
cisco Live!
ALL IN

The bridge to possible

Verifying Your Systems Transition to IPv6

Winning the journey & the outcome!

Mike Mikhail, Delivery Architect
@MikeMikhail

BRKIPV-2000

Agenda

- The Transition Journey
- Planning for Success
- Test Plan
- The Testing Environment
- Test Cases

Introduction

- About me
  - Mike Mikhail, Architect, mamikhai@cisco.com
  - Available for “Meet the Engineer” 1:1 & team discussions
  - Interests: ML/AI, Telemetry, SP technologies

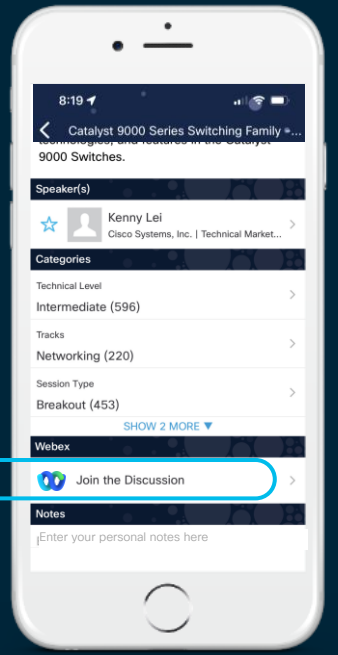
Cisco Webex App

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



https://ciscolive.ciscoevents.com/ciscolivebot/#BRKIPV-2000

Webex spaces will be moderated by the speaker until June 17, 2022.

Agenda

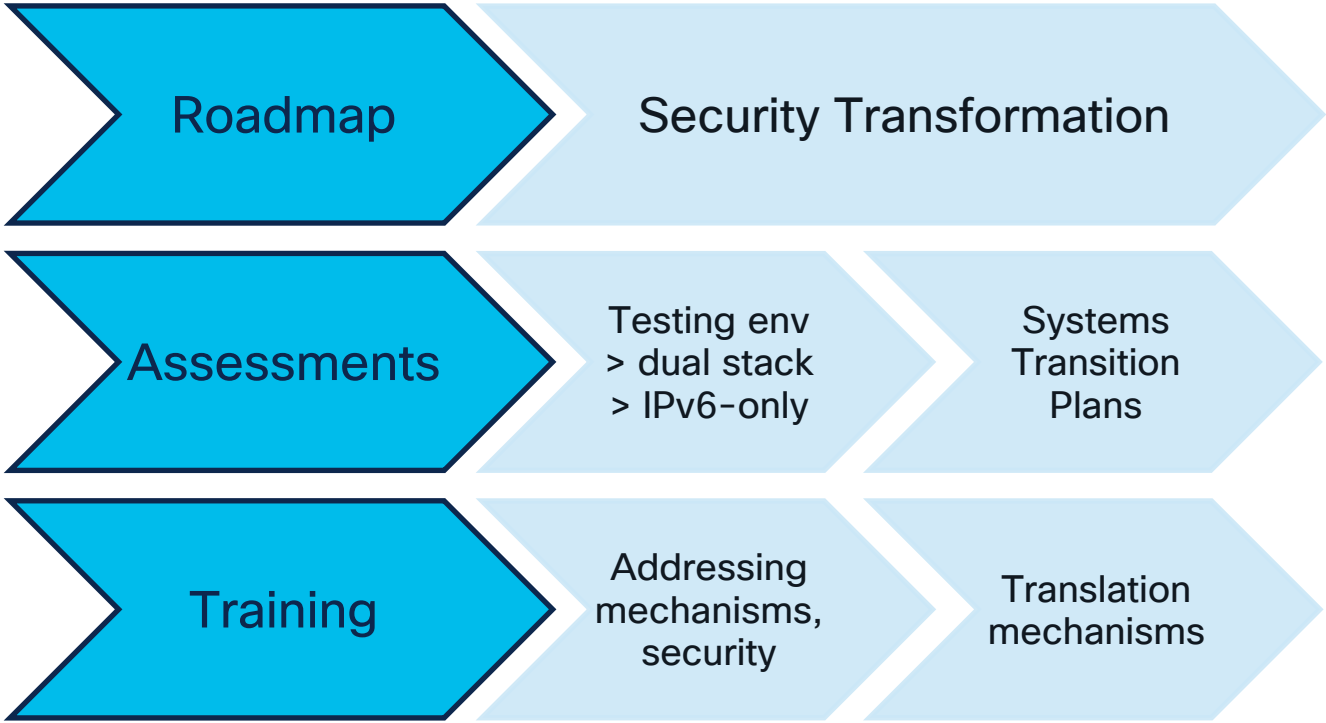
- The Transition Journey
- Planning for Success
- Test Plan
- The Testing Environment
- Test Cases

The Transition Journey

IPv6 Transition Areas

- Business/mission 1st
- IoT, Mission Partners, eCommerce, Data Lakes, Supply Chain
- Interconnected & interdependent

The Transition Journey



The Transition Journey

Will likely include..

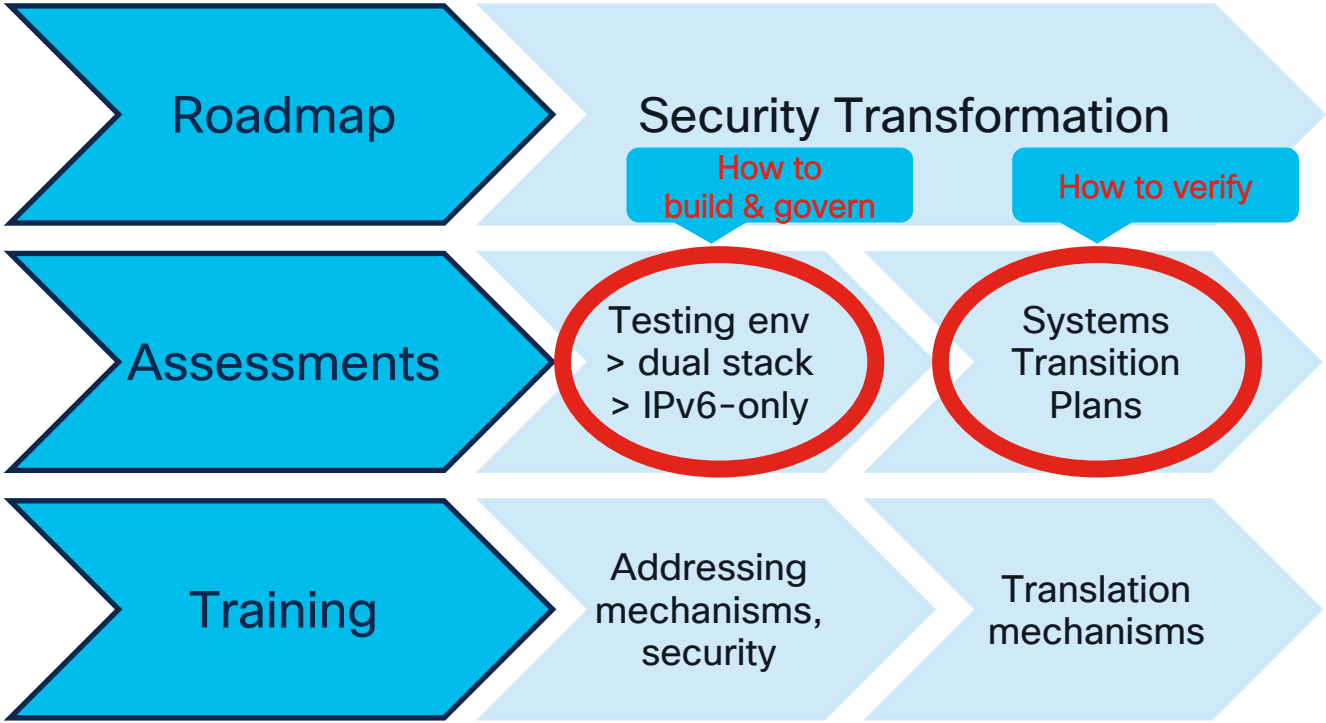
1. Roadmap: The plan for success throughout, and after transition
2. Security transformation: Security is dynamic & evolving, plus dual stack and IPv6-only change the attack surface
3. Assessment: Can the system work with IPv6? Is it suitable for IPv6-only future? Dependencies? Lifecycle?
4. Testing: for dual stack operation, then for IPv6-only environment
5. System transition plans: Eng and Ops changes, How and when. May: upgrades – dual stacking – co-existence – next gen?

The Transition Journey

Will likely include..

6. Training: Engineering and Ops workforce need to be knowledgeable and capable
7. IPv6 addressing: Address allocation plan, addressing and binding mechanisms, first hop and mobility security
8. Transition mechanisms: NAT64, DNS64, ALG's, where, capacities, security, Ops

We'll focus on:



Agenda

- ✓ The Transition Journey
- ➢ Planning for Success
- ➢ Test Plan
- ➢ The Testing Environment
- ➢ Test Cases

Planning for Success

Success Criteria

1. Business purpose: *List of have-to functions*
2. Performance metrics: *SLA? Today's performance, QoE*
3. Security criteria: *Access controls, confidentiality, traceability*
4. Ops controls & services: *Tools, monitoring, security, provision, support*
5. In-flight, anticipated, planned: *Approved changes, projects, lifecycle*

You should verify net gains, for duration of transition, and after!

