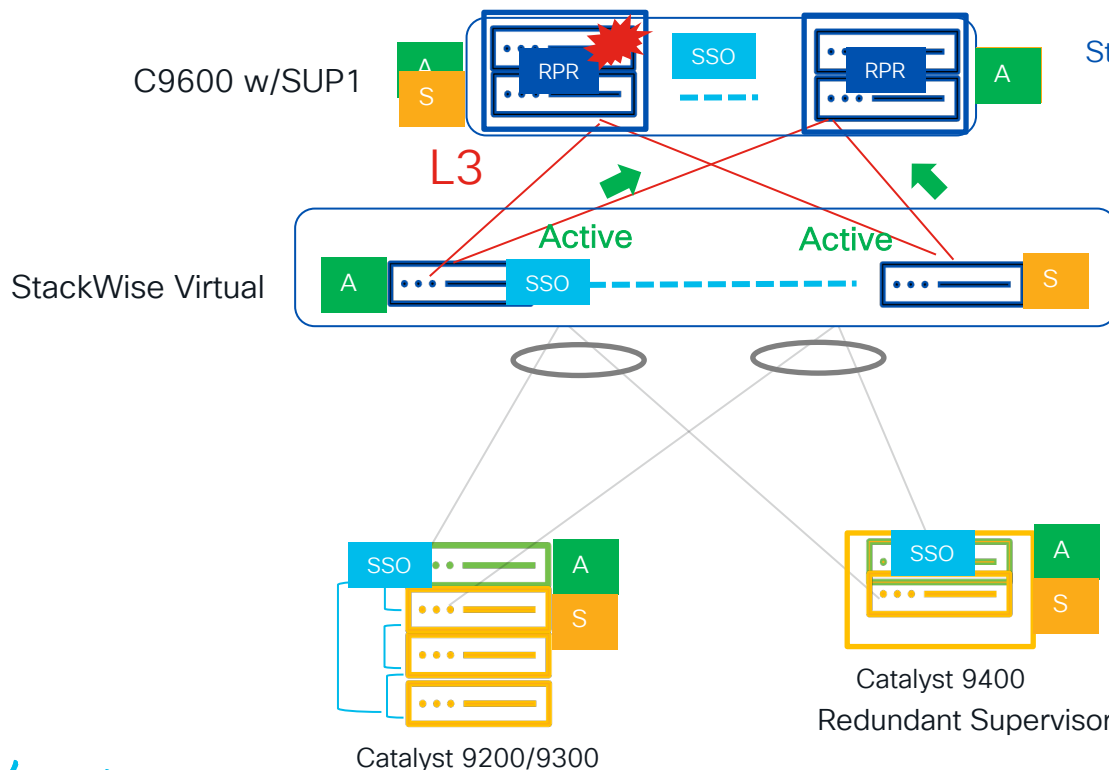
Standby Device Failures



Redundancy for Core Layer

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StackWise Virtual Quad SUP RPR for Core

