

April 21, 2022

Designing Next Generation Campus Environments with AOS 10

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aruba

a Hewlett Packard
Enterprise company



Welcome! Housekeeping.



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- All lines are muted during the webinar

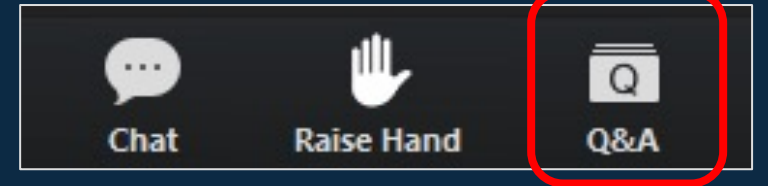


- Ask *questions* by selecting "Q&A" and to report any webinar difficulties



- Webinar is being recorded & will be emailed to all attendees

TO ASK
QUESTIONS



Partner Technical Webinar Series

Aruba AOS 10 Technical Deep Dive

Session 1: Designing Next Generation Campuses with ArubaOS 10

Thu, April 21st, 2022, 11:00 AM - 12:00 AM CET

Session 2: AOS10 Services Deep Dive

Thu, May 5th, 2022, 11:00 AM - 12:00 AM CET ([click here to register](#))

Session 3: Micro Branch Deep Dive

Mon, May 19th, 2022, 11:00 AM - 12:00 AM CET ([click here to register](#))

Session 4: Exploring Aruba SD-Branch with AOS10

Mon, June 2nd, 2022, 11:00 AM - 12:00 AM CET ([click here to register](#))



Agenda

- Groups, Sites & Labels
- Forwarding Modes & Roaming
- Gateways
- Q&A
- Useful Resources



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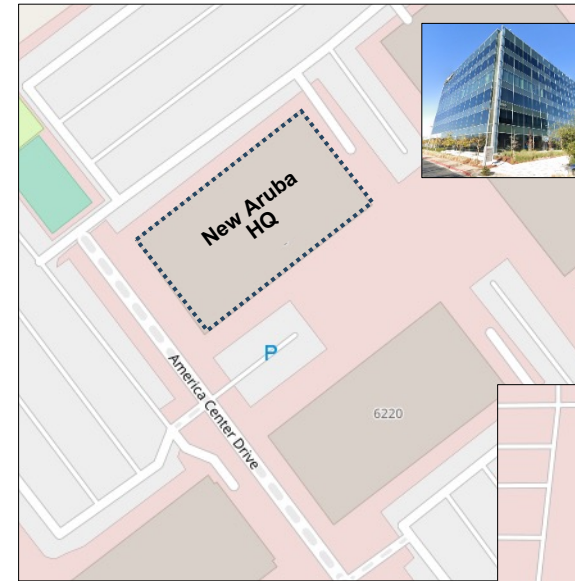


What is a Campus?

- A campus can be many things depending on your perspective and the size of your organization:
 - Single Building
 - Co-Located Buildings
 - Distributed Buildings within a common geographic location
- How you organize devices in a campus within the cloud platform will either simplify or complicate operations
 - Both configuration and monitoring requires some thought and planning



Single Building



Co-Located Buildings



Distributed Buildings



Day 0 Considerations

Configuration Groups

- How to achieve your desired WLAN configuration while balancing ease of implementation and operations

Sites

- How to achieve the desired resolution for surfacing issues while minimizing time to resolution

Labels

- Other tools for defining macro monitoring containers



What are Configuration Groups?

- Are primary containers for AP & Gateway configuration
 - Used to apply common configurations to groups of managed devices
 - Devices inherit their configuration from their assigned group
- Can also be used for monitoring and maintenance & reporting
- Are device and model agnostic
 - Groups can consist of APs, Gateways or Switches (any combination)
 - May support different models of devices
- Can be assigned a persona that influences the available configuration options and feature operation

Configuration

- APs / Switches / Gateways
- Security
- SD-WAN Overlays / Virtual Gateways / Cloud Connect

Firmware

- Compliance
- Upgrades

Monitoring

- Applications / Security / Network Services
- Alerts / Notifications
- Audit Trail
- Devices / Clients

Reporting

- Clients
- Infrastructure
- Security
- Applications

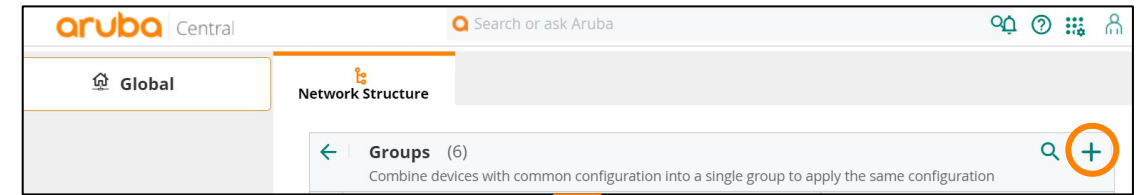
User Management

- Accounts
- Roles
- Permissions



AOS 10 Configuration Groups

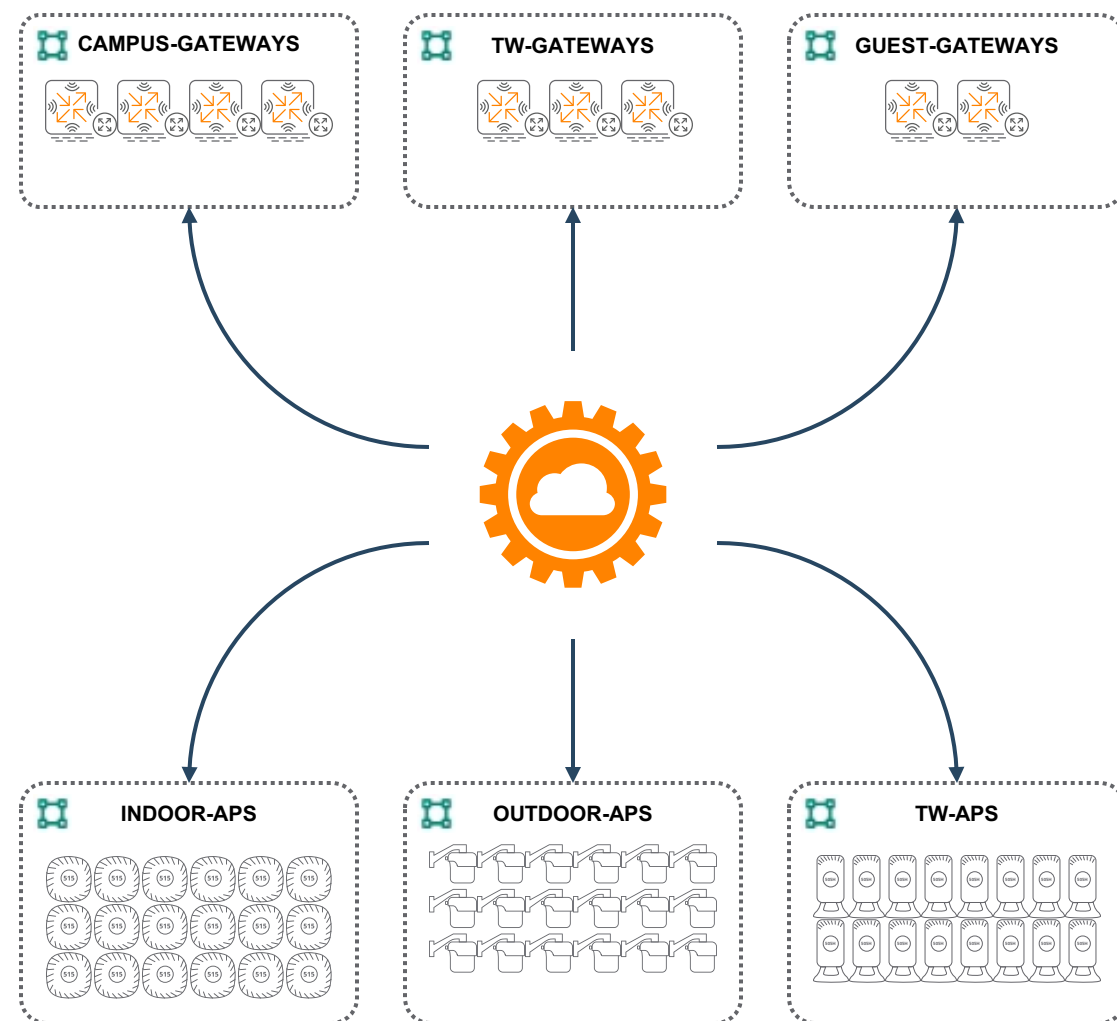
- AOS 10 APs and Gateways must be assigned to AOS 10 Groups
 - Conversion is performed per group (see graphic)
 - Can contain both APs and Gateways
 - Can be used by Gateways for Auto-Clustering
 - Conversion is a one-way process
- UI only groups for AOS 10 devices
 - Template groups are not recommended due to how configurations are orchestrated between APs and Gateways

A screenshot of the 'Add Group' form in the Aruba Central interface. The form has a title 'Add Group' and a back arrow. Below the title, there is a 'Name' field with the value 'CampusAPs'. A toggle switch for 'Use preferred group settings' is shown, with an orange circle highlighting it. Below this, there is a section 'Group will contain:' with three checkboxes: 'Access points' (checked), 'Gateways' (unchecked), and 'Switches' (unchecked). At the bottom, there is a section 'Configure using templates' with a toggle switch and a description: 'Enable this option to use scripts/templates instead of device configuration pages.' At the bottom right, there are 'Cancel' and 'Next' buttons.A screenshot of the 'Add Group' form in the Aruba Central interface, showing the 'Architecture for access points and gateways in this group:' section. There are two radio button options: 'ArubaOS 10' (selected) and 'ArubaOS 8' (unselected). Below this, there is a section 'Network role of the access points in this group:' with two radio button options: 'Campus/Branch' (selected) and 'Microbranch' (unselected). At the bottom, there is a checkbox 'Make these the preferred group settings' and 'Cancel' and 'Add' buttons.

AOS 10 Group Guidelines

Recommendations....

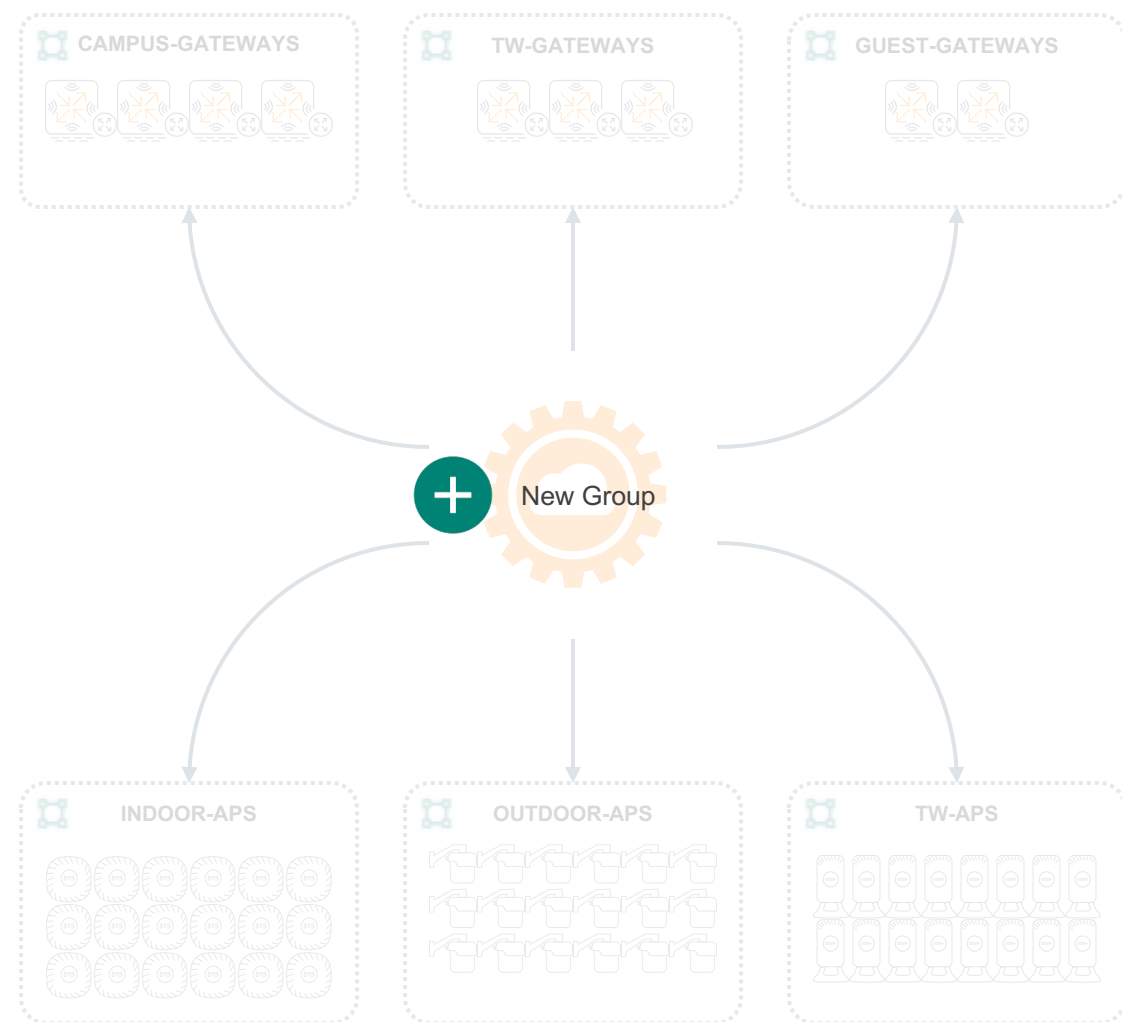
- The general rule of thumb is to create as few configuration groups as possible:
 - Each configuration group is its own island. The fewer the groups, the easier your day-to-day operations will be
 - While cloning groups is tempting, its not currently available for AP groups with tunneled or mixed WLANs
- Avoid creating configuration groups per building / site
 - Moves, adds and changes will need to be duplicated $N \times$ times