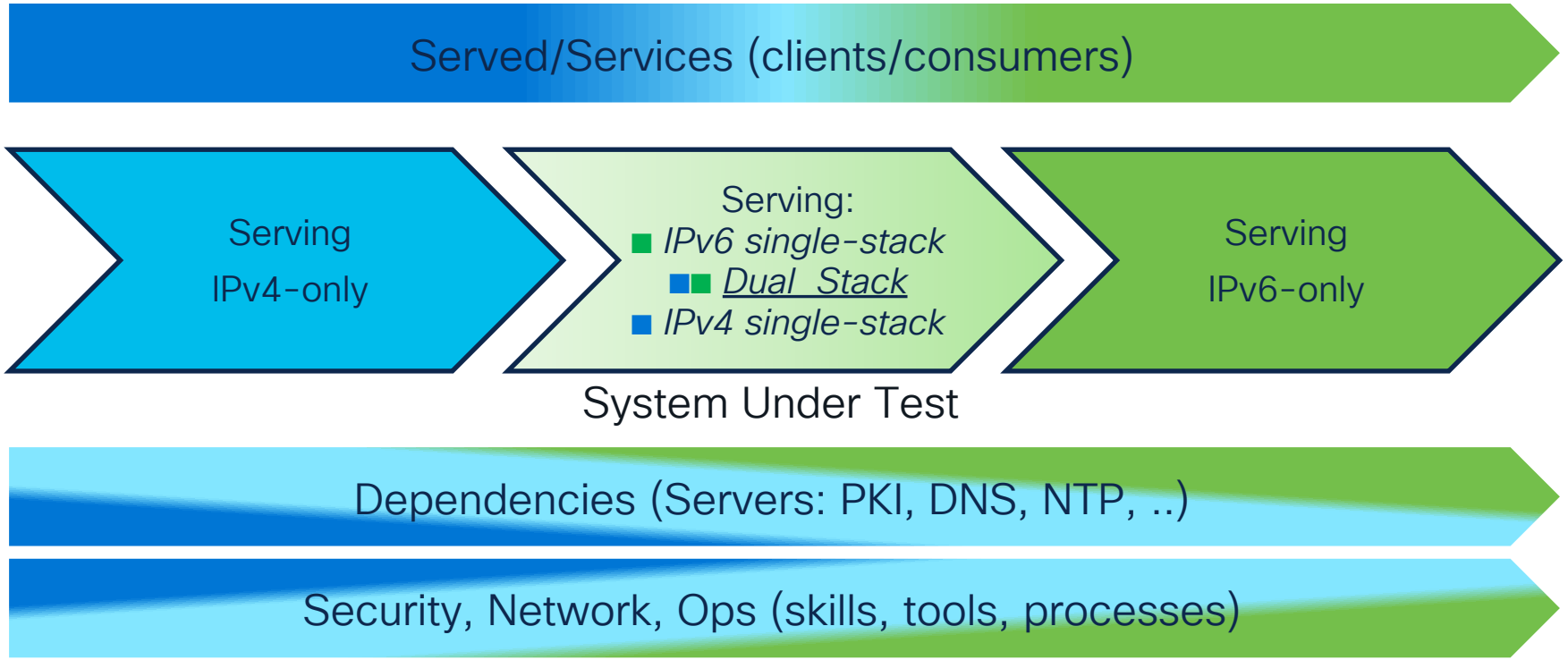
Transition Timeline & Milestones

- Two phase Transition: for most systems:
  1. From IPv4 everything, to dual / mixed environment
  2. Then gradually to diminished IPv4 clients/services/dependencies [IPv4-free]
- During dual / mixed phase, each host can be:
  1. IPv4-only: still fully dependent on IPv4 services, and can serve only over IPv4
  2. Dual stacked: the host/app behavior and selection of IP communication based on several factors. Complexities vary!
  3. IPv6-only: host is unaware & incapable of IPv4

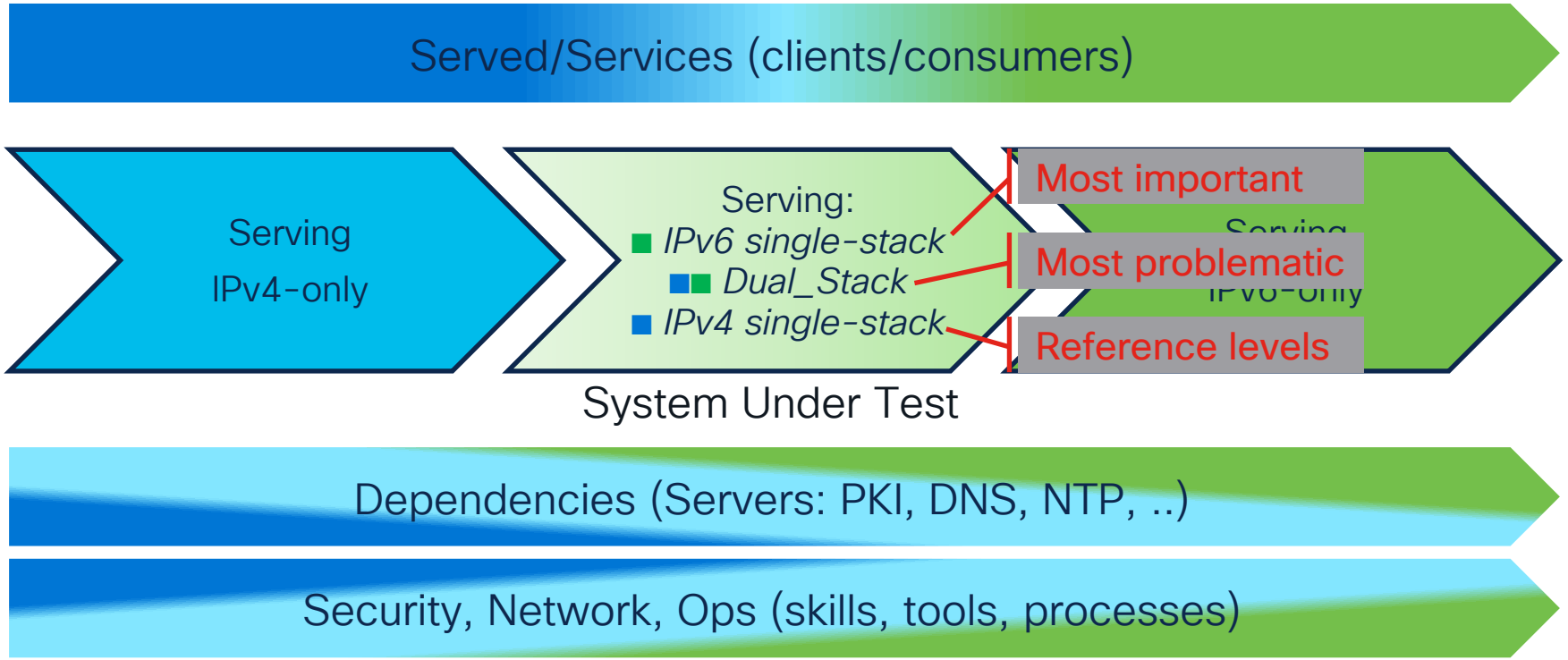
Transition Timeline & Milestones –Continued

- Systems/services have different timelines during dual-stack phase, with shifting behaviors:
  1. Preference for IPv6 or IPv4 may vary. Examples: Happy Eyeballs, and OS preferences
  2. Responses may vary. Example: DNS response
  3. Capabilities may vary. Example: signaling over IPv4 only
  4. Experience may vary. Examples: tracking/traceability over NAT64, multi-session restrictions
  5. Paths & components may vary: Ships in the night

Timing is ~Everything!