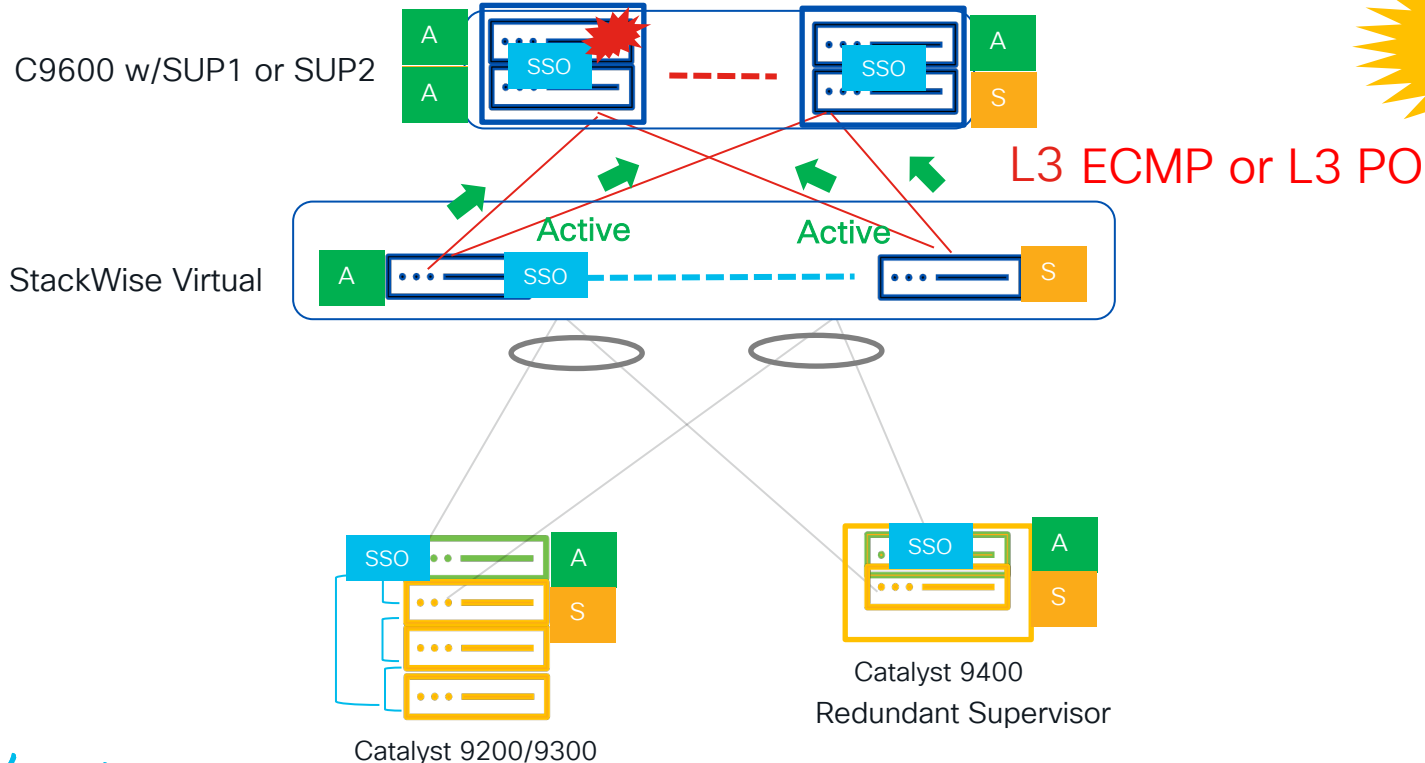


StackWise Virtual with
Quad Supervisors

<200 msec
Only + 6-8
min for ICS
to become
Standby

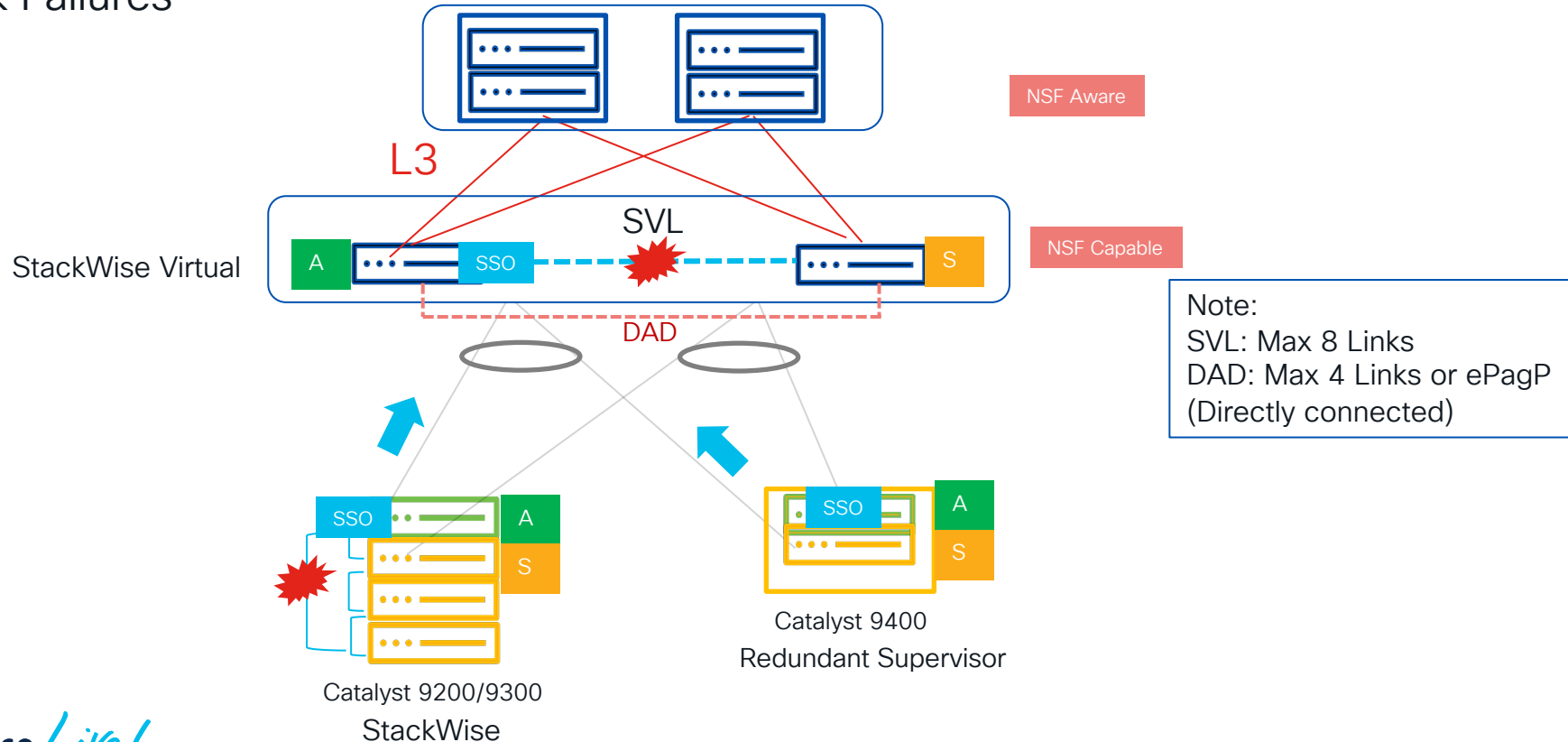
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L3 with Dual Sup for Core