AOS 10 Group Guidelines

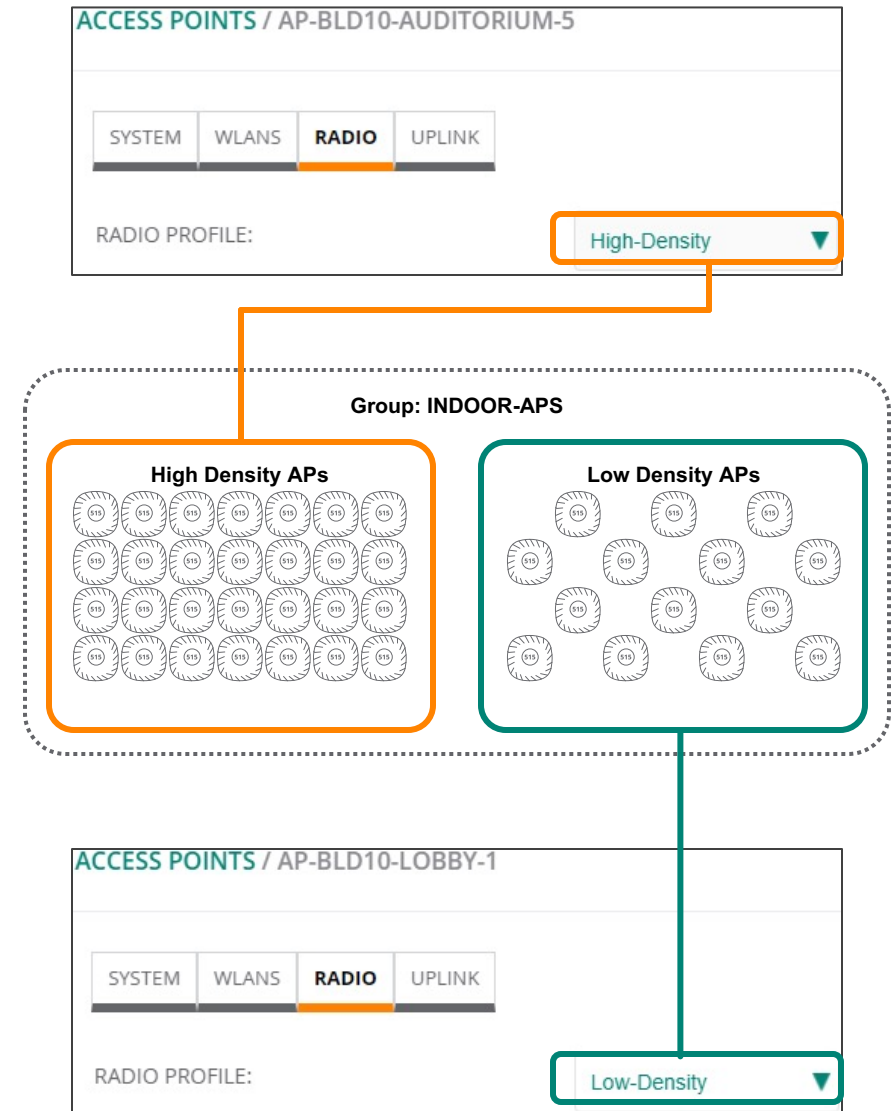
When to create....

- To accommodate configuration variances between buildings when overrides are not practical
 - Published WLANs, PSKs, RF Profiles etc.
- If your campus deployment includes Gateways of different personas
 - Campus, Guest, Headend etc.
- To separate managed devices by function and deployment type
 - Indoor APs, Remote APs etc.
 - Core, Aggregation, Access etc.
- If APs are owned by different departments or your IT team is distributed
- Testing and validating new configurations on a subset of APs



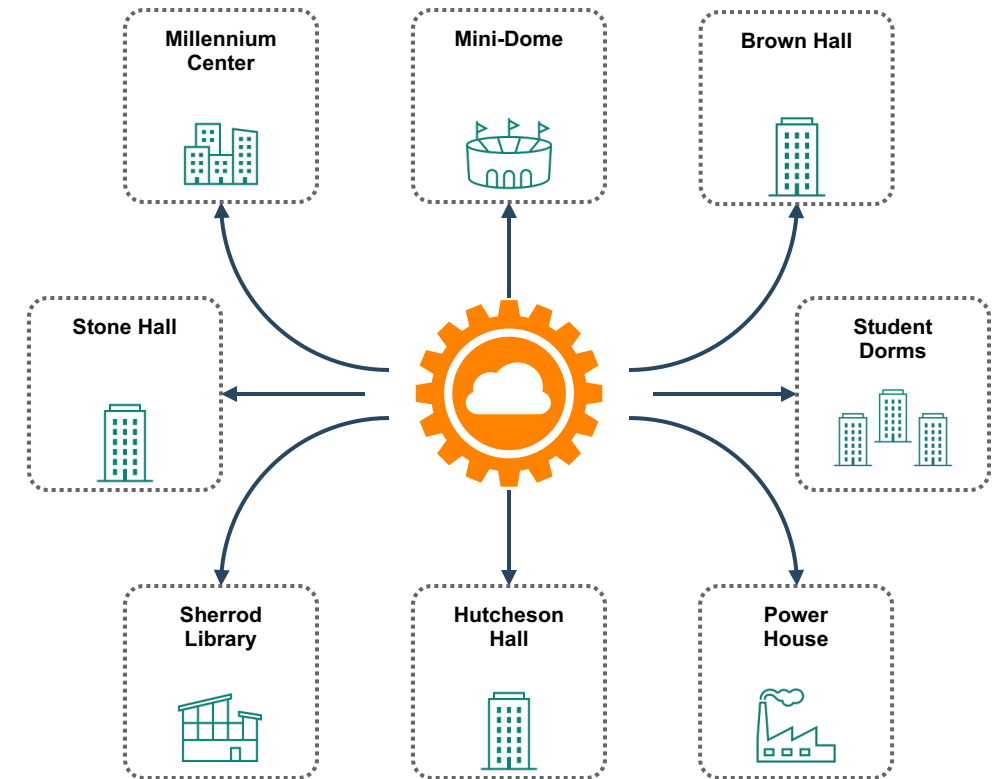
Per AP Overrides

- Additional configuration groups may not always be required:
 - For example, we offer per AP overrides for Radio Profile and WLAN Profile assignments in addition to applying other device specific configurations
- Per AP overrides provide flexibility but should be used cautiously
- Additional optimizations are coming



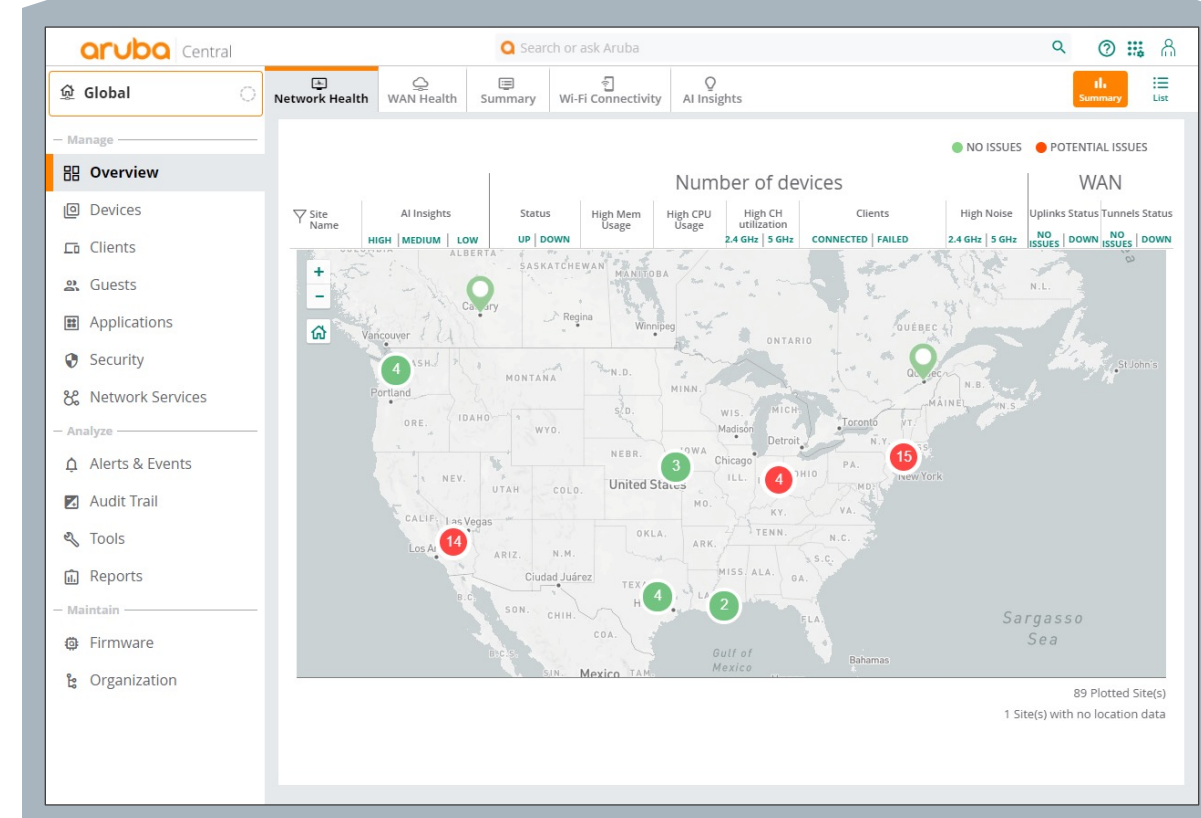
What are Sites?

- A container where a set of managed devices are physically installed
 - Can contain APs, Gateways and Switches
 - Single building, Co-located buildings or logical grouping of buildings
- Strongly recommended for campus deployments:
 - Used monitoring today
 - Will be used for other applications in future releases (stay tuned)
- Defines the resolution of alerts, events and AI Insights
 - More Buildings / Site = Lower Resolution



Why should I care about Sites?