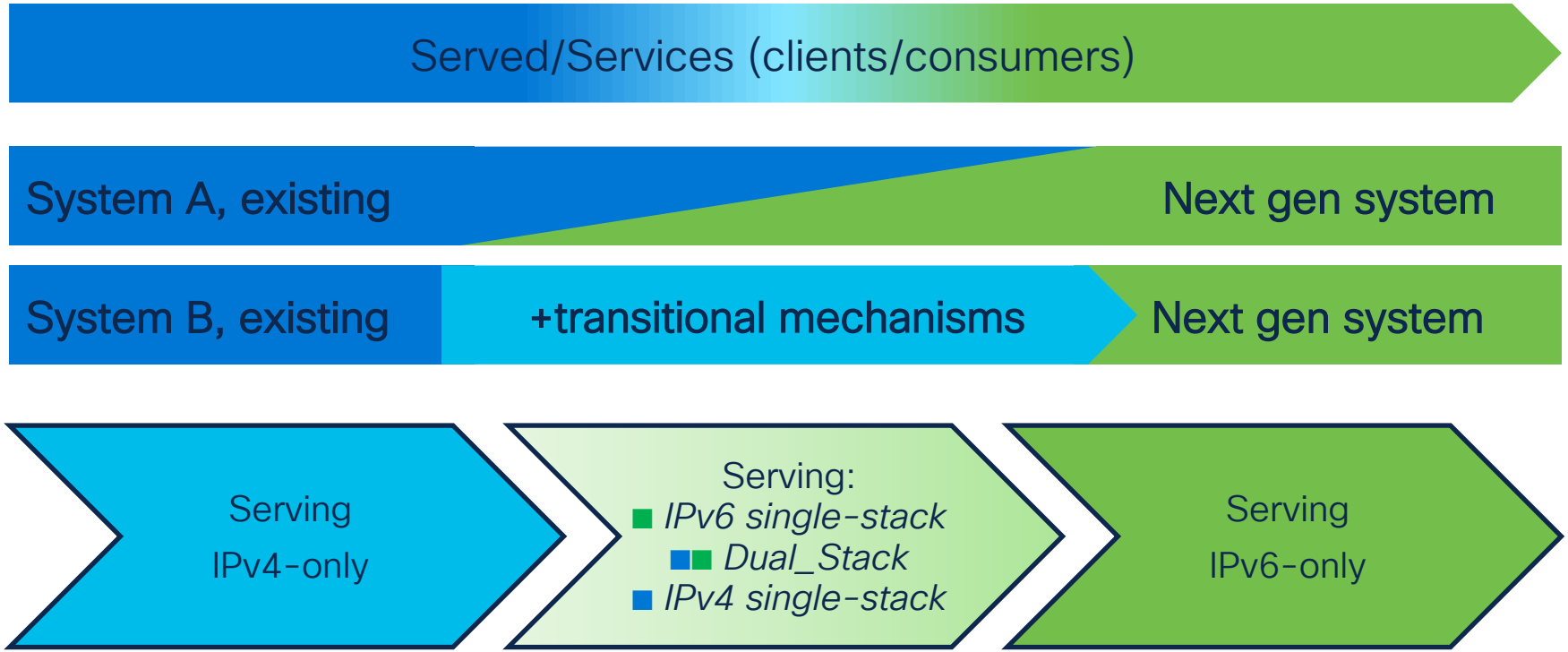
Business, Users, Ops Views



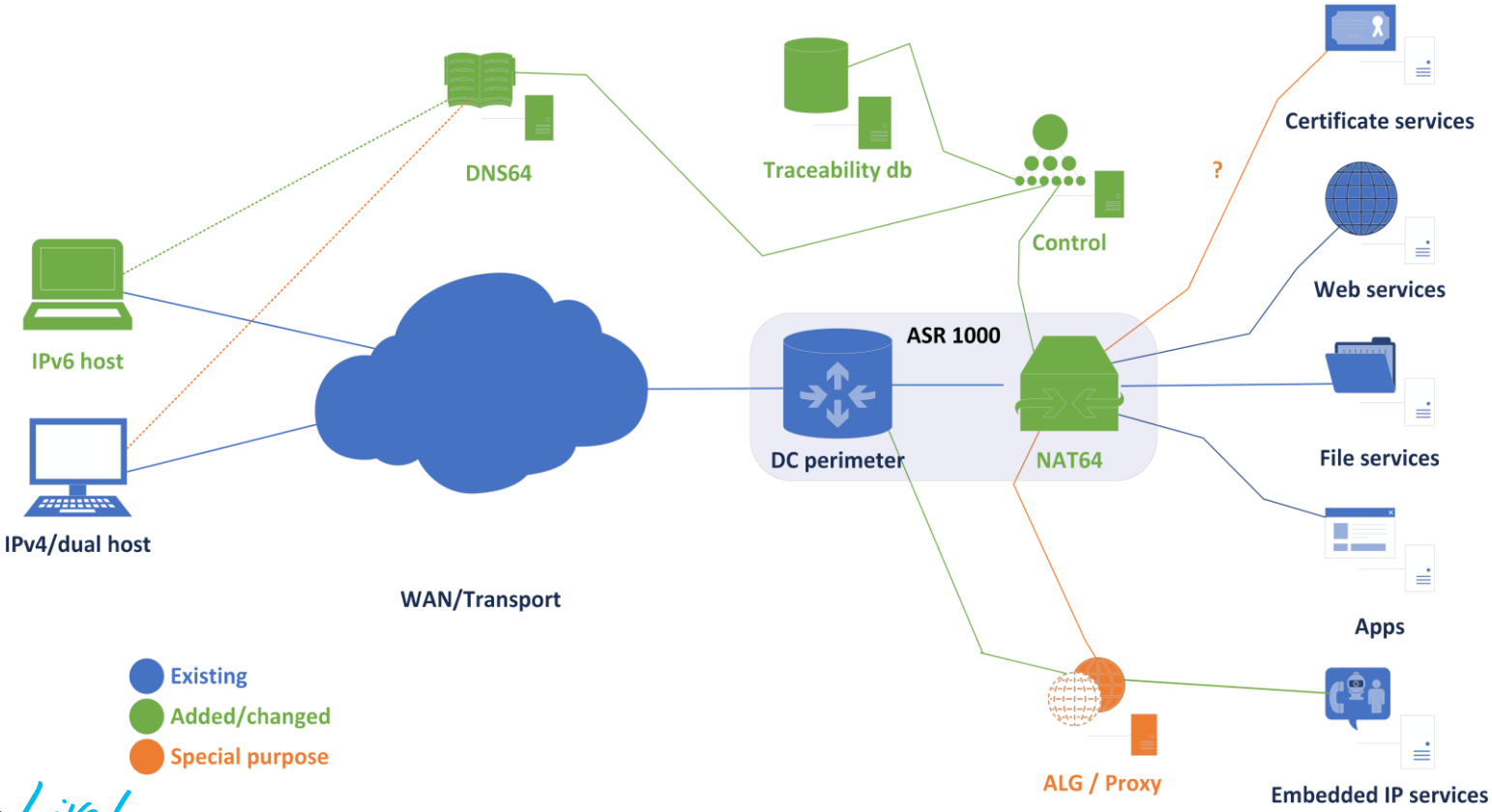
System Transition Methods

1. Transition to next gen system. Dual systems to support transition phase.
   - Example: phase in new cloud-based architecture, then gradually phase out legacy system
   - Legacy may continue to serve IPv4-only. New to serve dual-stacked and IPv6-only
2. Transition to next get system. Augment/upgrade existing to support transition phase.
   - New system comes at end of transition phase, and is IPv6-only
   - Legacy is upgraded or NAT augmented to support both IPv4 and IPv6 during transition phase
3. Current system is future-proof, can serve & function both IPv4 and IPv6

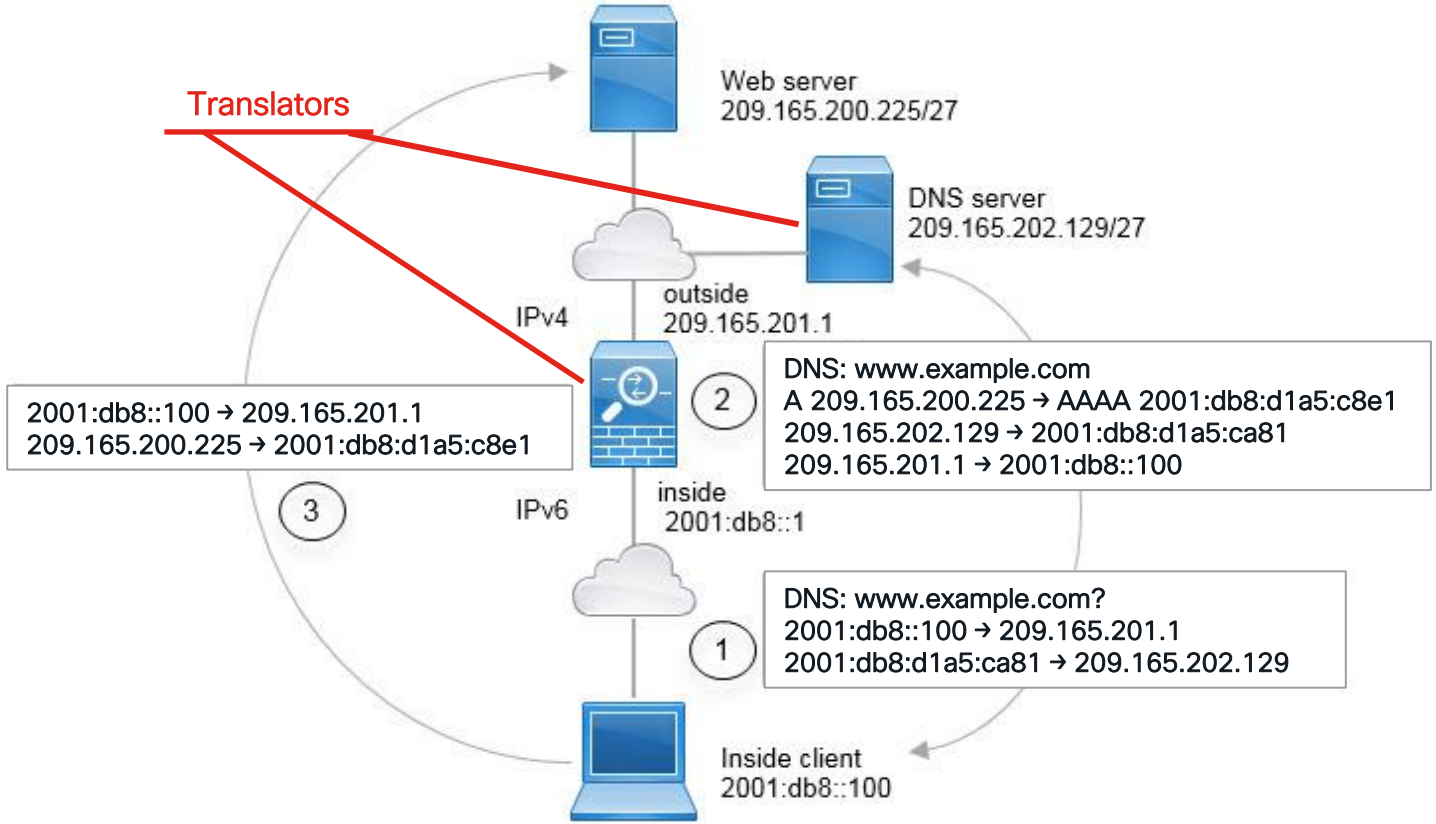
Transition Under Test!