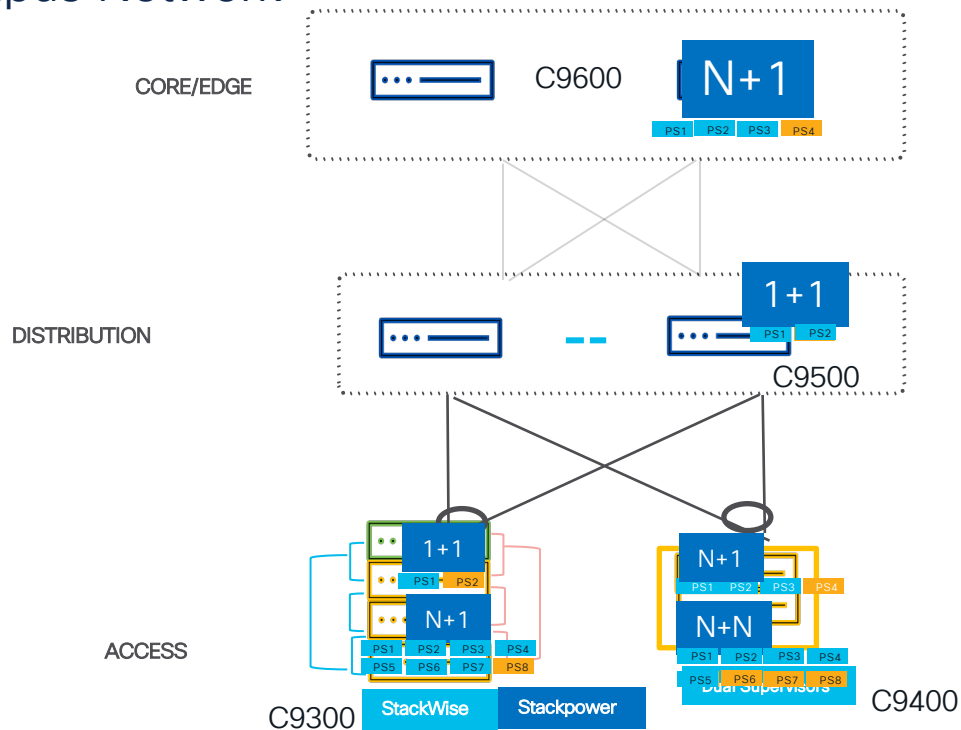
Enterprise Campus Network

Link Failures



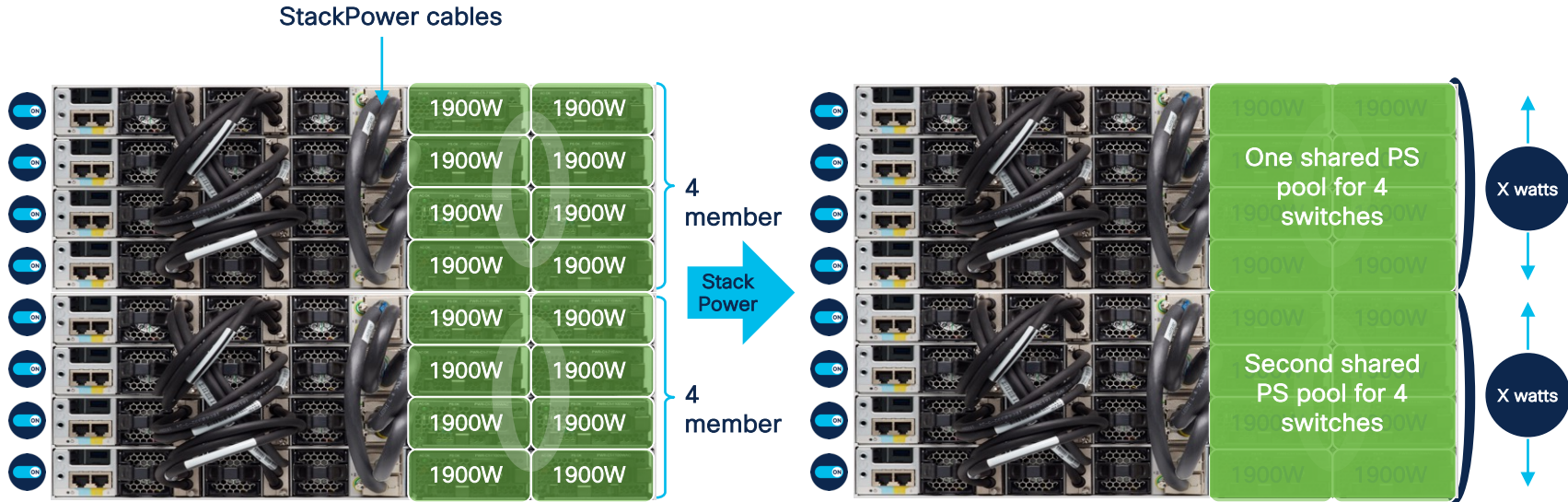
Power Supply Redundancy

Enterprise Campus Network



Power Redundancy with Stacking Power Supplies

StackPower

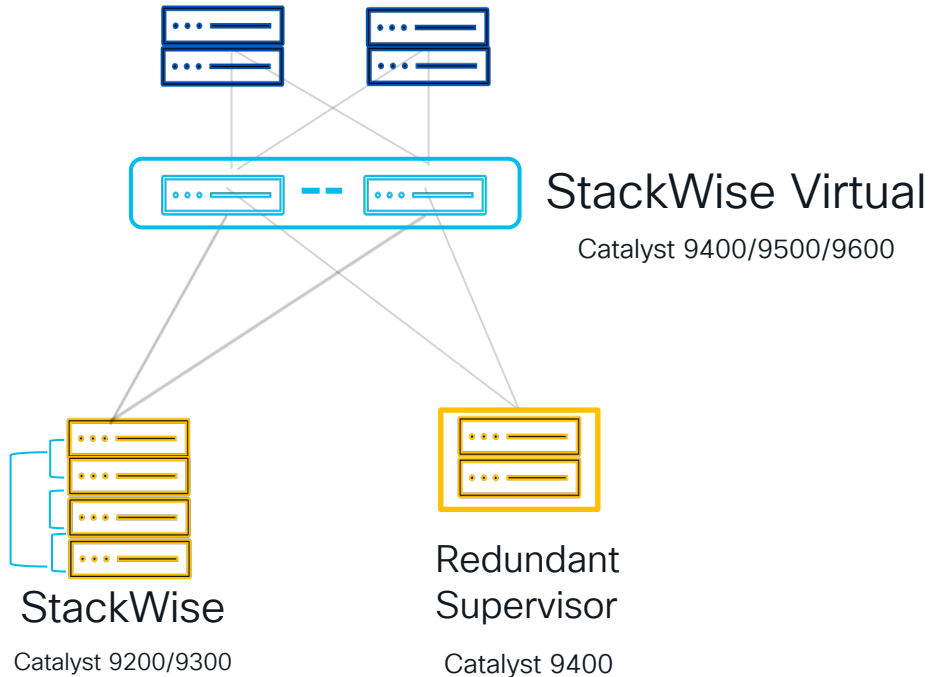


- Pools power from all Power Supplies (PS)
- All switches in StackPower share the available power in the pool
- Each switch is given its minimum power budget

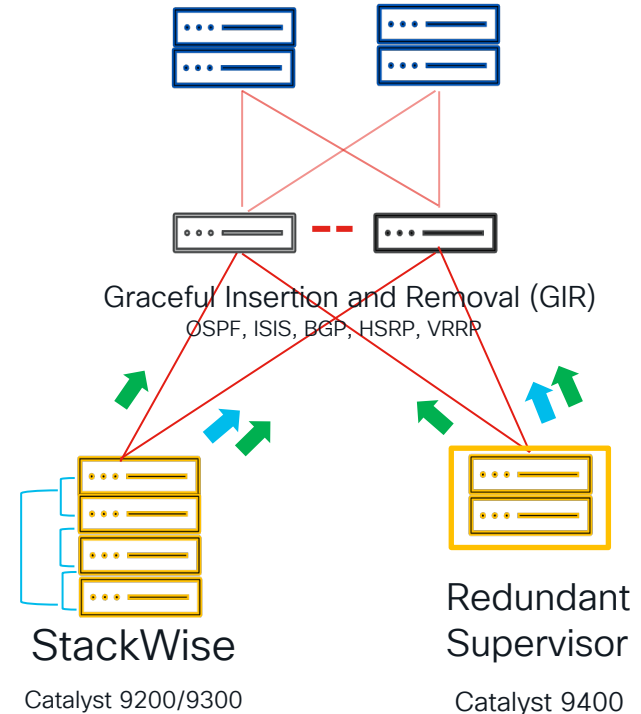
- 1+N Redundancy with inline power
- Up to 4 switches in one StackPower Ring
- Multiple Power stacks possible in one data stack