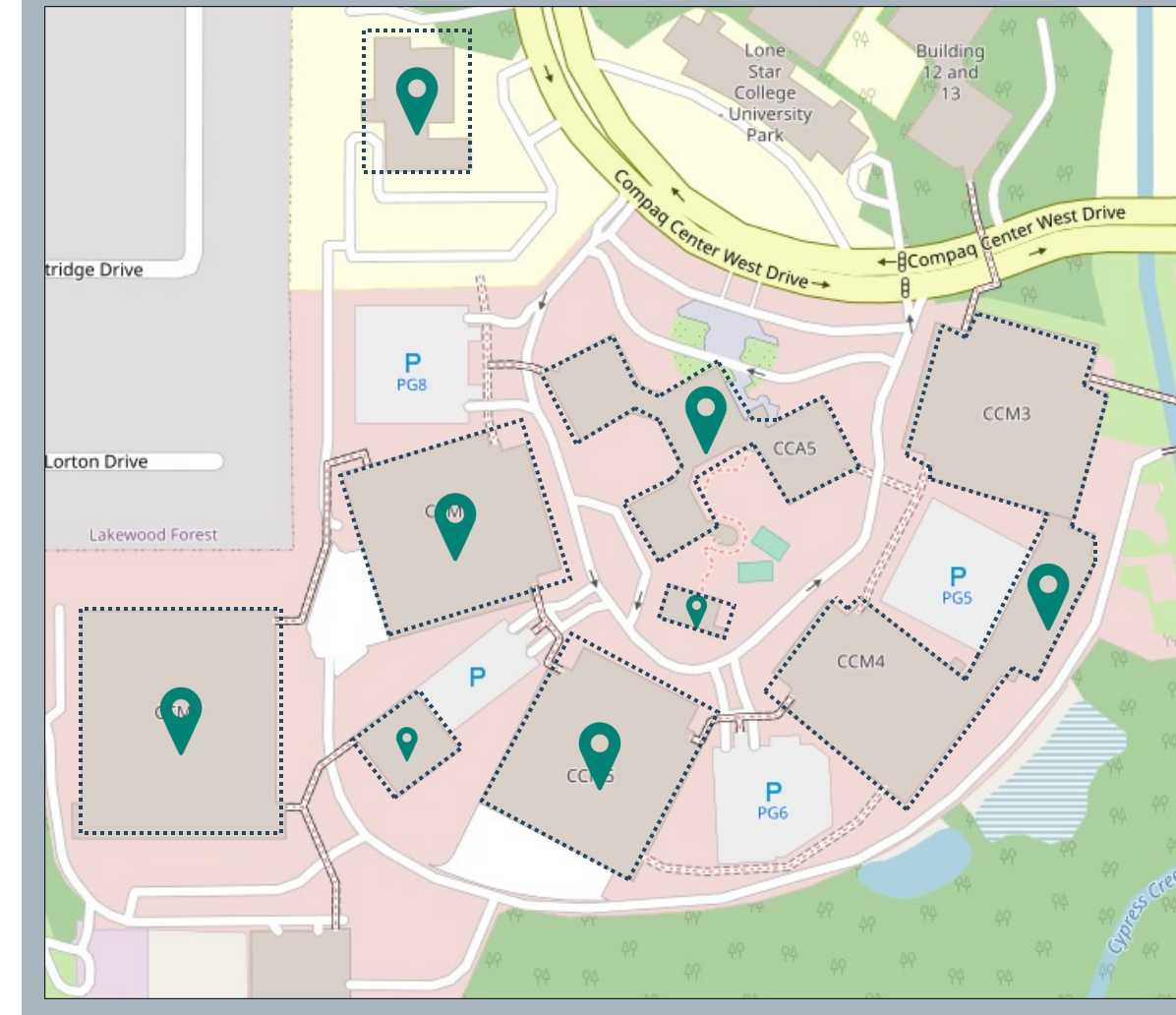
- Ties your managed devices to a physical location
 - Network Health, AI Insights & Topology
- Provides a ready-made container for monitoring
 - Offers more granularity & resolution than configuration groups
 - Provides performance baselining between sites
- Can be used for Auto-Clustering for distributed Gateway deployments
- In the future, will enable new ways to streamline configuration



Building > Site Mappings

There is no right or wrong answer, but I recommend creating sites for:

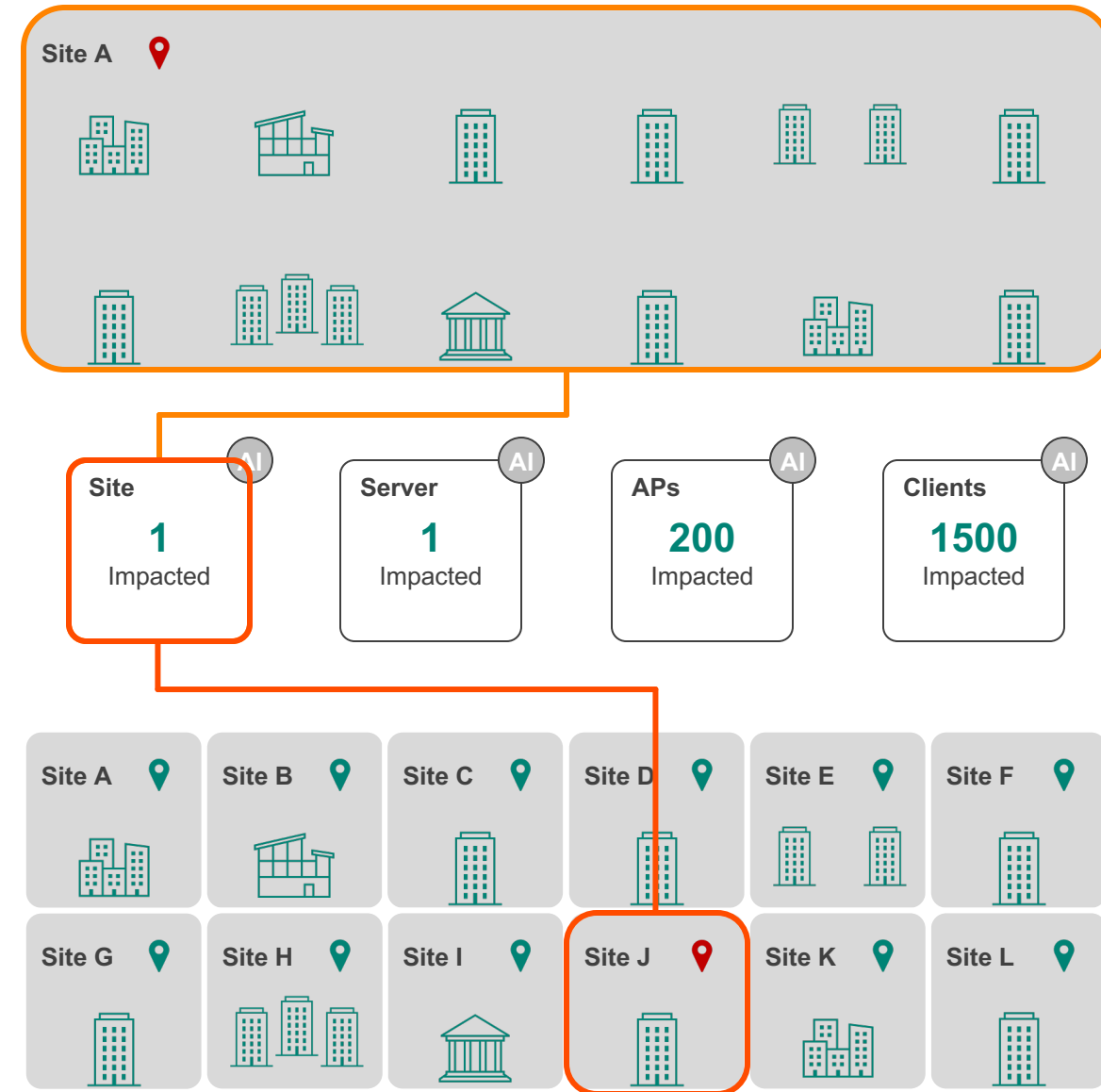
- Standalone or isolated buildings
- Logical groupings of buildings with contagious RF coverage areas
- Buildings in roaming domains with a common set of hardware
- Buildings with institutional names
- Buildings separated by physical or environmental obstacles
- Outdoor coverage areas



Why not per Campus?

- Alerts, events and AI Insights are aggregated
 - Global, Group or Site
- The more buildings you place into a single site, the harder it is to identify and isolate faults and issues!
 - The wider the scope, the lower the resolution

Example 1 – Single Site / Campus



Example 2 – Multiple Sites / Campus



What are Labels?

- Flexible containers for monitoring and reporting purposes
 - Arbitrary labels that are assigned to devices as needed
 - Maximum 5 labels / device
- Are extremely useful when monitoring and reporting is required for logical sets of devices within your campus
 - For example, Indoor APs, Outdoor APs and Dormitory APs
- Can be assigned ad-hock for alerts and events
 - For example, monitor critical areas within buildings

	Groups	Sites	Labels
AI Insights	No	Yes	No
Configuration	Yes	No	No
Events & Alerts	Yes	Yes	Yes
Monitoring	Yes	Yes	Yes
Reporting	Yes	Yes	Yes

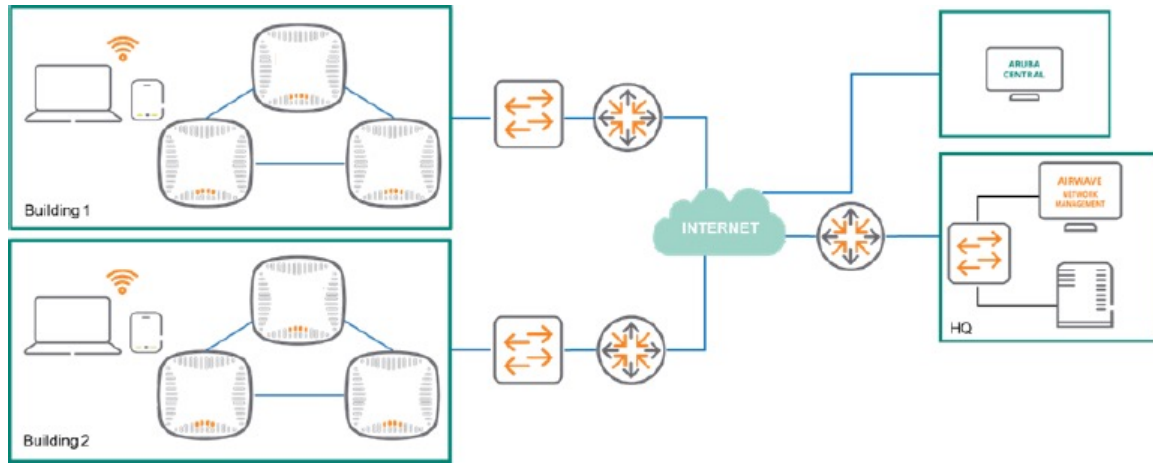


Agenda

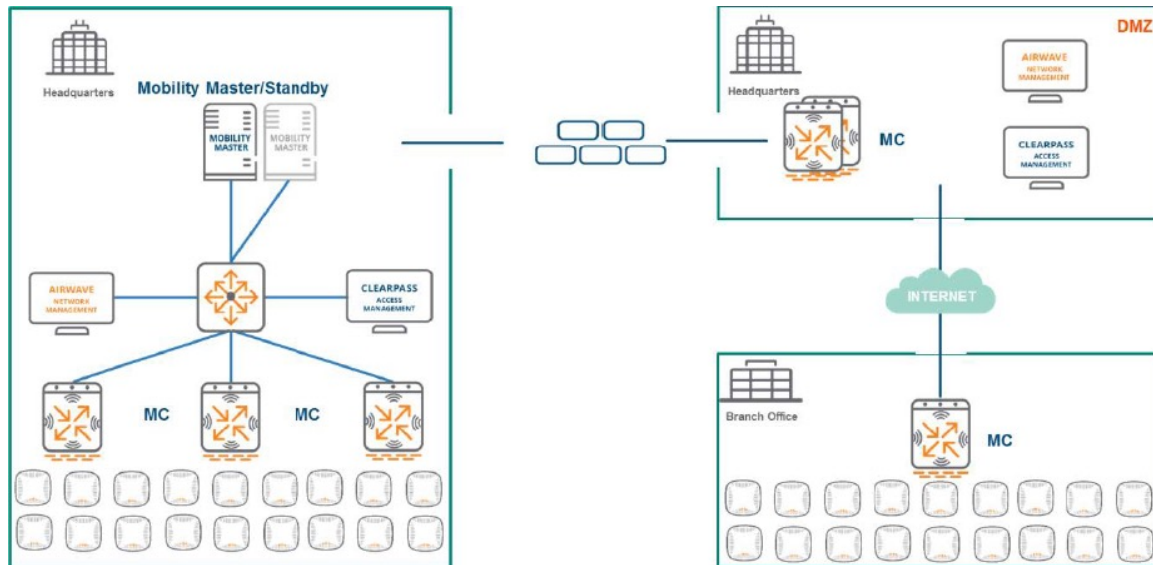
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- Q&A
- Useful Resources