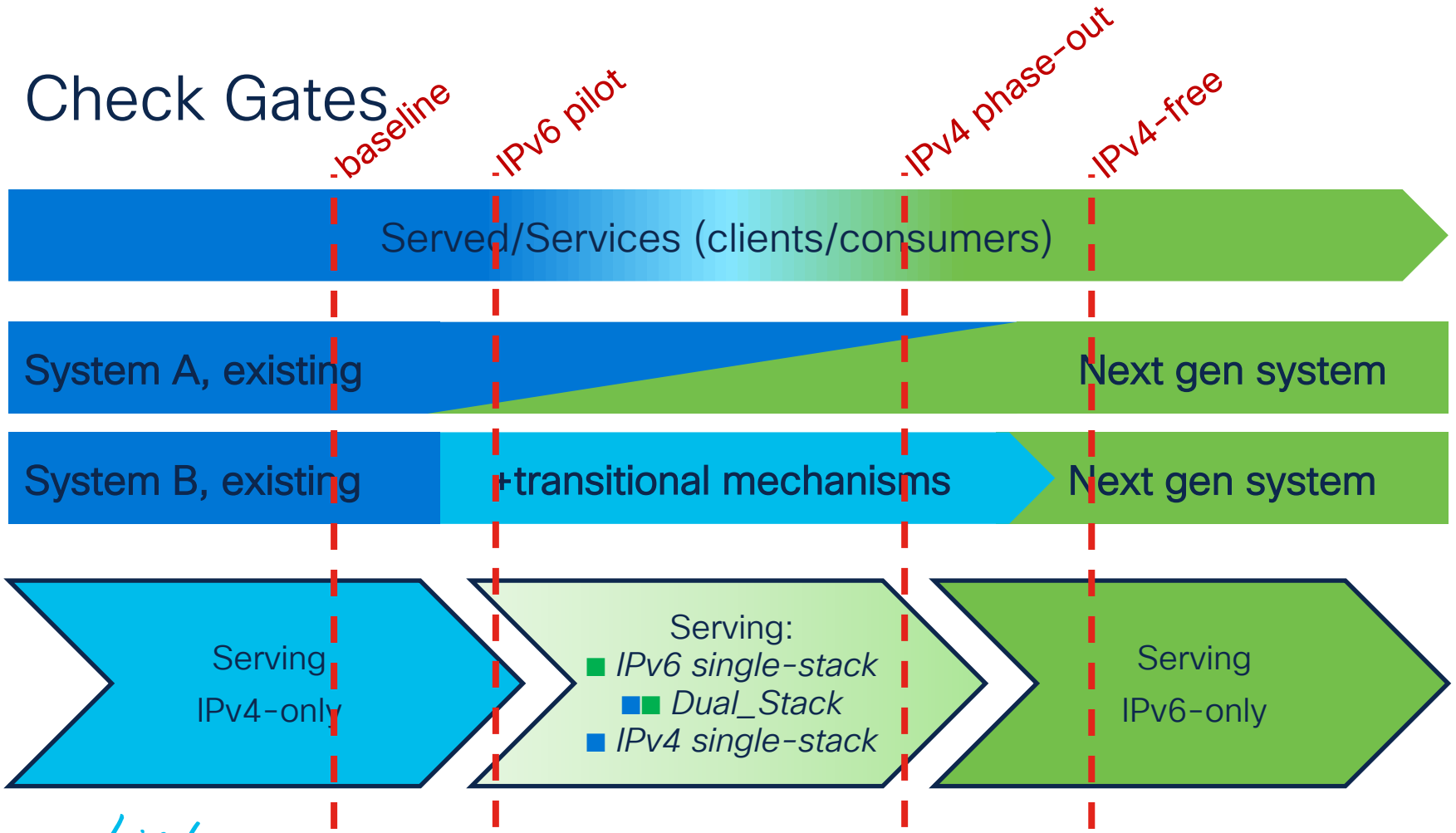
Transitional NAT64, DNS64, ALG's



The DNS64 Game!



Check Gates



Verification & Validation: You need both!

✓Verification

- Testing the system against requirements and specifications
- Using test cases in lab environment
- Example: is ambulance reaching correct destination within time limit?

✓Validation

- Stakeholders sign on satisfactory fulfillment of the business goals
- Through user feedback and business metrics in production pilots
- Example: has patient got reached best care location for the case?, alive and in better/stable condition?

Sources of Trouble

1. Behavioral differences between IPv6 and IPv4:
    1. A host may have several IPv6 addresses, dynamically bind, of different lifetimes, scopes & gateways. Each OS has preferences and choice algorithms
    2. Some protocols and mechanisms are different from IPv4, including address delegation, RA, ND, MTU, MLD
2. IPv6 and IPv4 protocol co-existence:
    1. Ships in the night, mostly.
    2. Except at dual stacked endpoints!
    3. Node performance may significantly vary.
    4. Resiliency may not be same nor equal.
    5. Resources might not be sufficient. Memory, control plane state tables, etc.

Sources of Trouble -Continued

3. IPv6-only, IPv4-only, dual-stacked hosts co-existence:
    1. Using same applications? Probably not! Transitioning between applications based on transition status.
    2. Can they consume group services, equally and collectively? Such as collaboration, conferencing, IPTV
    3. How about 3rd party, Mission Partners, and external services? Cloud/XaaS, real-time, productivity, Data Lakes?
    4. Is QoE improving?
    5. Can we monitor, track, support, lifecycle control?

The Dual Stack (Coexistence) Checklist

- Can it work over IPv6?
- Which IPv6 address?
- Behavior, MTU, path, perf, auth, encryption, monitoring?
- Will it use IPv6 only or both? Consistently? What if, Resiliency, Happy Eyeballs / Fast Fallback apps?
- Control plane load?
- Ops on par with IPv4?
- Management? controlled and guest hosts
- Security: can be traced and dynamically evaluated as a single identity?

Which Addresses?

The host may have choices, at different times and transports!

```
MAMIKHAI-M-D9HK:~ mamikhai$ ifconfig -a inet6
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        options=1203<RXCSUM,TXCSUM,TXSTATUS,SW_TIMESTAMP>
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
        nd6 options=201<PERFORMNUD,DAD>
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
anpi1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        inet6 fe80::7c23:99ff:febe:dcdf%anpi1 prefixlen 64 scopeid 0x4
        nd6 options=201<PERFORMNUD,DAD>
anpi2: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        inet6 fe80::7c23:99ff:febe:dce0%anpi2 prefixlen 64 scopeid 0x5
        nd6 options=201<PERFORMNUD,DAD>
anpi0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        inet6 fe80::7c23:99ff:febe:dcde%anpi0 prefixlen 64 scopeid 0x6
        nd6 options=201<PERFORMNUD,DAD>
..
```

Which Global Addresses?

The host may use to communicate..

```
MAMIKHAI-M-D9HK:~ mamikhai$ ifconfig -a inet6 | grep 'mtu\|inet6.2'
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
anpi1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
anpi2: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
anpi0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
en4: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
en5: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
en6: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
en1: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
en2: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
en3: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
ap1: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        inet6 2600:4040:28b5:9a00:1ce6:1080:361f:3dd3 prefixlen 64 autoconf secured
        inet6 2600:4040:28b5:9a00:bd73:a3fd:3cdc:308f prefixlen 64 autoconf temporary
bridge0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
awdl0: flags=8943<UP,BROADCAST,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
..
```

Which Global Addresses?

-continued

```
..
llw0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
utun0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1380
utun1: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 2000
utun2: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1000
utun3: flags=80d1<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1390
        inet6 2001:420:c0c4:1002::485 prefixlen 128
MAMIKHAI-M-D9HK:~ mamikhai$
```

Which Route/Interface/Tunnel?

The host's choice..

```
MAMIKHAI-M-D9HK:~ mamikhai$ netstat -nr -f inet6
Routing tables
..
Internet6:
Destination                             Gateway                         Flags           Netif Expire
default                                 link#21                         UGCSg           utun3
default                                 fe80::485c:53ff:fe34:5ed8%en0   UGcIg             en0
default                                 fe80::%utun0                    UGcIg           utun0
default                                 fe80::%utun1                    UGcIg           utun1
default                                 fe80::%utun2                    UGcIg           utun2
::1                                     ::1                             UHL               lo0
2001:420:c0c4:1002::485                 link#21                         UHL               lo0
2001:4860:4860::8888                    link#21                         UGHW3Ig         utun3      8
2001:4998:14:800::1000                  link#21                         UGHWIig         utun3
2001:4998:14:800::1001                  link#21                         UGHW3Ig         utun3      !
2001:4998:58:207::6000                  link#21                         UGHWIig         utun3
2600:1402:800::1700:af91/128            fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
2600:1402:800::1700:afa0/128            fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
2600:1402:6800:284::4b36/128            fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
2600:1402:6800:286::753/128             fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
2600:1402:6800:286::4b36/128            fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
2600:1402:6800:288::d42/128             fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
2600:1402:6800:291::753/128             fe80::485c:53ff:fe34:5ed8%en0   UGSc              en0
..
```

Which Route/Interface/Tunnel?

-continued

```
..
2600:4040:28b5:9a00::/64                  link#21                                 UCS             utun3
2600:4040:28b5:9a00:1ce6:1080:361f:3dd3 98:dd:60:34:f6:0                          UHL               lo0
2600:4040:28b5:9a00:bd73:a3fd:3cdc:308f 98:dd:60:34:f6:0                          UHL               lo0
2600:9000:2009:600:1e:9124:6080:93a1/128 fe80::485c:53ff:fe34:5ed8%en0             UGSc             en0
..
2603:1030:20e:3::4/128                    fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
2603:1036:206:14::2/128                   fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
..
2603:10e1:100:2::34bc:8a98/128            fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
2606:2800:11f:17a5:191a:18d5:537:22f9/128 fe80::485c:53ff:fe34:5ed8%en0             UGSc             en0
2606:4700:4400::ac40:9159                 link#21                                 UGHWIig         utun3
..
2620:149:a42:905::c/128                   fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
2620:149:a42:905::10/128                  fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
2620:1ec:21::11/128                       fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
2620:1ec:21::14                           link#21                                 UGHWIig         utun3
2620:1ec:40::41/128                       fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
..
2620:1ec:bdf::57/128                      fe80::485c:53ff:fe34:5ed8%en0           UGSc              en0
2a03:2880:f003:112:face:b00c:0:2          link#21                                 UGHWIig         utun3
fe80::%lo0/64                             fe80::1%lo0                             UcI               lo0
fe80::1%lo0                               link#1                                  UHLI              lo0
..
```

en0 MAC

Connections Over IPv6, IPv4, Mix?

Verify for app, dependencies, services, signaling

```
MAMIKHAI-M-D9HK:~ mamikhai$ netstat -n
Active Internet connections
Proto Recv-Q Send-Q  Local Address          Foreign Address        (state)
tcp4       0      0  10.82.241.32.64750     54.146.179.252.443     ESTABLISHED
tcp6       0     70  2001:420:c0c4:10.64748 2607:f8b0:4004:c.443   ESTABLISHED
tcp6       0      0  2001:420:c0c4:10.64747 2607:f8b0:4004:c.443   ESTABLISHED
..
tcp6       0      0  2001:420:c0c4:10.64735 2607:f8b0:4004:c.5228  ESTABLISHED
tcp4       0      0  10.82.241.32.64733     172.253.63.188.443     FIN_WAIT_2
tcp4       0      0  10.82.241.32.64695     192.111.4.110.443      ESTABLISHED
tcp6       0      0  2600:4040:28b5:9.64694 2603:1036:2404:1.443   ESTABLISHED
tcp6       0      0  2001:420:c0c4:10.64690 2607:f8b0:4004:c.5228  FIN_WAIT_2
..
tcp4       0      0  172.24.12.169.64318    64.207.197.226.4287    ESTABLISHED..
tcp4       0      0  10.82.241.32.50411     1.0.0.1.53             CLOSE_WAIT
tcp4     561      0  172.24.12.169.50097    8.8.8.8.53             ESTABLISHED
..
udp4     576      0  172.24.12.169.58716    23.89.56.135.5004
udp4     576      0  172.24.12.169.56831    170.72.220.135.5004
udp4       0      0  172.24.12.169.64188    8.8.8.8.53
udp4       0      0  10.82.241.32.55801     1.0.0.1.53
..
```

DNS over IPv4

What's the Server is Listening on?