Enterprise Campus Design Options

L2 + L3 Design

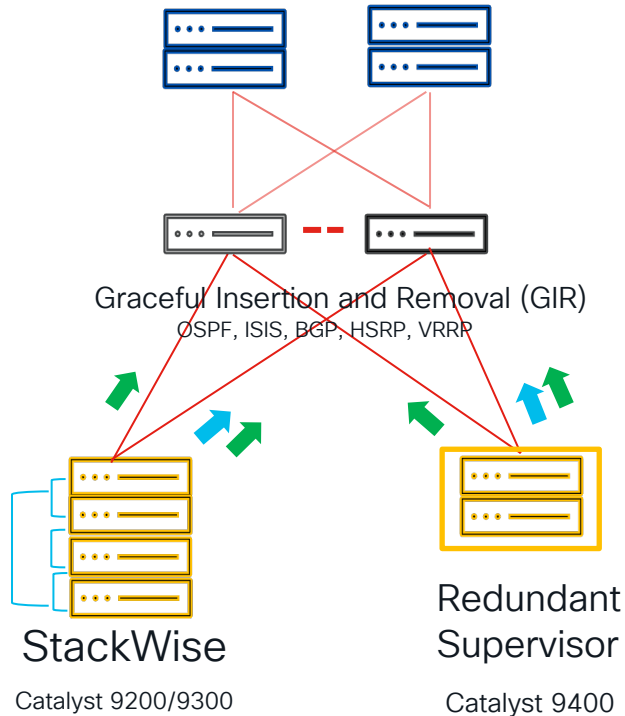


Routed Access Design with GIR

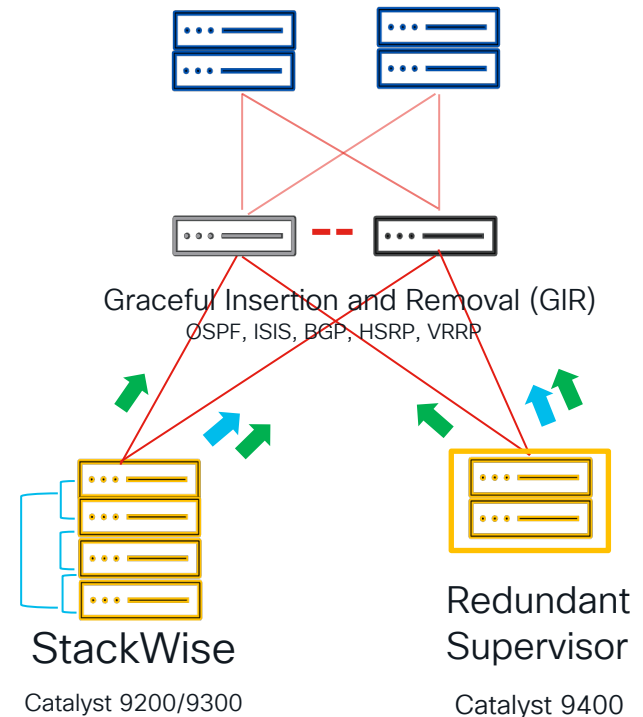


Enterprise Campus Design Options

Routed Access Design with GIR



Routed Access Design with GIR



Redundancy at the Software Level

Extended Fast Software Upgrade for C9300

Catalyst® 9300/9300X standalone



#Install add file image activate reloadfast commit

Control plane

Data plane

< 30
seconds of
traffic
impact

Catalyst 9300/9300X stack



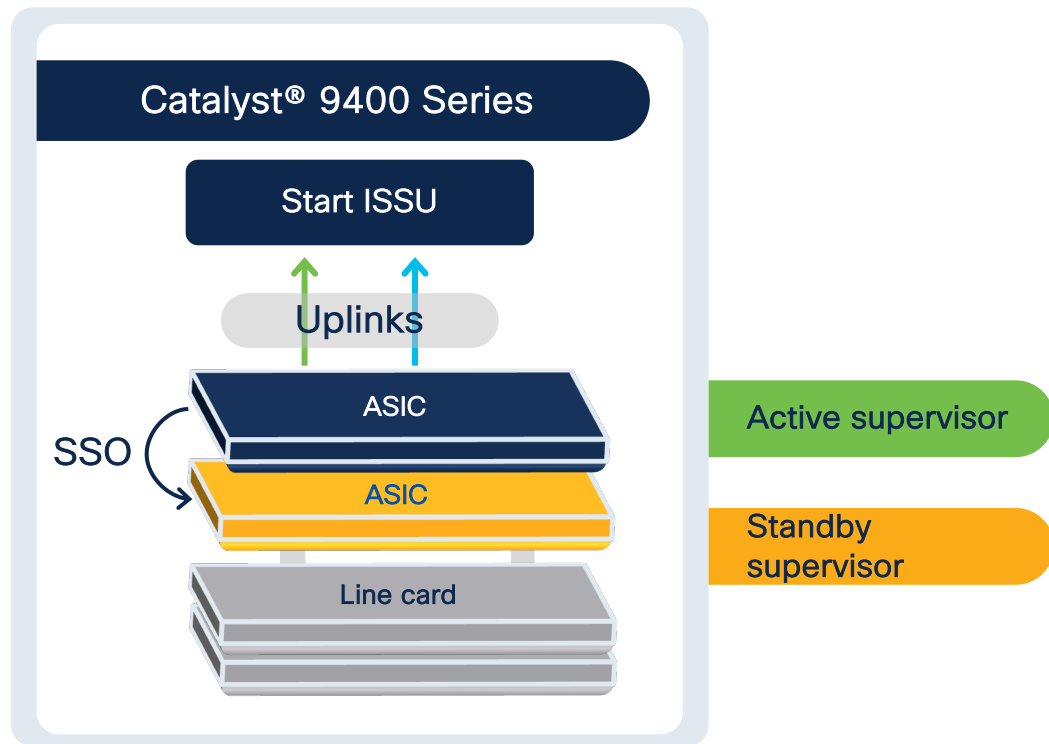
#Install add file image activate reloadfast commit