Aruba Controllerless – Local Bridging



Aruba Controller-Based – Overlay Tunnels



Forwarding Modes

With AOS 6 & AOS 8, the AP forwarding mode was tightly coupled to the architecture

Controllerless:

- Management / Control provided by Airwave or Central
- All wireless user traffic was locally bridged by the AP

Controller-Based:

- Management / Control provided by a Mobility Conductor
- Wireless user traffic is encapsulated and forwarded to a Mobility Controller
- Bridging for specific use cases



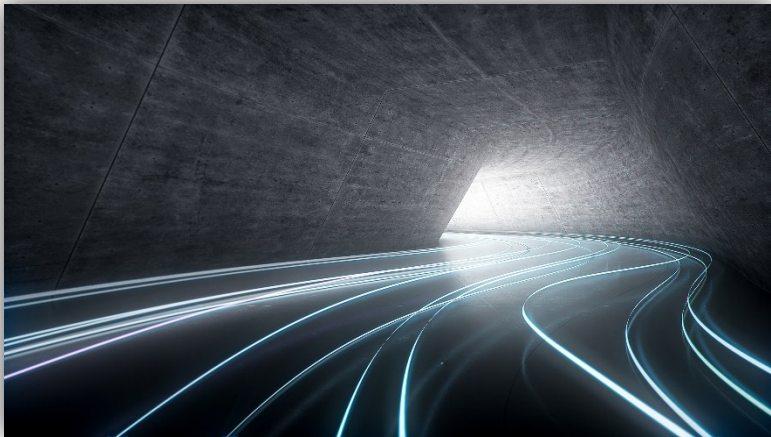
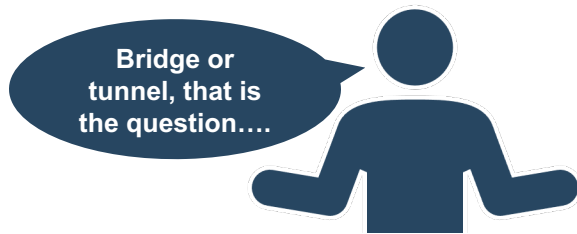
The image displays three overlapping screenshots of the 'CREATE A NEW NETWORK' configuration page in AOS 10, specifically the 'VLANs' tab. The page is divided into five sections: General, VLANs, Security, Access, and Summary. The 'VLANs' tab is highlighted in green in all three screenshots.

- Top Screenshot (Bridge mode):** Shows 'Traffic forwarding mode' with 'Bridge' selected. 'Client VLAN Assignment' has 'Static' selected. 'VLAN ID' is empty.
- Middle Screenshot (Tunnel mode):** Shows 'Traffic forwarding mode' with 'Tunnel' selected. 'Primary Gateway Cluster' is set to 'CAMPUS-GATEWAYS:auto_gwcluster_1'. 'Secondary Gateway Cluster' is set to 'None'. 'Client VLAN Assignment' is partially visible.
- Bottom Screenshot (Mixed mode):** Shows 'Traffic forwarding mode' with 'Mixed' selected. 'Primary Gateway Cluster' is set to 'CAMPUS-GATEWAYS:auto_gwcluster_1'. 'Secondary Gateway Cluster' is set to 'None'. 'Client VLAN Assignment' has 'Dynamic' selected. Below this, the 'VLAN Assignment Rules' section shows 'Default VLAN: LAB-VLAN75'.

Forwarding Modes

- The forwarding options are much more flexible in AOS 10
 - Determined by the WLAN profile
 - Mixed mode permits the per-user forwarding
 - A VLAN can be bridged, tunneled but not both
- APs can tunnel traffic to a single Gateway cluster or multiple Gateway clusters:
 - Overlay Tunnels are no-longer tied to the APs management / control plane
 - Provides more flexibility and addresses new use cases
 - A single Gateway is still considered a cluster...





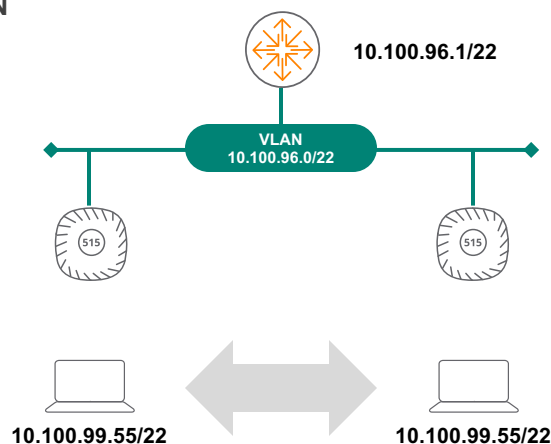
Bridge or Tunnel?

Ask yourself...

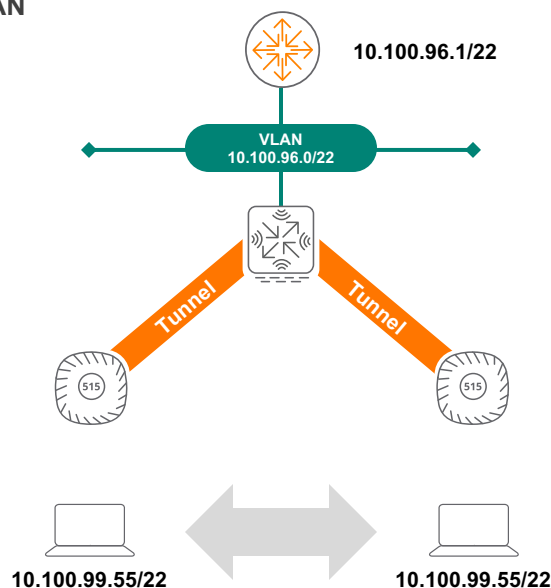
- Is seamless mobility really needed?
 - Application tolerance
 - VLAN extensibility
 - OS behaviors
 - User expectations
- Is it feasible to re-architect my LAN to accommodate bridged WLANs?
- What are my traffic requirements?
 - North / South & East West
- What are my policy and segmentation requirements?

What is Seamless Roaming

Bridged WLAN



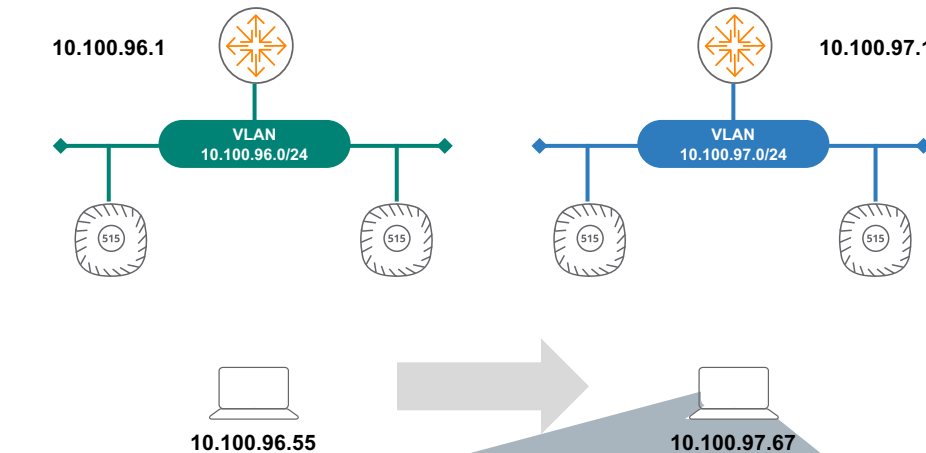
Tunneled WLAN



- A wireless client's ability to maintain its association to a broadcast domain as it roams between APs within a common coverage area
 - VLAN membership and IP addressing are maintained
- No perceived interruption to applications or sessions during a roam
 - UDP voice & video
 - TCP terminal
 - Multicast video
- Improved transitions with fast roaming
 - OKC & 802.11r



Roaming across Broadcast Domains



Source	Destination	Protocol	Info
0.0.0.0	255.255.255.255	DHCP	DHCP Request
10.100.50.10	255.255.255.255	DHCP	DHCP Offer
0.0.0.0	255.255.255.255	DHCP	DHCP Request
10.100.50.10	255.255.255.255	DHCP	DHCP ACK
10.100.97.67	255.255.255.255	ARP	Who has 10.100.97.1? Tell 10.100.97.67
10.100.97.1	10.100.97.67	ARP	10.100.97.1 is at b8:83:03:3a:c2:20

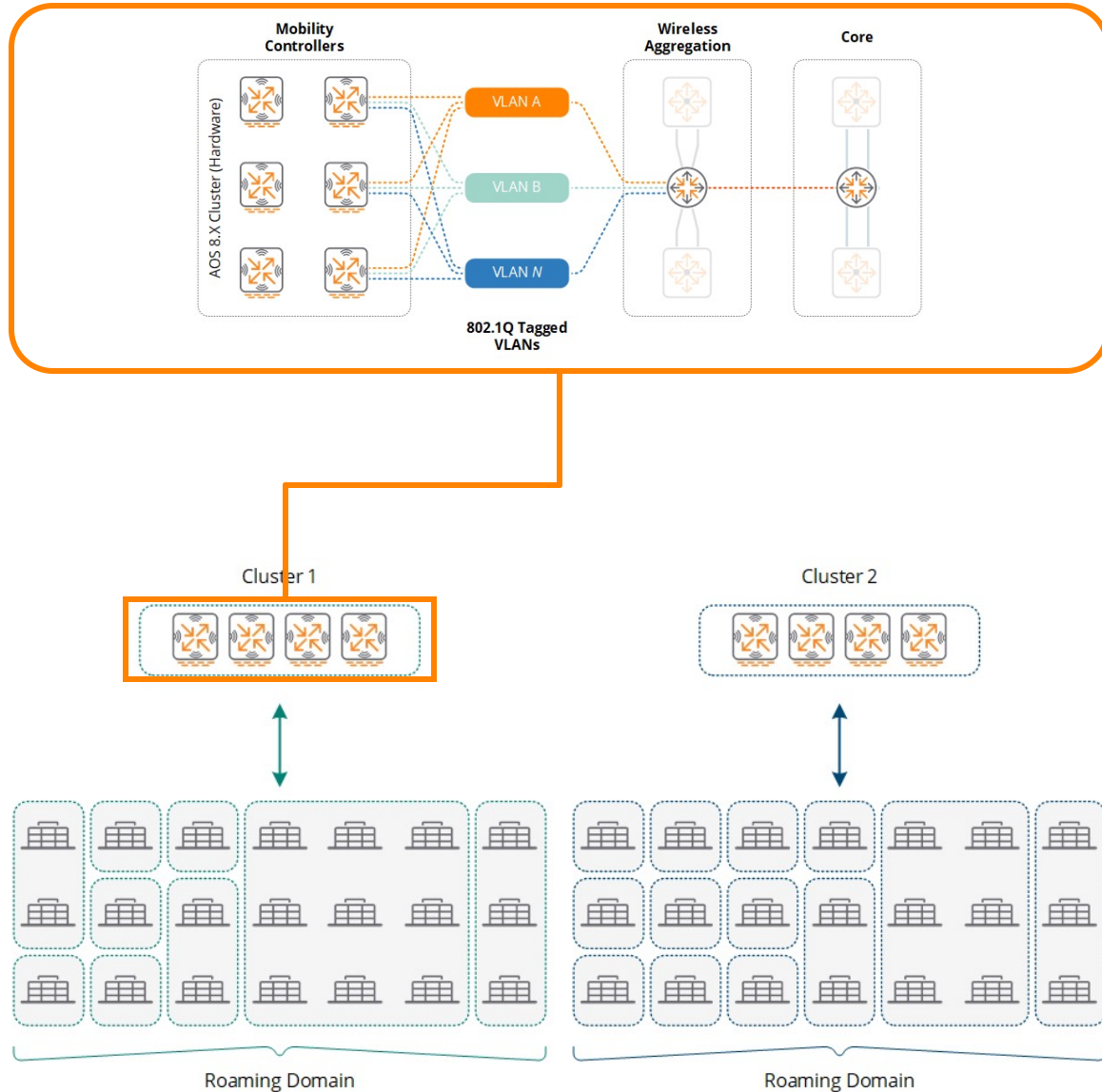
- Is possible as modern operating systems will automatically send a DHCP request after each roam
 - Apple and Microsoft
- Application tolerance will vary
 - While modern applications such as Teams and Zoom can tolerate these transitions, Wi-Fi calling, RTP, multicast and terminal based applications cannot
- Often referred to as “hard roaming”
 - Lots of things must happen
 - AAA > DHCP > ARP > App Session Restarts



Roaming across Broadcast Domains

How we solve this today?