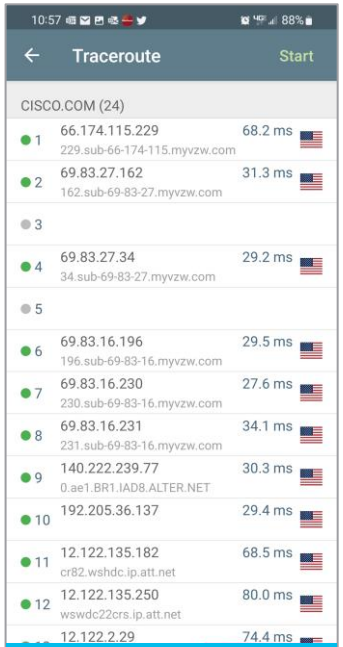
Is it serving/signaled over IPv4, IPv6, or both?

```
MAMIKHAI-M-D9HK:~ mamikhai$ netstat -an | grep LISTEN
tcp4       0      0  127.0.0.1.53           *.*                    LISTEN
tcp4       0      0  127.0.0.1.15310        *.*                    LISTEN
tcp4       0      0  127.0.0.1.631          *.*                    LISTEN
tcp6       0      0  ::1.631                *.*                    LISTEN
tcp4       0      0  127.0.0.1.62722        *.*                    LISTEN
tcp4       0      0  127.0.0.1.60012        *.*                    LISTEN
..
tcp4       0      0  127.0.0.1.29754        *.*                    LISTEN
tcp6       0      0  ::1.17223              *.*                    LISTEN
tcp4       0      0  127.0.0.1.17223        *.*                    LISTEN
tcp4       0      0  127.0.0.1.4244         *.*                    LISTEN
..
tcp6       0      0  *.5000                 *.*                    LISTEN
tcp4       0      0  *.5000                 *.*                    LISTEN
tcp6       0      0  *.7000                 *.*                    LISTEN
tcp4       0      0  *.7000                 *.*                    LISTEN
tcp46      0      0  *.49152                *.*                    LISTEN
tcp4       0      0  *.22                   *.*                    LISTEN
tcp6       0      0  *.22                   *.*                    LISTEN
MAMIKHAI-M-D9HK:~ mamikhai$
```

Mix of Host OS, Including BYOD

Check for different behaviors, preferences. Android example

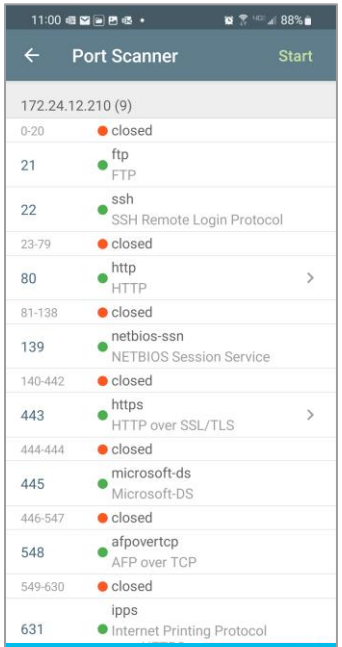
Host addresses on connections



Using IPv4 performance

Using IPv6 initial performance

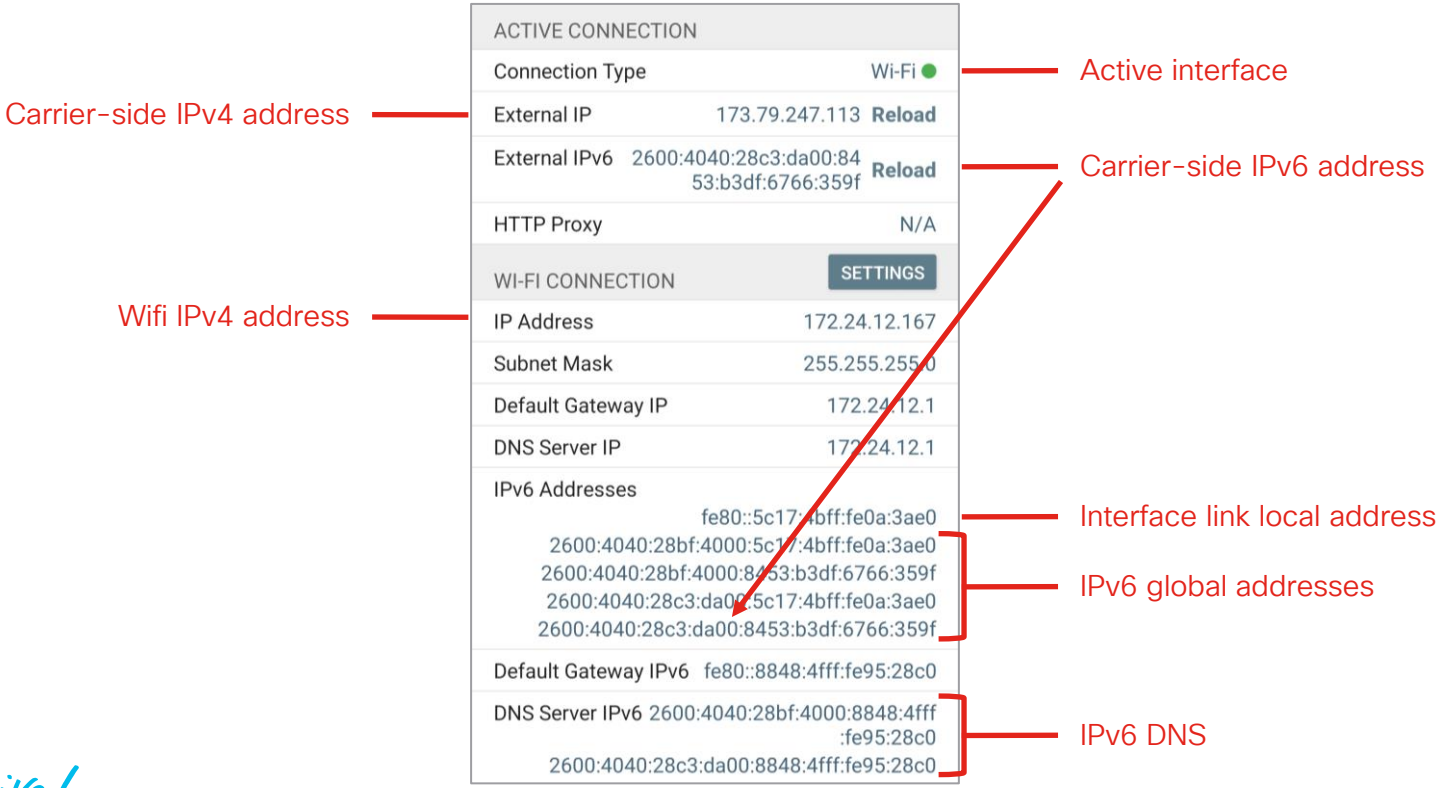
Ongoing stream performance



Server listening services

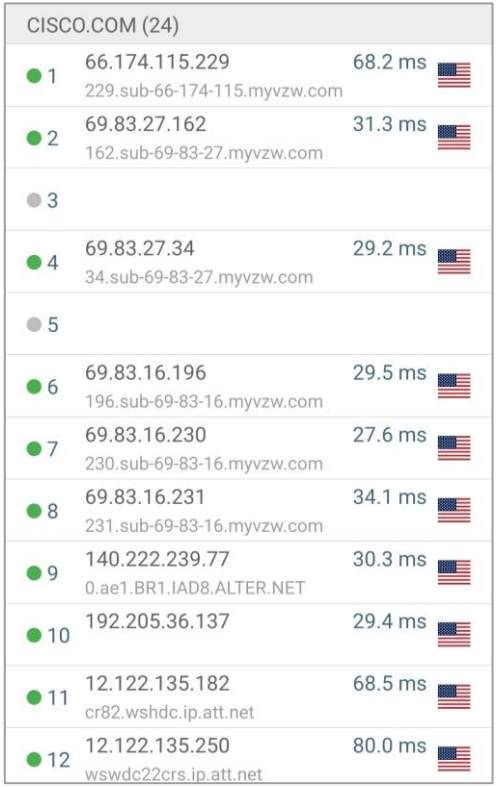
Host Interfaces and Addresses

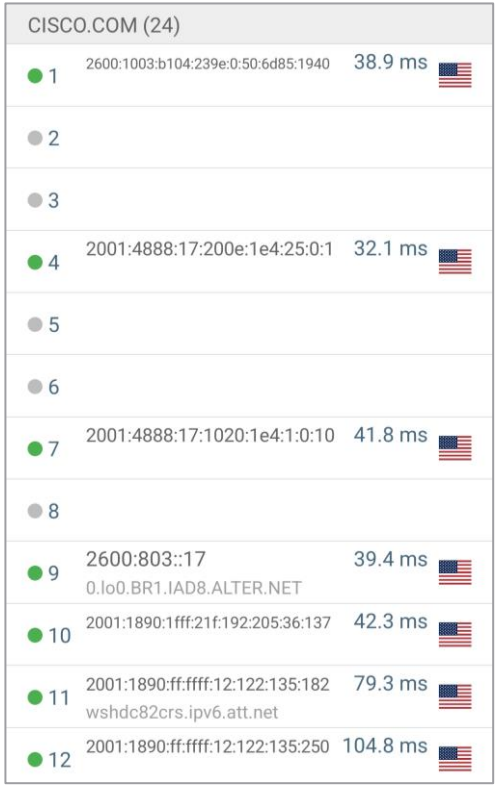
Dynamically changing



Check the Paths and Performance

Use app-specific metrics & tools



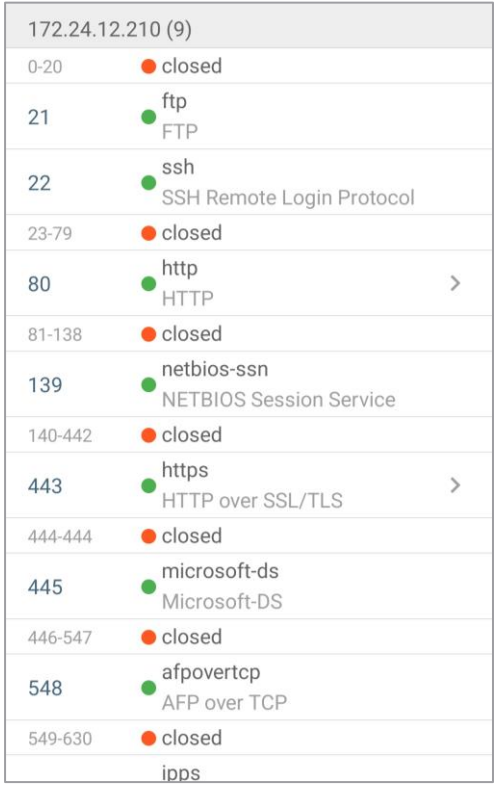


Server Listening Ports

Which ports, which IP version?