Active control plane

Data plane

< 30 seconds
of traffic impact
for all ports in
the stack

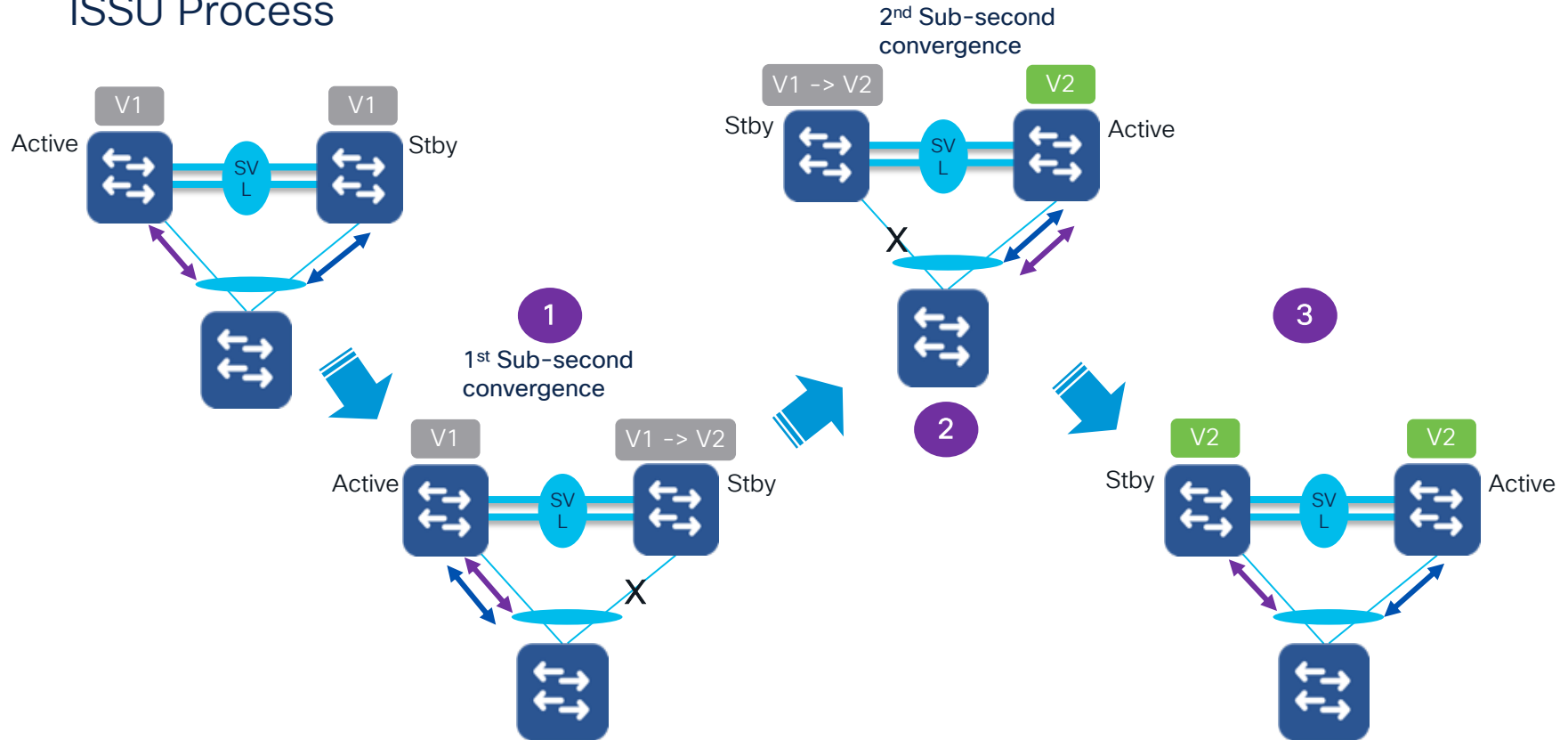
ISSU process for Dual supervisors



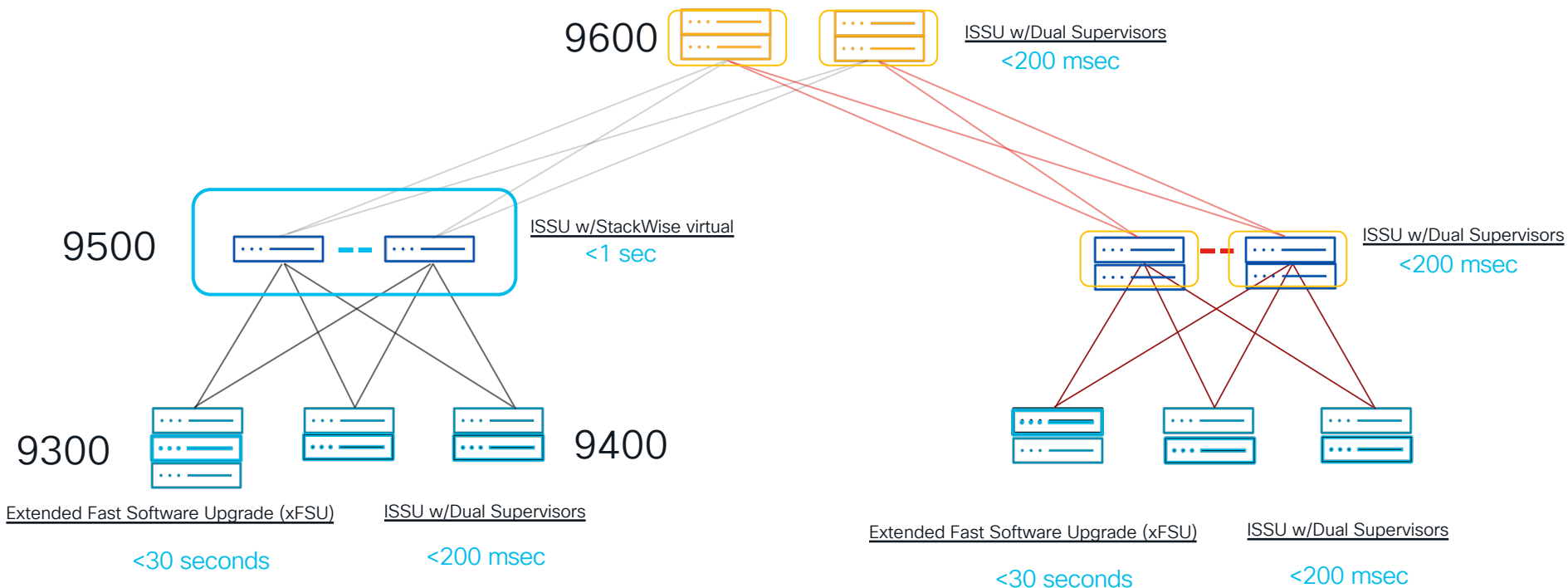
- Uplinks on both Active and Standby supervisors are forwarding traffic
- Convergence takes less than 200 ms during the switchover