- By tunneling user traffic from APs to centralized appliances where the user VLAN(s) reside
- At Aruba, we add additional sauce (aka clustering) to provide seamless failover between appliances and permit in-service upgrades
 - Seamless roaming is provided within a cluster
 - Hard roaming is provided between clusters
- AOS 10 makes this even easier with auto-clustering
 - By group or by site to accommodate different campus environments

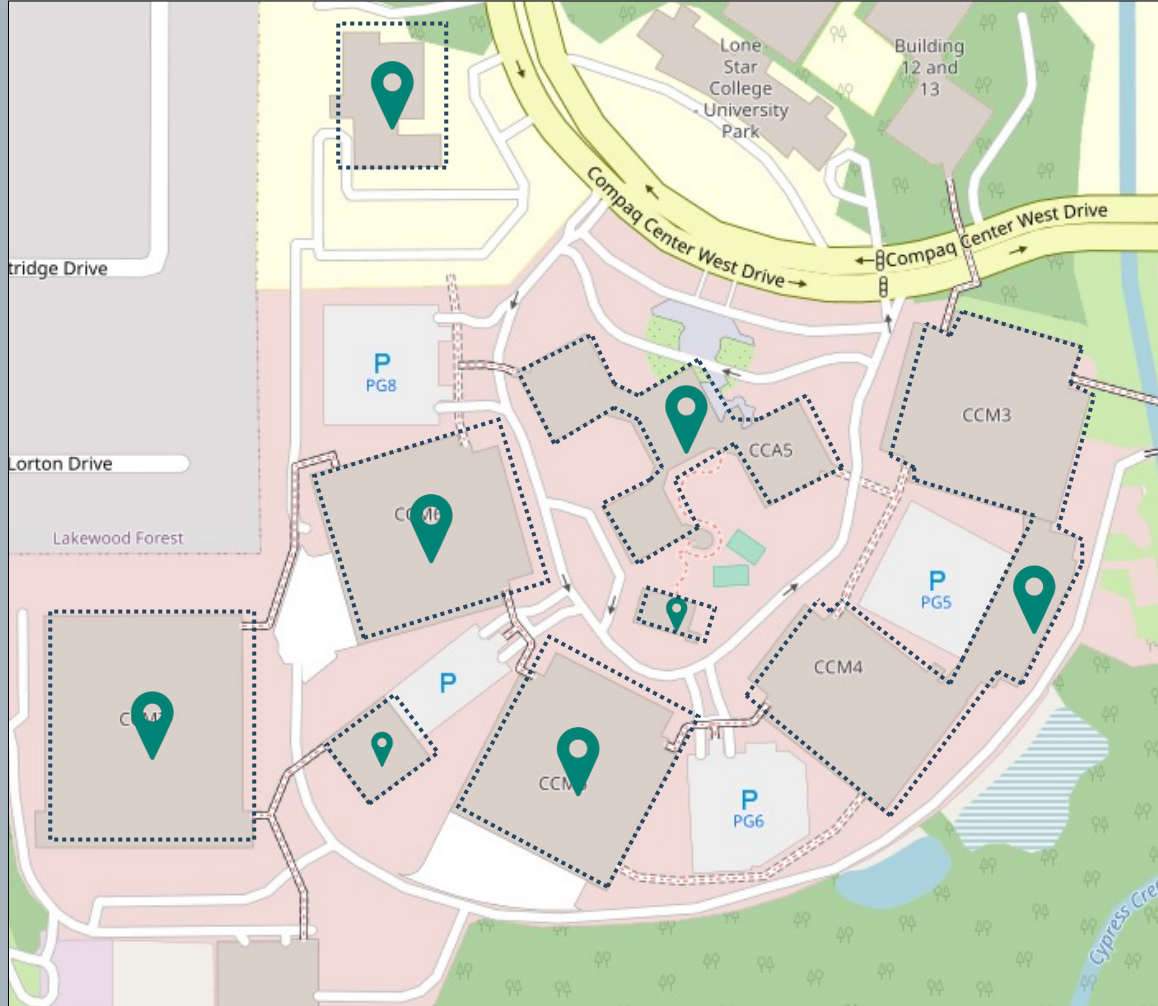




Planning for Bridged or Mixed WLANs

Before considering bridged or mixed WLANs, you must understand your environment!

- Where are my contagious RF coverage areas (indoor / outdoor)?
- Which buildings do my users actually move between?
- How do my users move between buildings? Do they walk or use transportation?
- How is my LAN architected? Which buildings can I extend VLANs between?



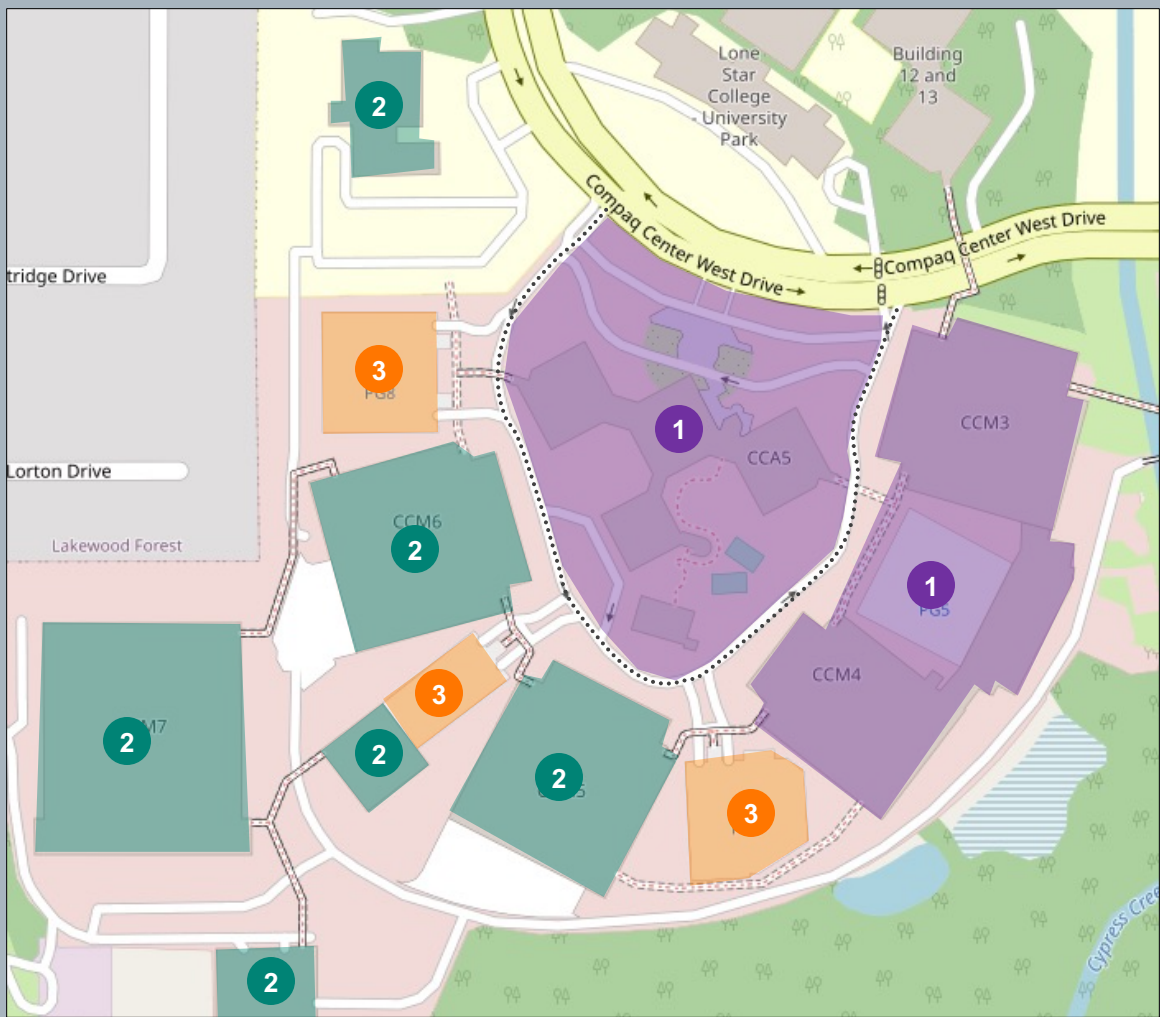


RF Coverage Areas

1. Building cluster with contiguous indoor / outdoor coverage
2. Buildings with no outdoor coverage between (i.e., RF isolated)
3. Parking garage with no RF coverage

Takeaway:

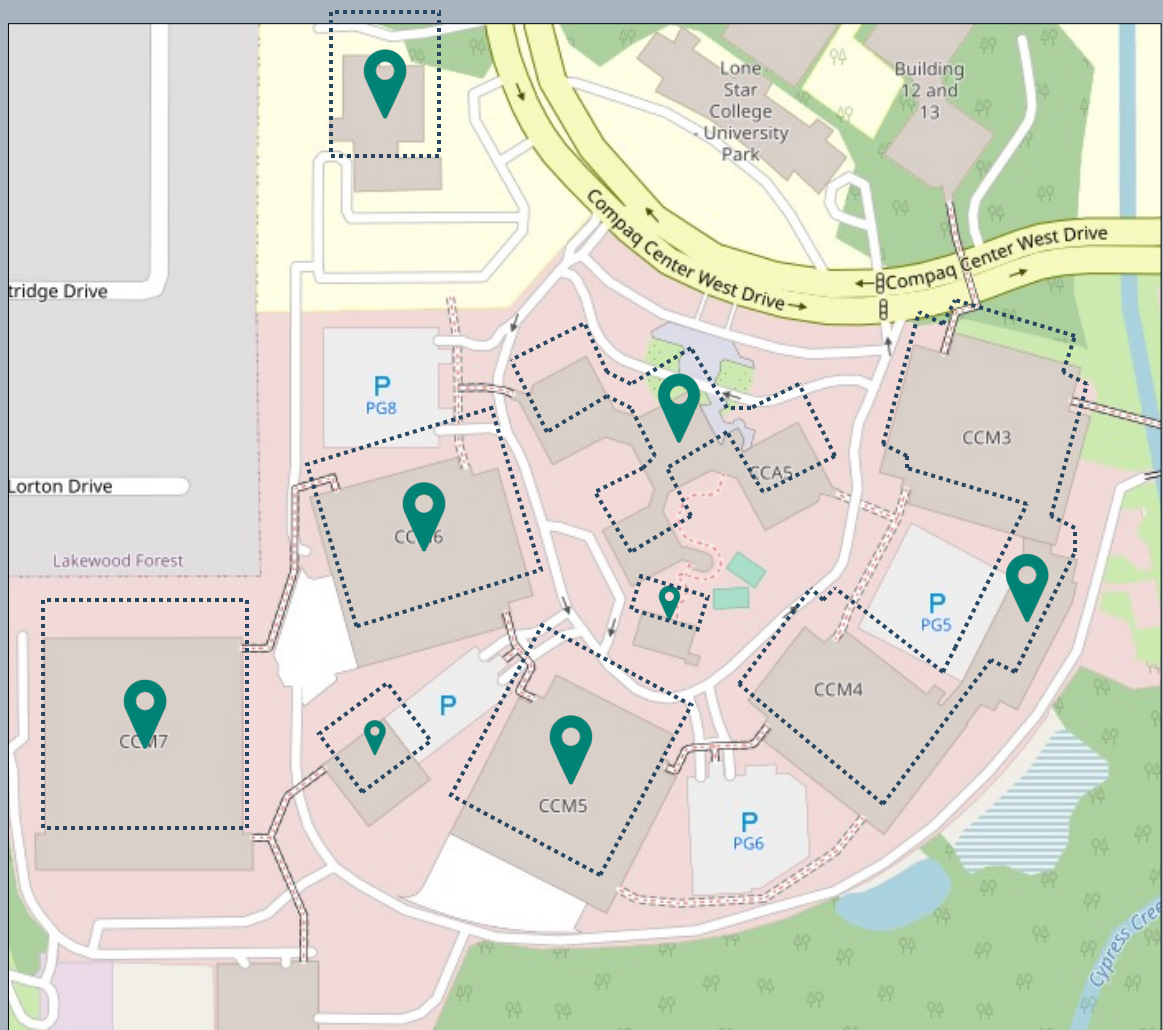
In this simple campus example, there are two clusters of buildings with contiguous RF coverage where mobility would be required. Both building clusters are separated by a physical boundary (i.e. road)