- Scan all IP addresses

- ✓ Check listening ports for IPv4 & IPv6
- ✓ Check against security policy & filters
- ✓ Check listening ports
- ✓ Check listening ports for functionality and performance
- ✓ Check listening processes for load & resource consumption



Translation Issues

1. NAT64: Stateless [usually IPv4-only server-side] or stateful? Impact: scale, performance, traceability
2. Server load balancers?
3. Where's NAT64 placed? Impact: path/performance
4. DNS64: DNS responses, client interactions
5. ALG's: Necessary complexity, working deep on protocol specifics

Agenda

- ✓ The Transition Journey
- ✓ Planning for Success
- ➢ Test Plan
- ➢ The Testing Environment
- ➢ Test Cases

Test Plan

Verification Areas

1. Functional: Services, interop, service interfaces.
2. Compliance: Regulatory, certification, constraints.
3. Security: Equivalent or better!
4. Performance: Service rates, user experience, control resources.
5. Operation: Visibility, tools, processes.

- Behavioral differences – 2 sets of protocols – 3 classes of hosts

Sources of Metrics & Pass Criteria

For Verification Testing and deployment Pilots

1. Standards and regulations
   - Applicable per country, industry, stakeholders. Examples: OMB, HIPAA, NIST, GDPR
2. Quality of experience
   - Lab: SLA gains at every stage
   - Pilots: user feedback and evaluation
3. Competition
   - How the industry measures performance? Examples: rate of transactions, session duration
4. Ops metrics
   - Such as rate of case open/resolution.
5. Performance & Ops trends
   - Watch for unexpected negatives

Metrics to cover every user, business, security, compliance requirement!

In all Areas, Account for:

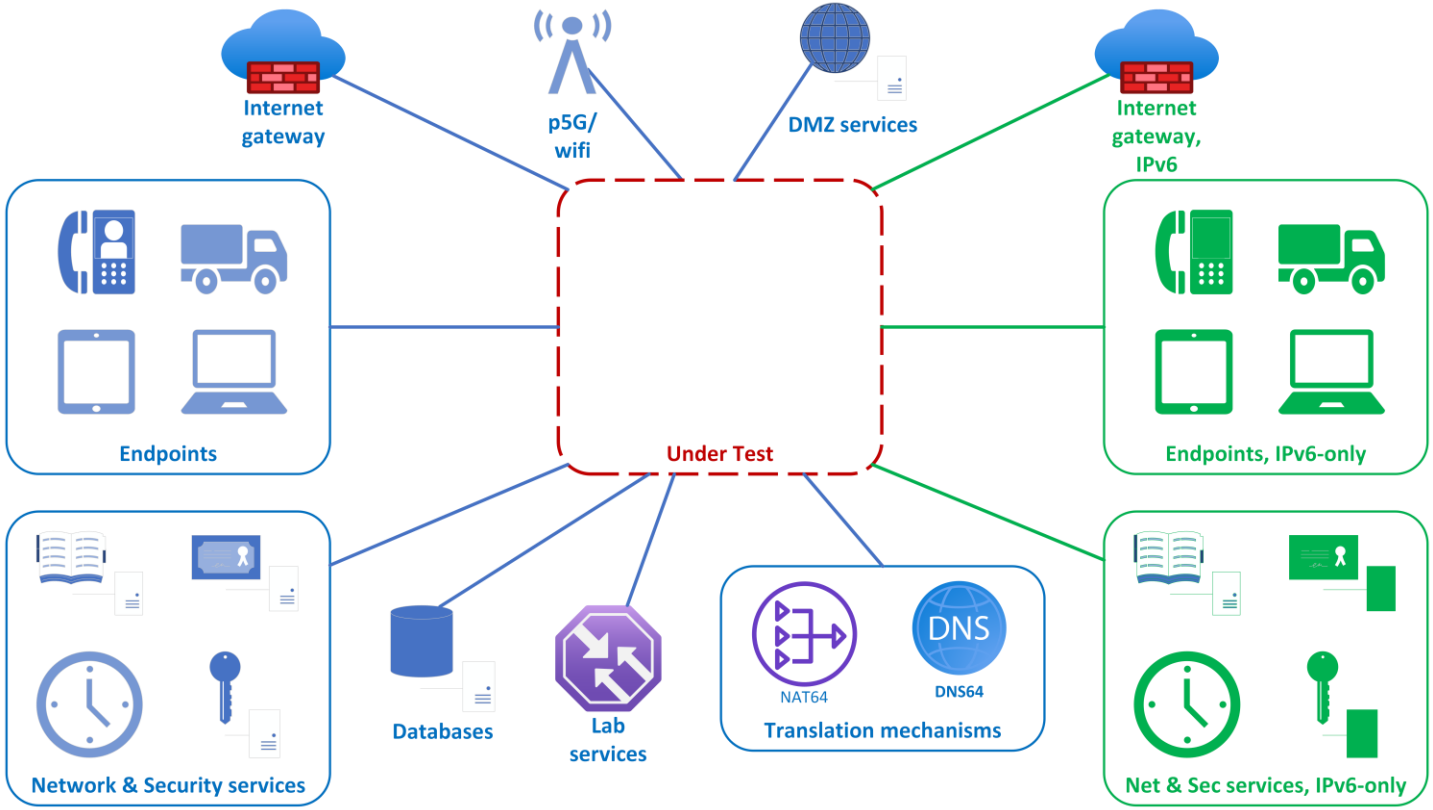
- Behavioral differences: IPv6 & IPv4 have different: structures, protocols, mechanisms, security, mobility, preferences, etc.
- 2 sets of: protocols, perimeters, interfaces, threats, etc.
- 3 classes of hosts: Dual stacked, IPv6-only, IPv4-only, with OS-specific behaviors.

Agenda

- ✓ The Transition Journey
- ✓ Planning for Success
- ✓ Test Plan
- ➢ The Testing Environment
- ➢ Test Cases

The Testing Environment

Effective & Efficient for All Apps



The IPv6 Transition Lab Should..

1. Mimic production environment
2. Include common infrastructure component, network services, and external interfaces
3. Sanitized replicas of databases
4. Facilities for traffic, session, transaction, load, fault simulation
5. Archiving and documentation means
6. Clean up, entry/exit criteria, and procedures
7. Safe from production access, contamination, mix up

Lab Microscopes

1. Firewalls see (and permit/block/reset) every conversation
2. Traffic generator profiles' performance
3. Controllers (responsible for signaling)
4. Host communication stacks
5. Sensors and sniffers

Rule: A device cannot be the judge for its own operation!

Preference: multiple reading points. Example: close to headend & tailend.

Lab Microscopes: Firewalls

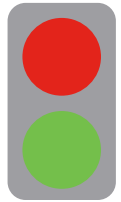
Packet inspection: see, track, count, and sometimes spoof or reset!

```
firepower(config)# show conn all
17 in use, 4005 most used
Cluster:
        fwd connections: 0 in use, 914 most used
        dir connections: 0 in use, 5151 most used
        centralized connections: 5 in use, 2402 most used
        VPN redirect connections: 0 in use, 0 most used
Inspect Snort:
        preserve-connection: 2 enabled, 0 in effect, 1341 most enabled, 0 most in effect

TCP outside  2001:db8:20::4:6781 NP Identity Ifc  2001:db8:30::4:80, idle 0:00:12, bytes 0, flags aAc
TCP outside  2001:db8:20::a:1257 NP Identity Ifc  2001:db8:30::a:80, idle 0:00:16, bytes 0, flags aAc
TCP outside  2001:db8:20::2:44004 NP Identity Ifc  2001:db8:30::2:80, idle 0:00:12, bytes 0, flags aAc
TCP outside  2001:db8:20::a:1258 NP Identity Ifc  2001:db8:30::a:80, idle 0:00:03, bytes 0, flags aAc
OSPF outside ff02::5 inside  fe80::250:56ff:fea3:542d, idle 0:00:06, bytes 34704, flags cN1
OSPF outside 224.0.0.5 inside  112.10.0.1, idle 0:00:03, bytes 73188, flags  N1
UDP cluster  10.10.10.3:49495 NP Identity Ifc  255.255.255.255:49495, idle 0:00:09, bytes 6272630, flags
-
TCP cluster  10.10.10.3:57606 NP Identity Ifc  10.10.10.2:10851, idle 0:00:00, bytes 960, flags UO
TCP cluster  10.10.10.3:56908 NP Identity Ifc  10.10.10.2:10843, idle 0:00:49, bytes 7960, flags UO
UDP cluster  10.10.10.3:49495 NP Identity Ifc  10.10.10.2:49495, idle 0:00:11, bytes 2629772, flags -
TCP cluster  10.10.10.3:9670 NP Identity Ifc  10.10.10.2:49498, idle 0:00:55, bytes 640, flags UO
UDP nlp_int_tap  169.254.1.3:123 NP Identity Ifc  169.254.1.1:65535, idle 0:00:47, bytes 13728, flags -
.
```

Governance & Controls

1. Scheduling, check-in/out controls
2. The “clean” state, clean up routines, reset
3. Entry criteria: Test plan: topology, resources, production replicas, test cases; Transition plan: phases, timeline
4. Exit criteria: Report, archive, logs, re-create capabilities
5. Data handling & safety: Lab data is sanitized, secured; inaccessible & unusable outside