Stackwise Virtual ISSU

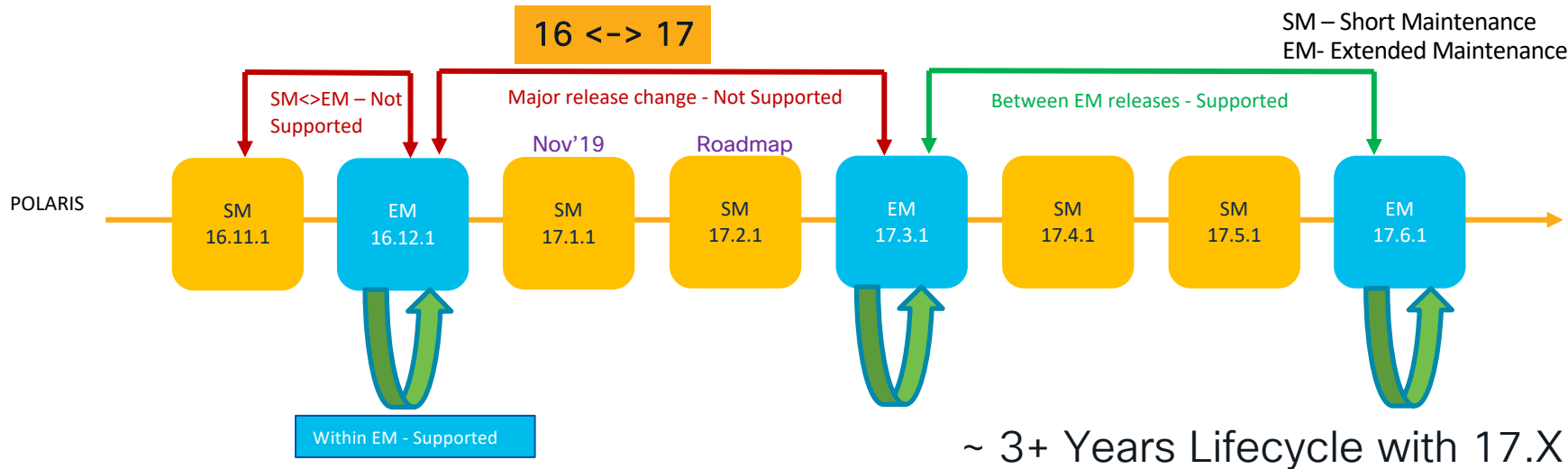
ISSU Process



Software Upgrades with Catalyst 9000 Platform



ISSU Release Guidelines



Supported

- Within EM Release - Any to Any within the EM Release (16.12.X <-> 16.12.X)
- Between EM Releases but within major releases [within +/- 2 EM releases]

Not Supported

- SM to EM or EM to SM.(16.11.X <-> 16.12.x)
- Within SM Release - (16.11.1 <-> 16.11.2)
- Beyond the +/- 2 EM Releases.
- When there is a major release change.
 - For example 16.x.x to 17.x.x



Software Maintenance Upgrade

SMU is a package that can be installed on a system to provide a fix or a security resolution to a released image.

- **Hot Patching** - does not require explicit reload after installation to get activated. *(not traffic-affecting)*
- **Cold Patching** - requires a system reload after installation to get activated. *(traffic-affecting)*. The 9200 family supports only this.

- **Bundle SMU** - One single SMU file containing and applying multiple SMU fixes on the backend.
- **Independent SMU** - One single SMU file tailored to address a specific bug or vulnerability.



Patching can also be performed using Cisco DNAC

C9300-Access.cisco.com (172.26.192.131) Image Update

Date:
Mar 16, 2023 12:15
PM

Duration: 4 minutes 20
seconds

Status: ● Successfully Activated cat9k_iosxe.17.03.04.SPA.bin
cat9k_iosxe.17.03.04.CSCwa53947.SPA.smu.bin

DNAC Version: Guardian 2.3.3
License Level : DNA Advantage

Operations

Checks

> ● SMU Distribution

1 minute 51 seconds

✓ ● SMU Activation

2 minutes 27 seconds

SMU Activation of image: cat9k_iosxe.17.03.04.CSCwa53947.SPA.smu.bin on device: 172.26.192.131 completed successfully

> ● Pre Activation Script Execution
1 second

> ● Activation
2 minutes 26 seconds



Reduces time
and scope of
testing



Self-sufficient
and reliant bug
fix solution for
PSIRT, CFD & IFD



Hot Patching



EMR Releases with
371 SMU files
available

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Software Maintenance Upgrade Customer Use Case



CDETS	Bugs & Vulnerabilities	SMU Fix File
CSCwb16232	SNMP Engine High CPU when NVE interface is Configured	cat9k_iosxe.17.06.03.CSCwb16232.SPA.smu.bin
CSCwd92655	Cat9k switch hangs during bootup after power-cycle	cat9k_iosxe.17.06.03.CSCwd92655.SPA.smu.bin
CSCwa85257	VXLAN Encapsulated Unicast DHCP ACK packet, after arriving at Fabric Edge is silently dropped	cat9k_iosxe.17.06.03.CSCwa85257.SPA.smu.bin
CSCwc85207	Umbrella SMU for critical defects on 17.6.3	cat9k_iosxe.17.06.03.CSCwc85207.SPA.smu.bin