LAN Architectures

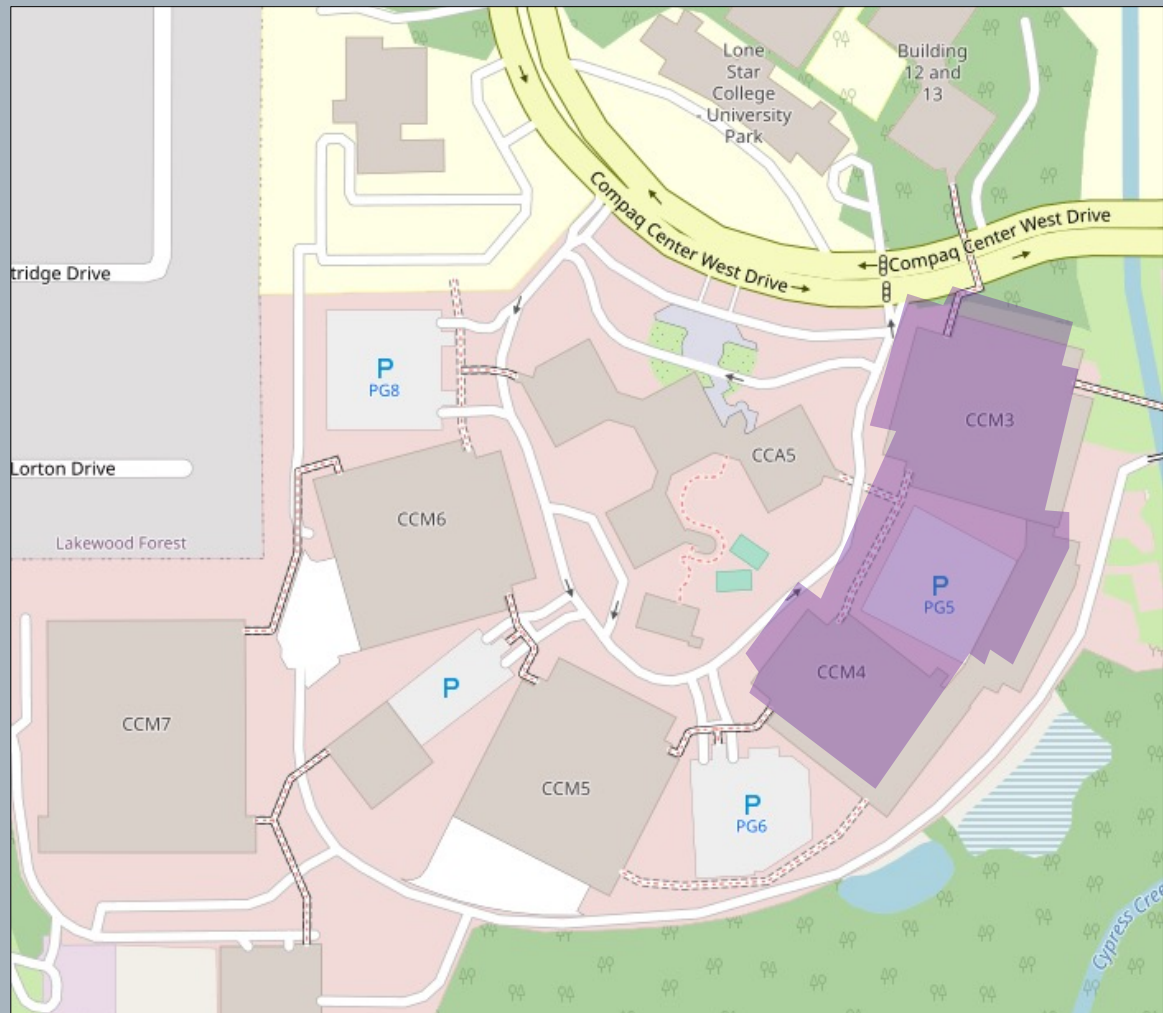
- The LAN architecture in each of your buildings will vary
 - Building Size & Neighbors
 - Availability Needs
 - Fiber Paths & Diversity
 - And more.
- Will include Core, Aggregation & Access layers
 - The core maybe centralized or distributed
- May include fabric technologies used to establish overlays
 - Cisco Software Defined Access (SDA)
 - EVPN with VXLAN
 - Shortest Path Bridging MAC (SPBM)





LAN Architectures

- The LAN architecture in each of your buildings will define your roaming domains for bridged / mixed WLANs
 - Intra / Inter Floor
 - Building to Building
 - Indoor / Outdoor
- Layer 3 routing in aggregation and access layers will limit the switches that any wireless user VLANs can be extended between
- Let's use CCM3 & CCM4 as an example...

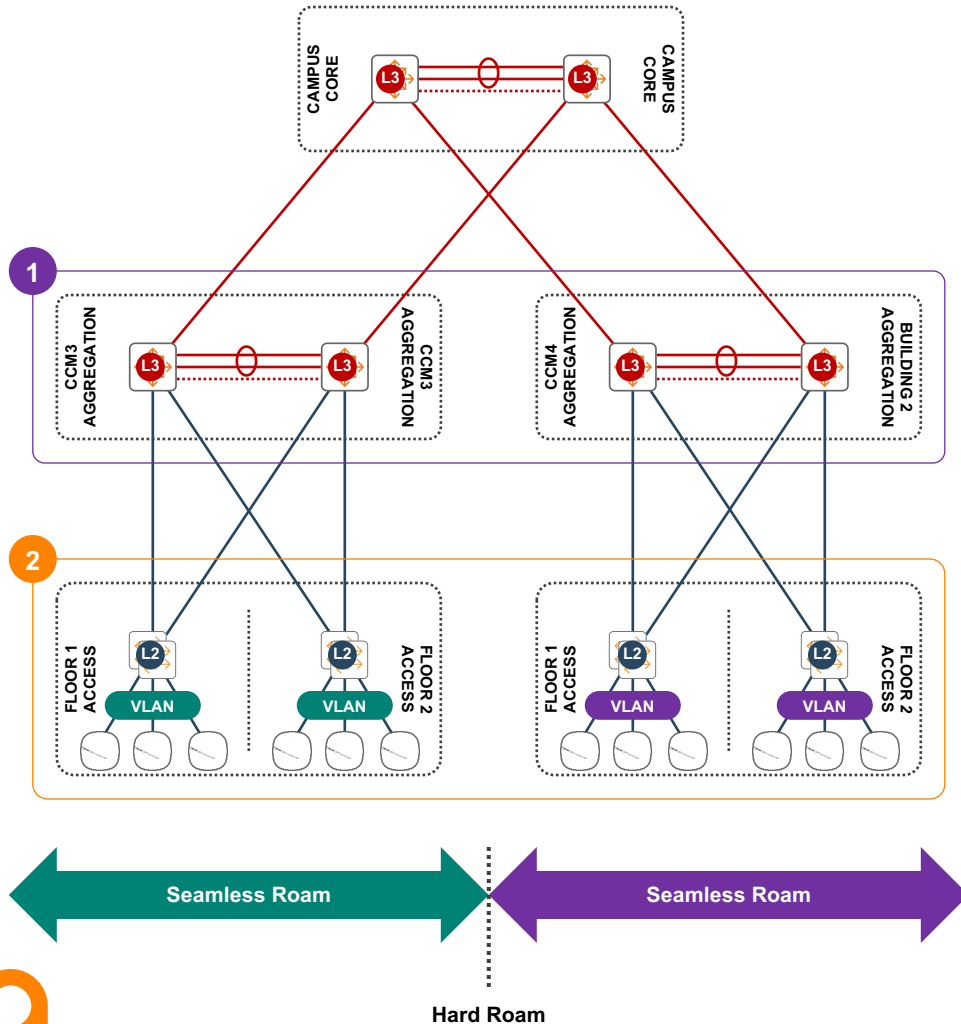


LAN Architectures

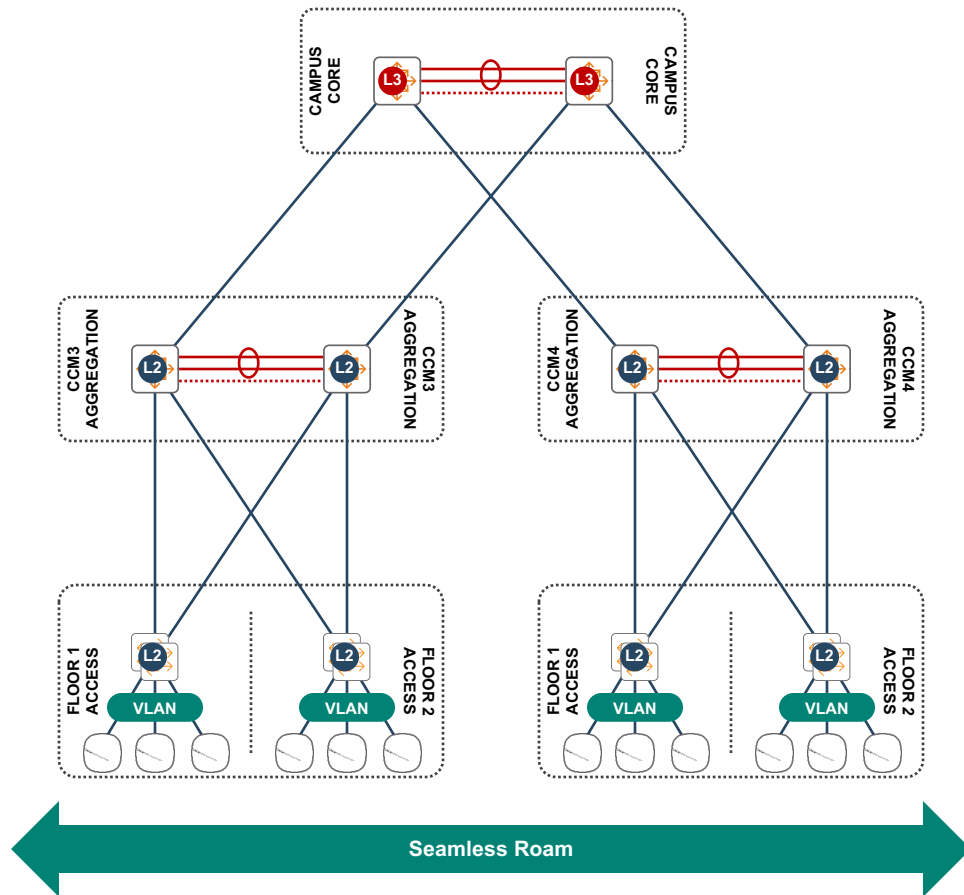
1. CCM3 & CCM4 are serviced by separate layer 3 aggregation switches
2. Access switches in each building are layer 2, all user VLANs are extended to the respective aggregation layer

Takeaway:

Wireless users will be able to seamlessly roam within each building, but not between buildings. A LAN redesign would be required to extend the VLANs to support bridged / mixed WLANs!