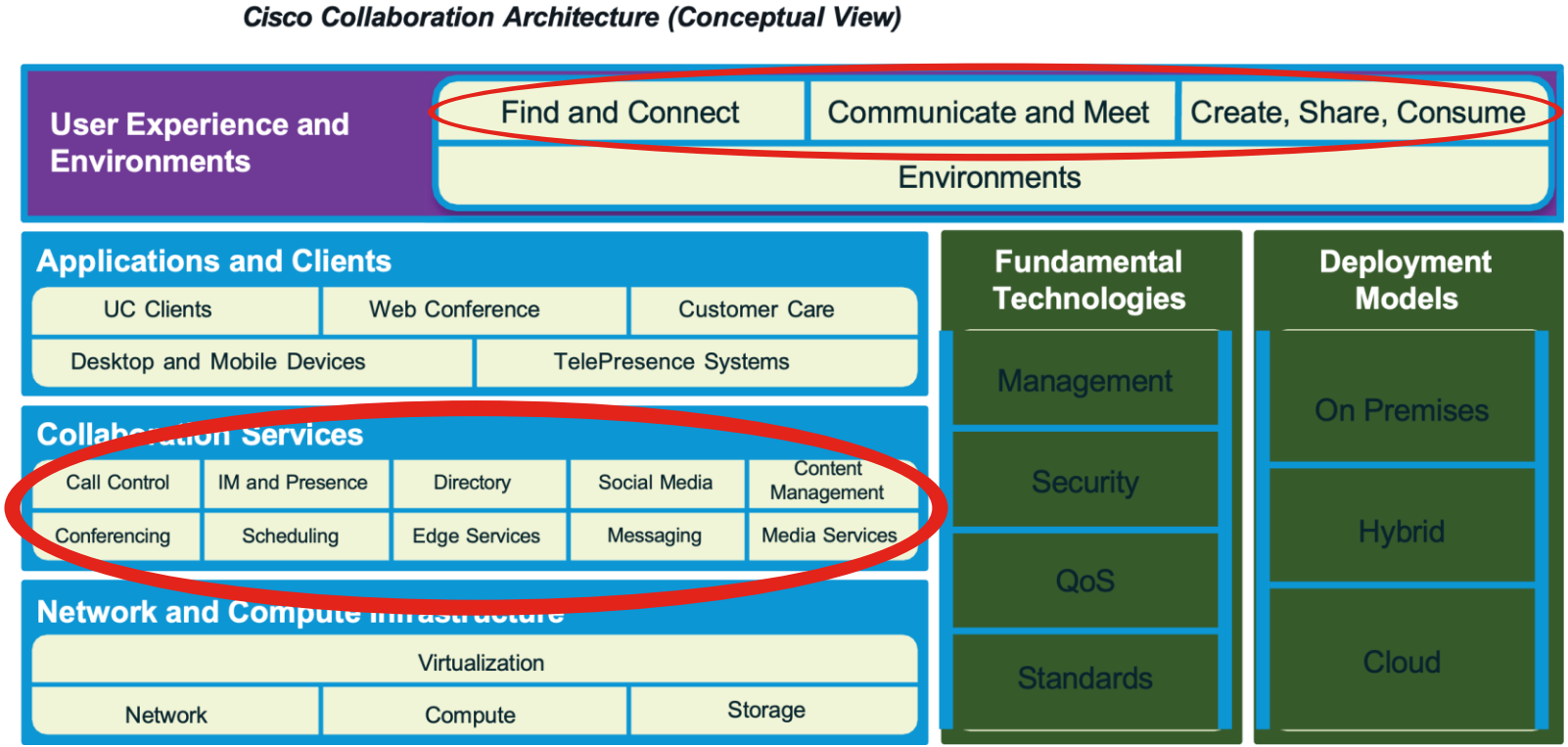


Agenda

- ✓ The Transition Journey
- ✓ Planning for Success
- ✓ Test Plan
- ✓ The Testing Environment
- ➢ Test Cases

Test Cases

Functional: Purpose, Services, Outcomes



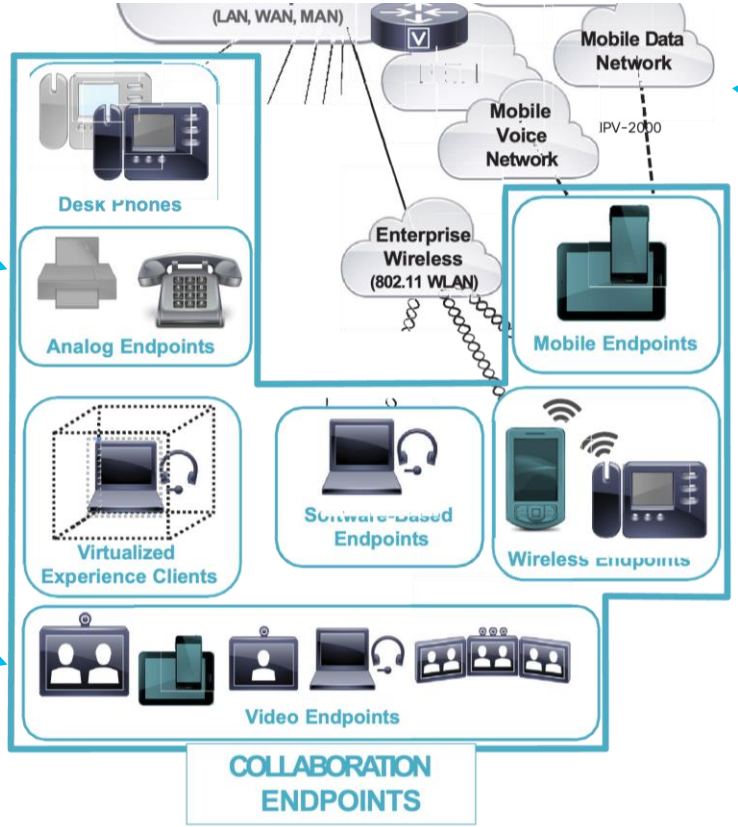
Functional Test Cases

1. **Service availability** to every authorized consumer
2. **Session capacity**: Concurrent session capacity. Example: number of session endpoints, with mix of endpoints in session, to maximum number of concurrent sessions.
3. **System capacity**: Maximum number of …, per location, resource utilization, under different IPv4+IPv6 mixes
4. **Dependencies**: DNS, NTP, PKI, external interfaces. At their transition points on the transition timeline.

Performance: Combinations to Test

OS: preferences, behaviors, policies

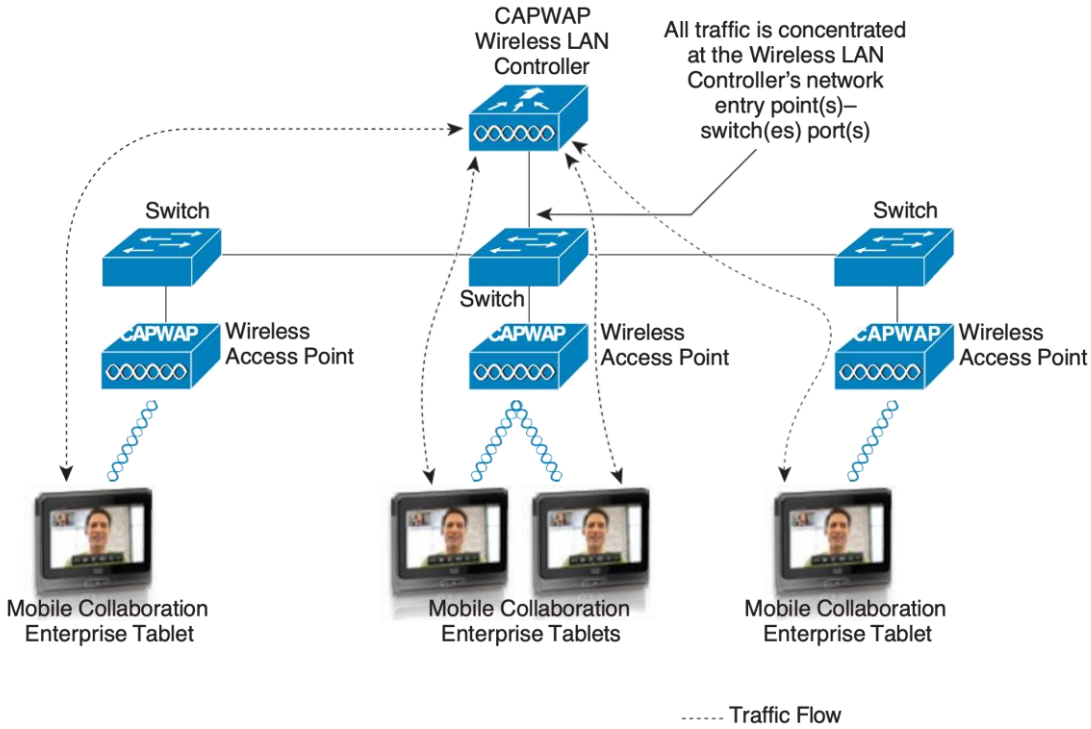
Host controls: Who, how?