This Bundle SMU resolved two issues

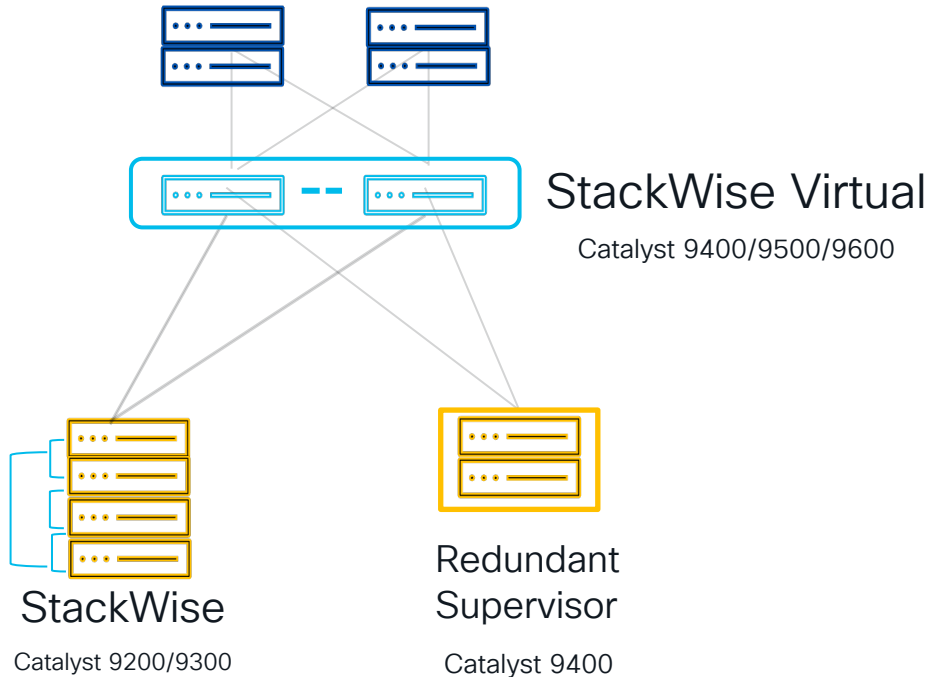
Hot Patched!

CSCwb25610 - IPv6: Switch may reload due to a memory allocation error by SISF - Occurs on a scaled environment
CSCwb70411 - C9300 - Critical software exception crash - iosd core - No specific trigger

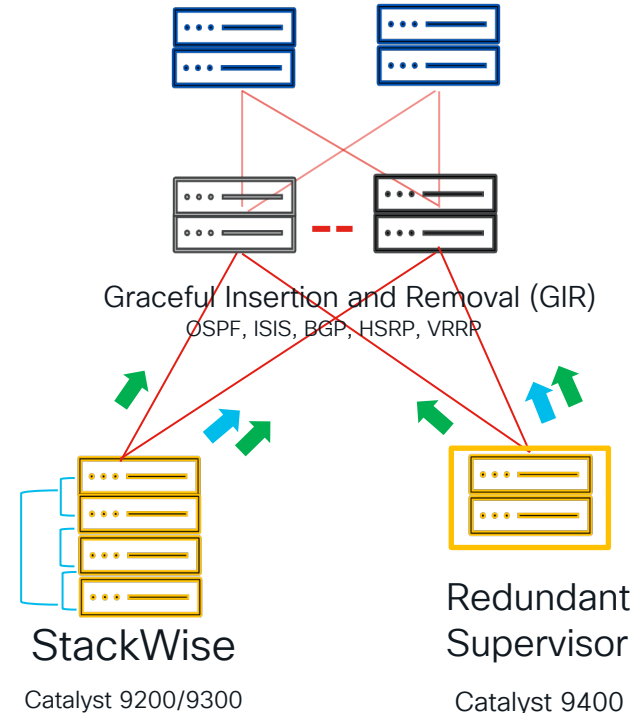
Customer Profiles – Design Option Recommendations