LAN Redesign Example

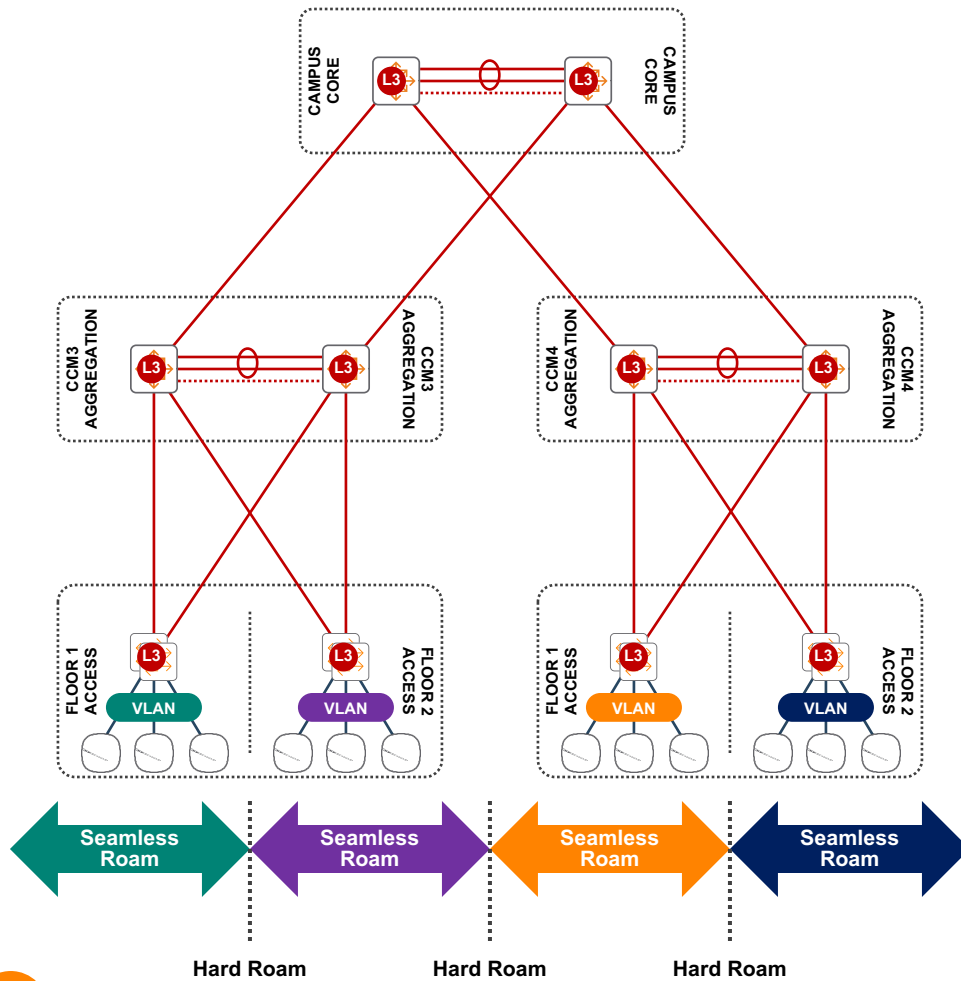


- Solves the mobility problem in this example without requiring wireless overlays
 - A design promoted by Meraki and Mist
- Each wireless user VLAN is extended between access layer switches establishing a common roaming domain
 - Requires reconfiguration of the core, aggregation and access layers to achieve this
- Is this a good design?
 - There are valid reasons for having IP routing in the aggregation layers which is broken by extending the VLANs
 - Extending VLANs introduces other scaling challenges such as controlling broadcast / multicast traffic



Routed Access Environments

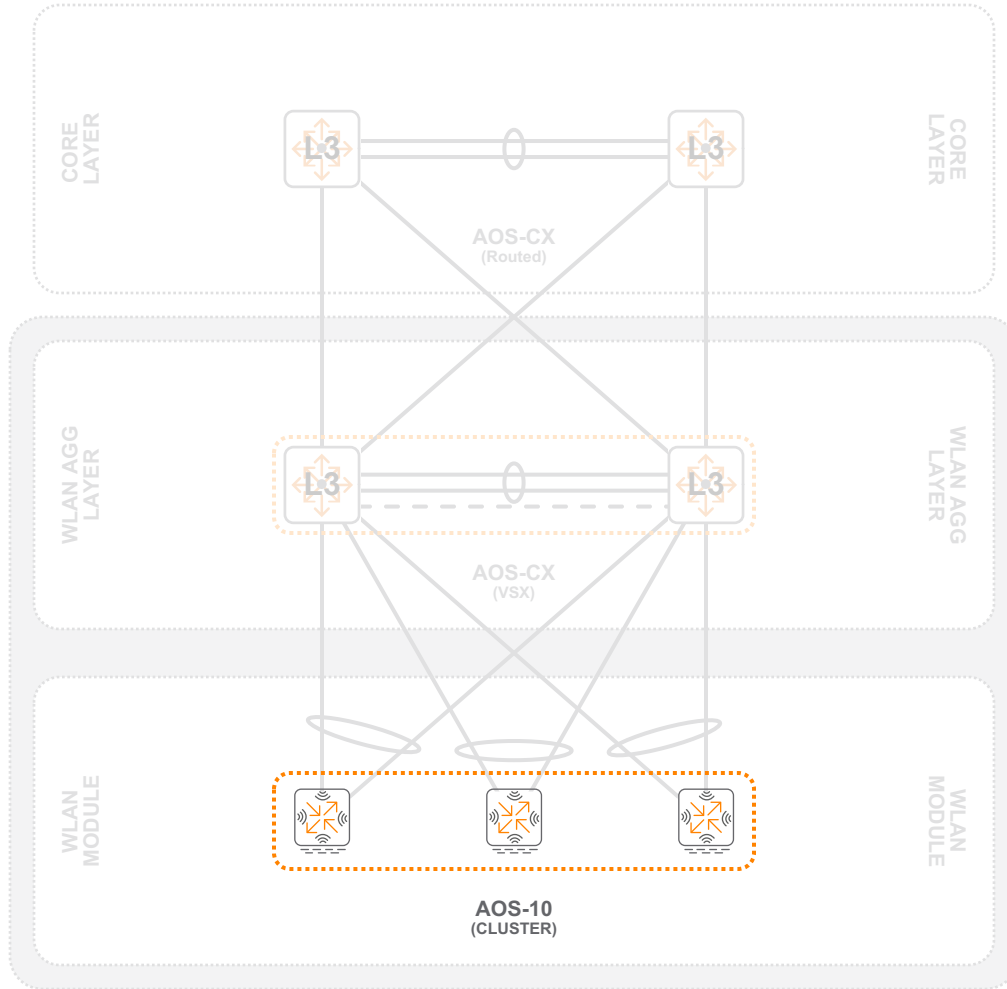
- Most challenging environment as the roaming domains are contained within each access layer switch / stack
 - Requires address renewals as wireless clients roam between APs connected to separate access layer switch / stacks
- Overlays are your least invasive option else a complete LAN redesign is required



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When do I need Gateways?

Mobility:

- When seamless roaming is required by your applications and VLANs cannot be extended between floors or buildings

Security / Policy:

- Traffic of different classes needs to be segmented and/or terminated in different zones and VLANs are insufficient

UBT:

- Terminate user-based tunnels from Aruba Access Switches

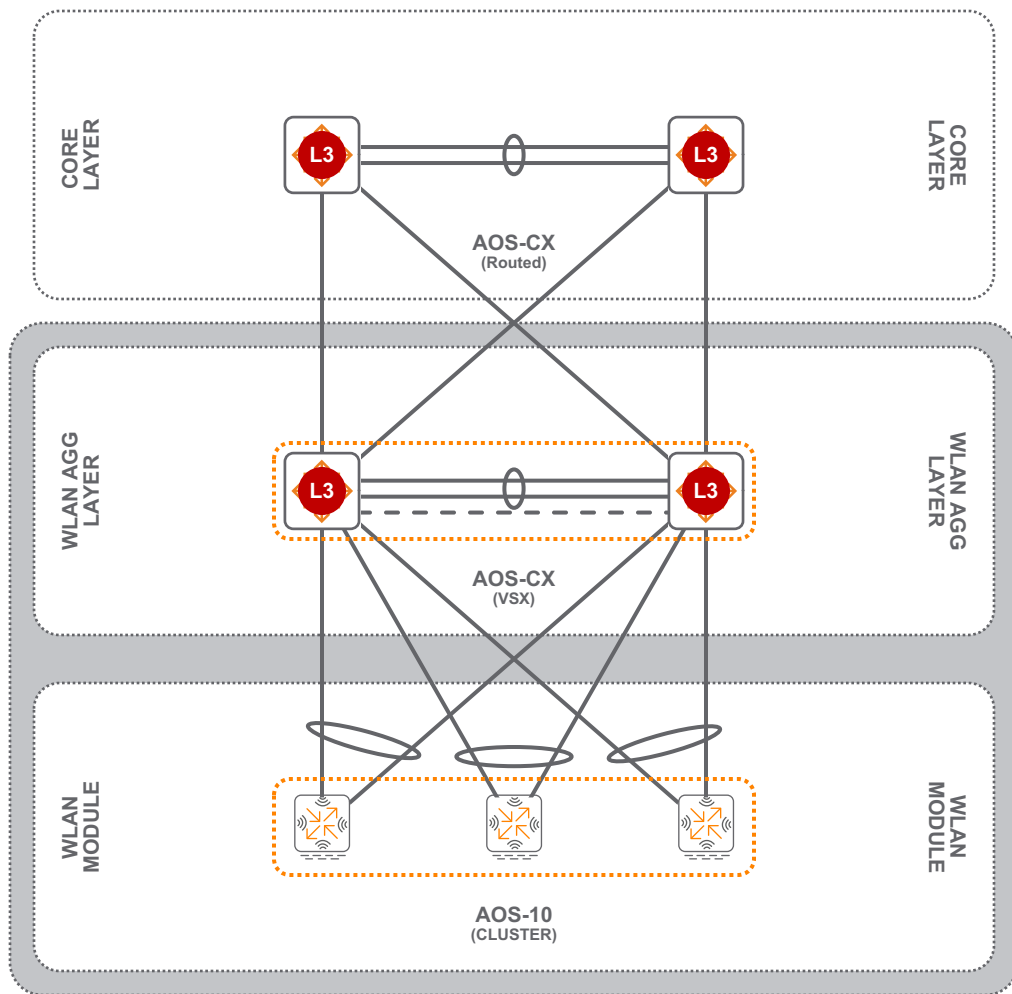
Scaling:

- Your campus requires supports > 2K x Access Points and 20,000 x Clients

Features:

- Dynamic RADIUS Proxy, Microbranch, SD-WAN, Multi-Zone





Where do I place my Gateways?

No changes in AOS 10!

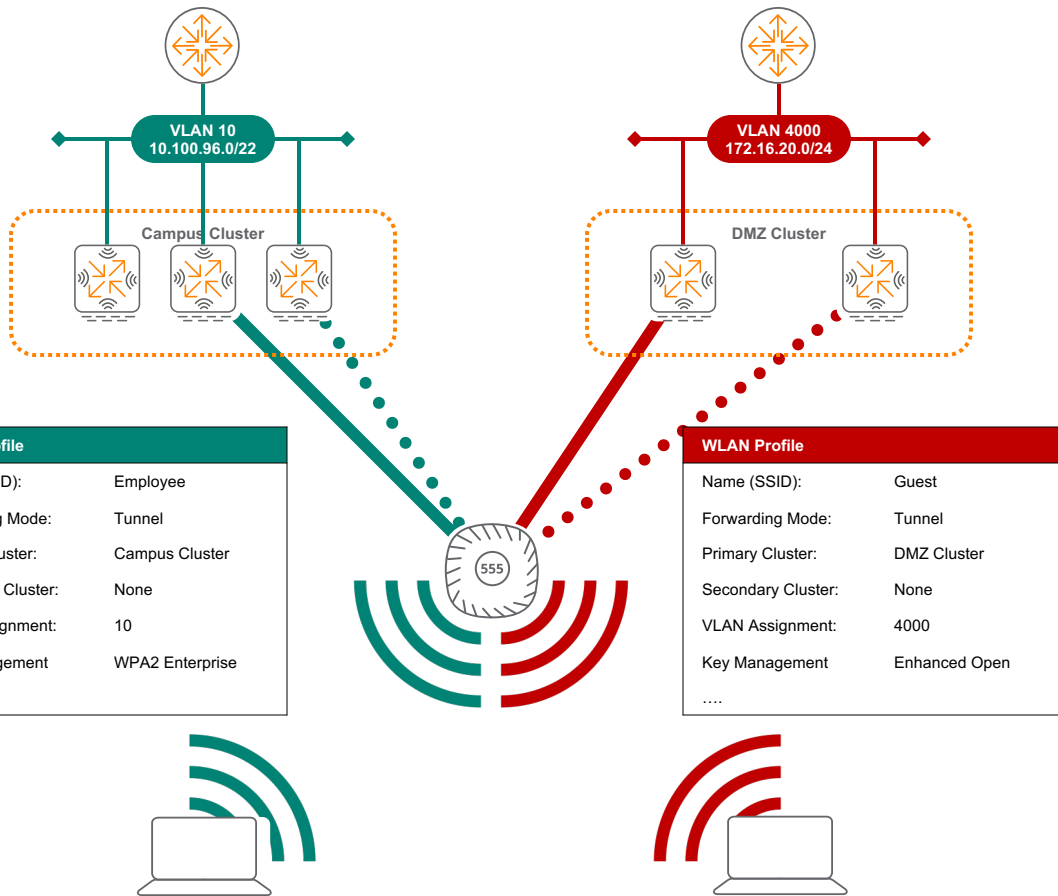
- Same best practices and recommendations as with AOS 8:
 - Can be connected to the core, datacenter or dedicated aggregation layer depending on the number of clients
- We still recommend a dedicated aggregation layer to offload MAC and ARP learning from the core:
 - Considered: > 4K users
 - Strongly Advised: > 8K users