Transport modes: Perf, mobility, network & security services

Performance: User Experience

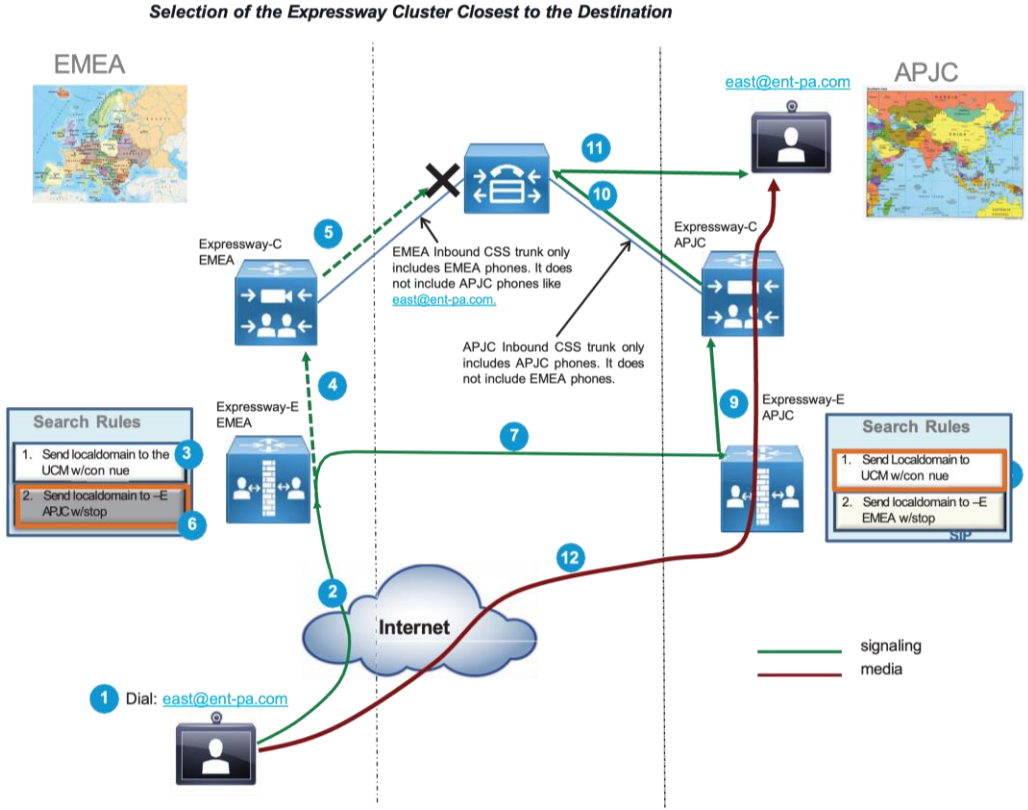
Traffic Concentrated at the Wireless LAN Controller Network Entry Point



Performance Test Cases

1. **Quality of Experience**: substantial improvement along timeline
2. **Engines performance** with protocol mix/coexistence. Response, error handling, capacity, latency, might be different.
3. **Mobility**, teleworking, mode of Transport, can cause performance issues/differences between IPv6 and IPv4 sessions
4. **Encryption / tunneling**: MTU? Translations? Can be performance differentiators!

Performance: Optimum & Consistent?

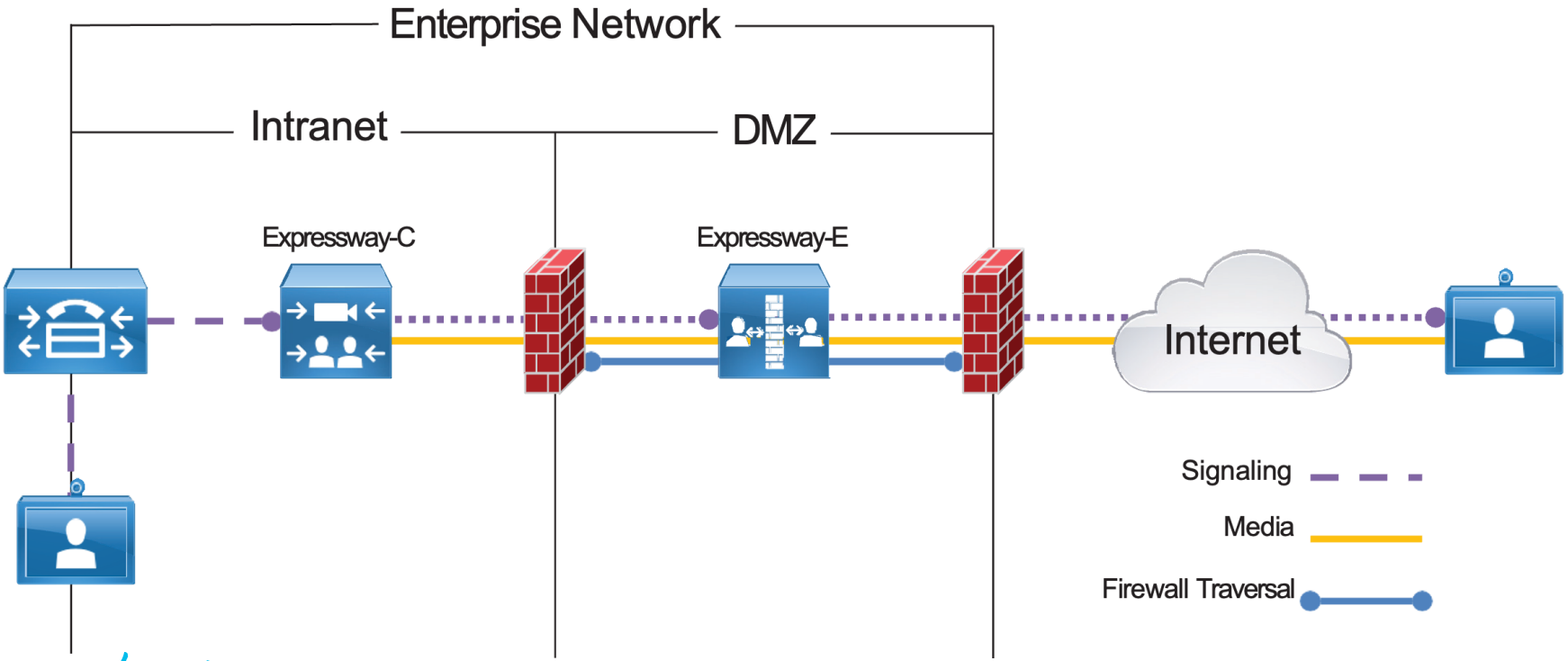


Compliance & Security

1. **Regulatory**: Does the system satisfy/comply with regulatory controls? Examples: HIPAA, GDPR
2. **Certification/testing** required/verified? Examples: NIST FIPS, JITC APL, USGv6, CJIS
3. **Security services**: PKI, IDAM, traceability, non-repudiation
4. **Threat** exposure, & attack surfaces
5. **Anomaly detection**
6. **Incident handling**

Security: Segmented Paths & Controls

Firewall Traversal in a Dual-Interface Deployment



Control & Signaling Test Cases

1. **Signaling**: Is all signaling possible in IPv6-only?
2. **Control plane**: Can control planes, state tables, handle coexistence loads up to capacity?
3. **Protection**: Control protections/exposures in dual stack environment

Ops Test Cases

1. **Visibility**: Do we effectively monitor dual protocol environment?
2. **Provision, change,** for IPv6 on par with IPv4
3. **Processes**: Reporting and handling of IPv6 and dual-stack cases
4. **Self service**: Improved user self serve and lifecycle experience
5. **Support**: Can we troubleshoot effectively and efficiently?

Conclusion

Conclusion

1. Prove the benefits. It is an upgrade!
2. Test thoroughly before any and every change!
3. Coexistence phase is expensive and risky!
4. Transition is a path to next gen systems.
5. It is a journey into the future, so keep up to date.
6. Testing = Plan + Test env + Test cases

Agenda

- ✓ The Transition Journey
- ✓ Planning for Success
- ✓ Test Plan
- ✓ The Testing Environment
- ✓ Test Cases

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

IPv6

Deploying and Securing IPv6

You have either deployed IPv6 or are thinking about deploying it.
Those sessions aim to increase your knowledge of IPV6 and its security.

START

June 13 | 8:00 a.m.
BRKIPV-2000
Verifying your Systems Transition to IPv6

June 13 | 2:30 p.m.
BRKENT-2109
Let's Deploy IPv6 NOW

June 14 | 10:30 a.m.
IBOIPV-2000
Sharing Experience on IPv6 Deployments in Enterprise

June 14 | 2:30 p.m.
BRKENT-1616
IPv6 - What Do You Mean There Isn't a Broadcast?

June 13 | 1:00 p.m.
BRKSEC-2044
Secure Operations for an IPv6 Network

June 14 | 4:00 p.m.
BRKENT-3002
IPv6 Security in the Local Area with First Hop Security

FINISH

June 14 | 1:00 p.m.
BRKENT-2122
IPv6 - Powering the World of IoT

If you are unable to attend a live session, you can watch it On Demand after the event.

cisco Live!

IPv6

IPv6 and Wireless

IPv6 over wireless is not exactly the same as IPv6 over a switched infrastructure. Learn how Meraki wired and wireless can simplify the deployment.

START

June 14 | 1:00 p.m.

BRKIPV-1752

Experience the Journey to IPv6-Only With Cisco Meraki

June 15 | 2:30 p.m.

IBOIPV-2001

Let's Discuss the IPv6 Implementation of Meraki

June 15 | 4:00 p.m.

BRKIVP-2751

Cisco Routing Meraki Access with IPv6 (CRMAv6) - A Practical Guide

June 15 | 4:00 p.m.

CSSGEN-2000

Migrating a Large Cisco Enterprise Wireless Network to IPv6 by Facebook

FINISH

On Demand

BRKENS-2834

IPv6 Enabled Software Defined Wireless Access- Design, Deploy and Troubleshoot

If you are unable to attend a live session, you can watch it On Demand after the event.

cisco Live!

Cisco Learning and Certifications

From technology training and team development to Cisco certifications and learning plans, let us help you empower your business and career. www.cisco.com/go/certs

Pay for Learning with Cisco Learning Credits

(CLCs) are prepaid training vouchers redeemed directly with Cisco.

Learn

Cisco U.
IT learning hub that guides teams and learners toward their goals

Cisco Digital Learning
Subscription-based product, technology, and certification training

Cisco Modeling Labs
Network simulation platform for design, testing, and troubleshooting

Cisco Learning Network
Resource community portal for certifications and learning

Train

Cisco Training Bootcamps
Intensive team & individual automation and technology training programs

Cisco Learning Partner Program
Authorized training partners supporting Cisco technology and career certifications

Cisco Instructor-led and Virtual Instructor-led training
Accelerated curriculum of product, technology, and certification courses

Certify

Cisco Certifications and Specialist Certifications
Award-winning certification program empowers students and IT Professionals to advance their technical careers

Cisco Guided Study Groups
180-day certification prep program with learning and support

Cisco Continuing Education Program
Recertification training options for Cisco certified individuals

Here at the event? Visit us at **The Learning and Certifications lounge at the World of Solutions**

Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer 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

cisco Live!

Thank you


cisco Live!
ALL IN