Enterprise Campus Design Options

Customer Profile 1: L2 + L3

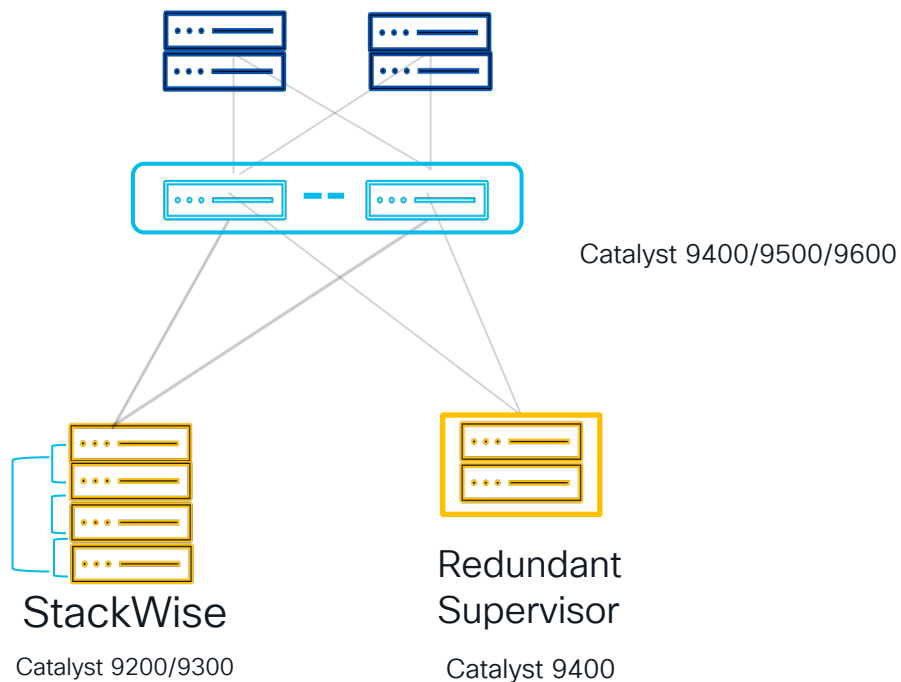


Customer Profile 2: Routed Access

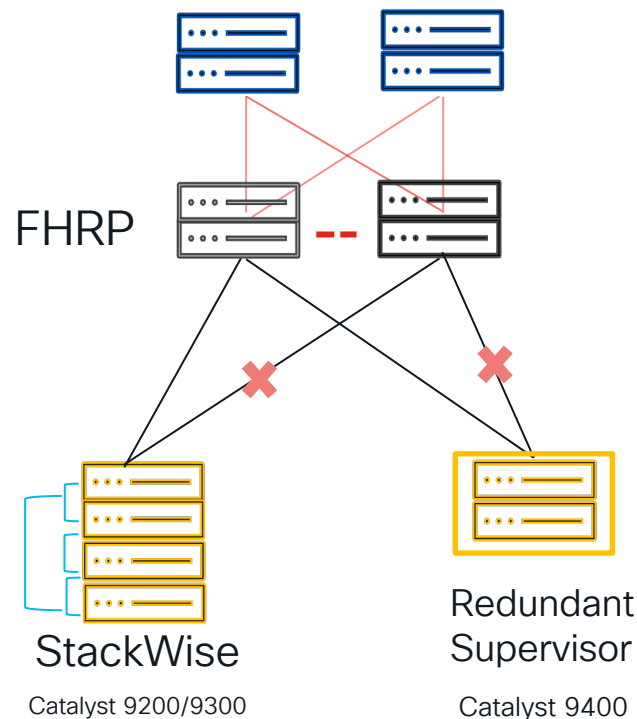


Enterprise Campus Design Options

Customer Profile 3: SDA LISP or EVPN

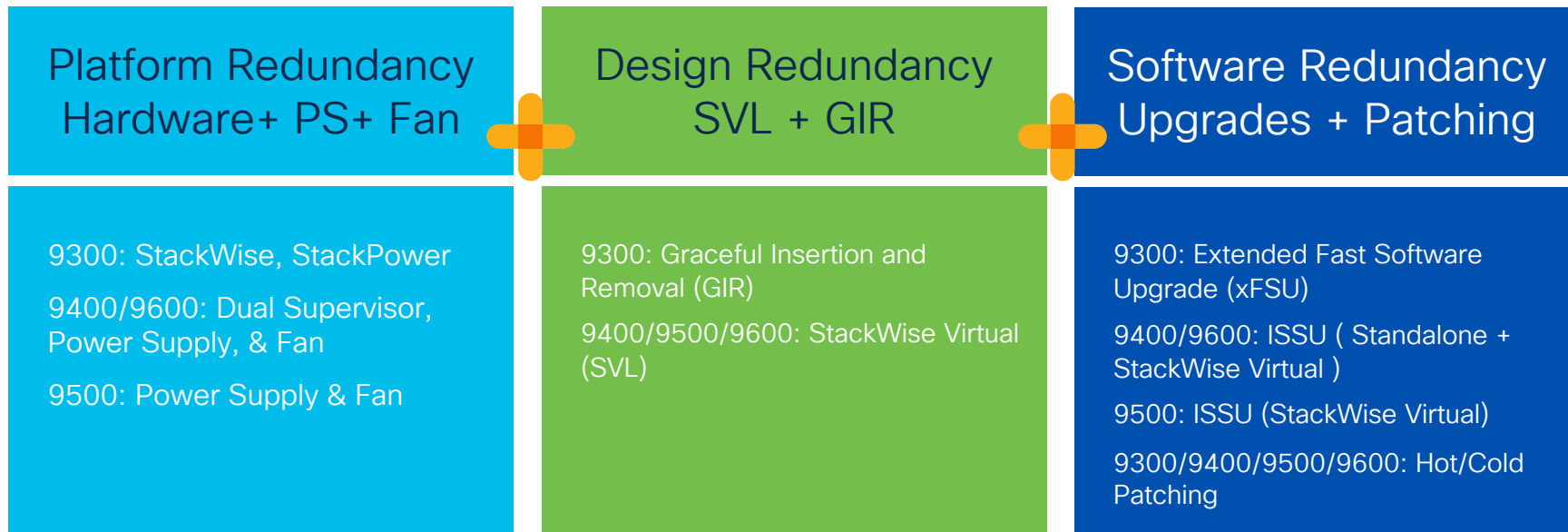


Customer Profile 4: L2 + L3 with FHRP



ROADMAP

Catalyst 9000: Redundancy at every layer



Sub-second Traffic Impact across all layers of Redundancy



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to meet, greet, whiteboard & gain
insights about your unique questions
with the best of the best.



Meet the Expert Opening Hours:

Tuesday	3:00pm – 7:00pm
Wednesday	11:15am – 7:00pm
Thursday	9:30am – 4:00pm
Friday	10:30am – 1:30pm

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- Book your one-on-one Meet the Expert meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

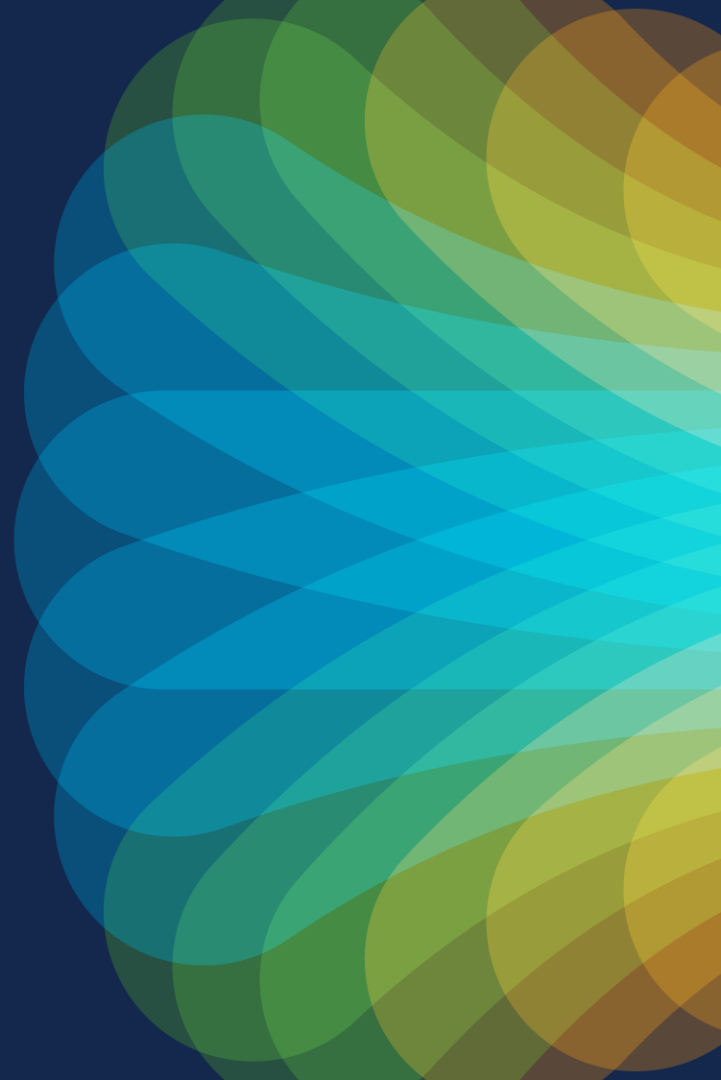


The bridge to possible

Thank you

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The background is a vibrant, abstract graphic featuring a spectrum of colors (red, orange, yellow, green, blue, purple) arranged in a radial, sunburst-like pattern. The colors transition from red on the left to blue on the right, with a bright white center. The overall effect is dynamic and energetic.

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