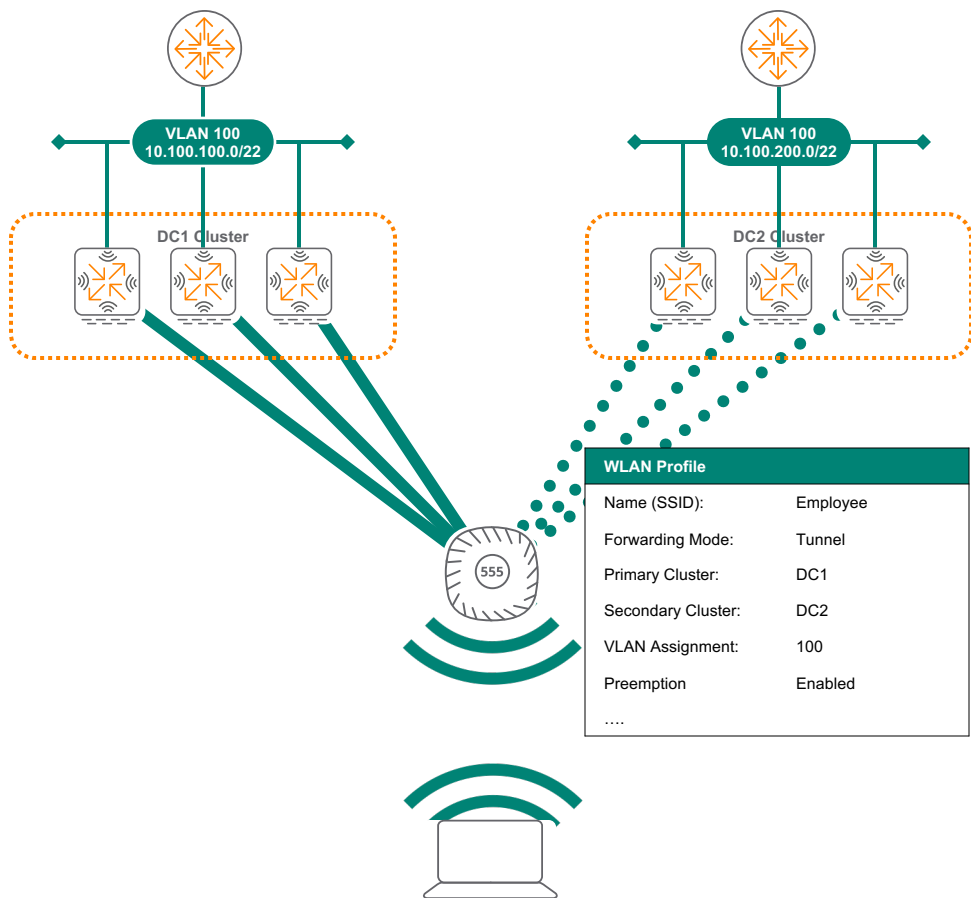


New Tunneling Designs

With AOS 10, the APs control plane and data planes are completely de-coupled!

- WLANs can now be tunneled to different Gateway clusters within the same Central Organization
- Permits new overlay tunnel designs
 - Datacenter Redundancy
 - Salt-n-pepper
 - Segmentation (Departmental, Trust)
- This de-coupling is the main reason for re-branding Mobility Controllers to Gateways





Cluster Failover

- WLANs can now be tunneled to a primary and secondary clusters
 - VLAN IDs must be consistent across both clusters, subnets unique
 - Number of Gateways in the primary cluster must be \geq the number of Gateways in the secondary cluster
- WLANs can also be salt and peppered between primary and secondary clusters
- Failover is not seamless
 - The WLAN is disabled for 60 seconds upon a failure detection
- Optional Preemption
 - 5-minute preemption timer (fixed)





Q&A



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AOS 10 Resources

- Arubapedia:
 - Partners: https://afp.arubanetworks.com/afp/index.php/AOS_10
- Validated Solution Guides:
 - <https://www.arubanetworks.com/techdocs/VSG/>



What Are Validated Solutions Guides

Validated Solution Guide (VSG)

Validated solution guides covers Aruba product portfolio including but not limited to wireless, wired, sensors, NAC and management.

Prescriptive guidance focused on Aruba recommended best practices that are tested by Aruba's Solution TME and Solution Quality Assurance teams on an ongoing basis.

Home

Campus Design



Campus Deploy



Data Center Design



Data Center Deploy



VSGs are categorized into volumes to differentiate each guide type from the others.

Volumes

1. *Design*: Identify products and technologies to meet customer business requirements
2. *Deploy*: Step-by-step set of procedures to build the solution

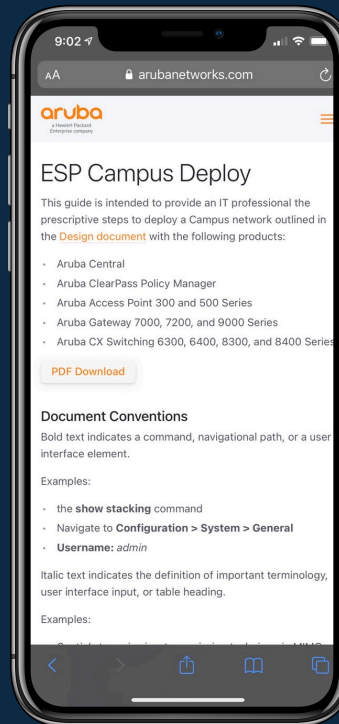


Assets

<https://www.arubanetworks.com/techdocs/VSG/>



VSG on arubanetworks.com



Solution TME on GitHub



aruba-solution-tme@hpe.com



[#vsg-feedback](https://twitter.com/vsg-feedback)



Partner Resources

Portals



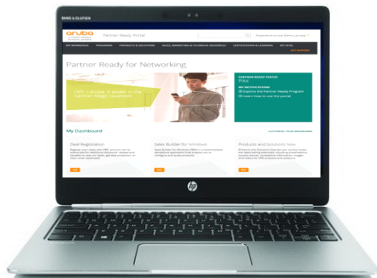
Airheads Community

[\(Click Here\)](#)



Arubapedia for Partners

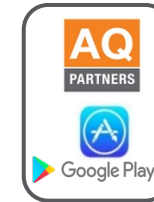
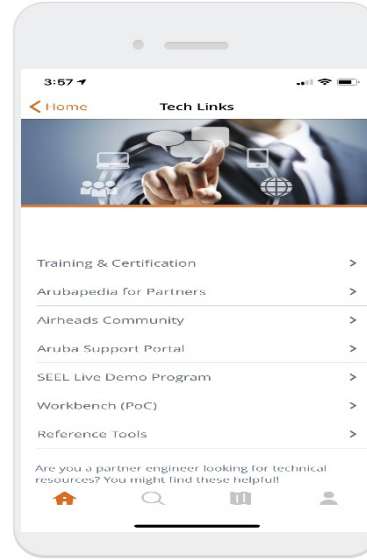
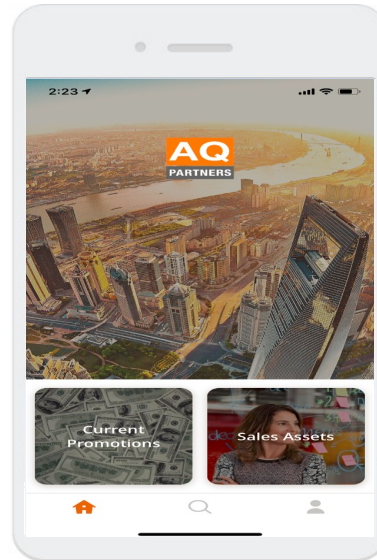
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Partner Ready for Networking portal

[\(Click Here\)](#)

Mobile App



Aruba Quotient for Partners (mobile app)
Navigate to Tech Links

Apple Store [\(Click Here\)](#)
Google Play [\(Click Here\)](#)

Live Support

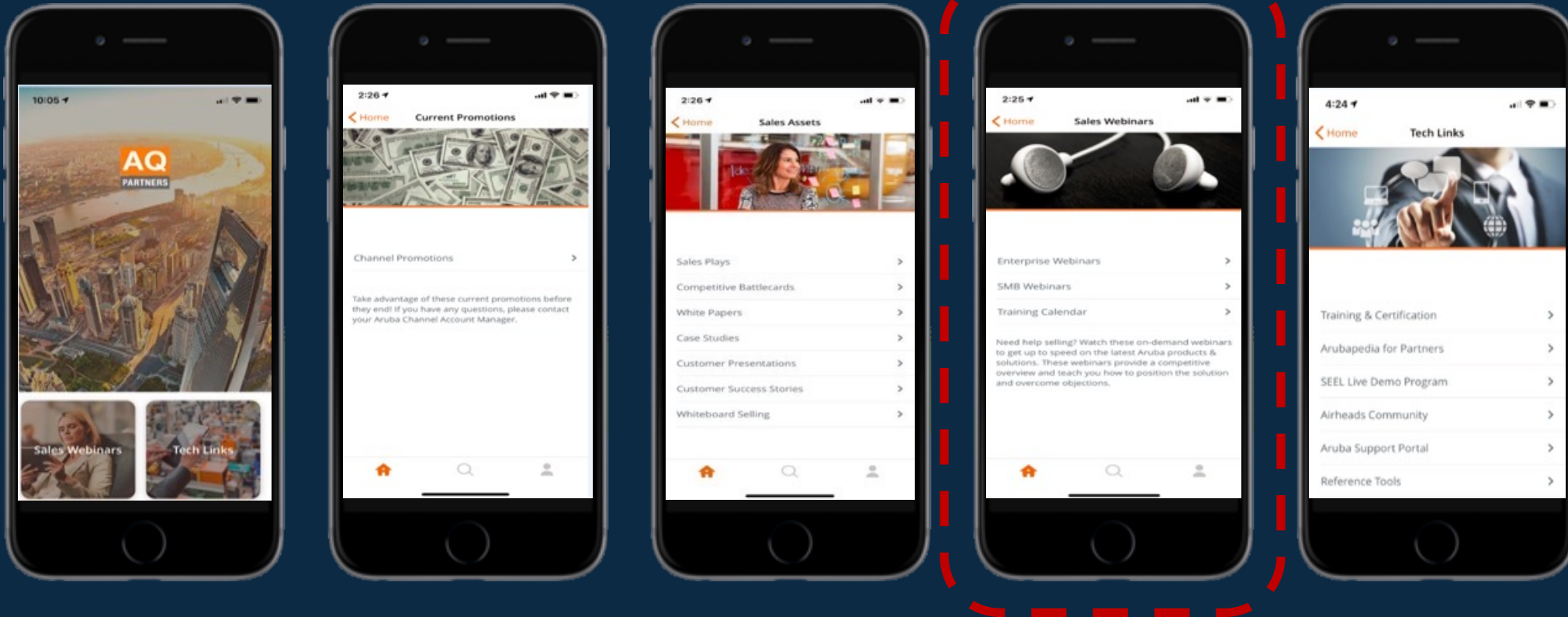


Channel SEs (CSEs)
Regional channel support

Aruba Quotient for Partners Mobile App



1. Download the free “Aruba Quotient for Partners”
2. Login with Partner Login information
3. Browse content by scrolling left and right at bottom of screen



Partner Technical Webinar Series

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Thank You

