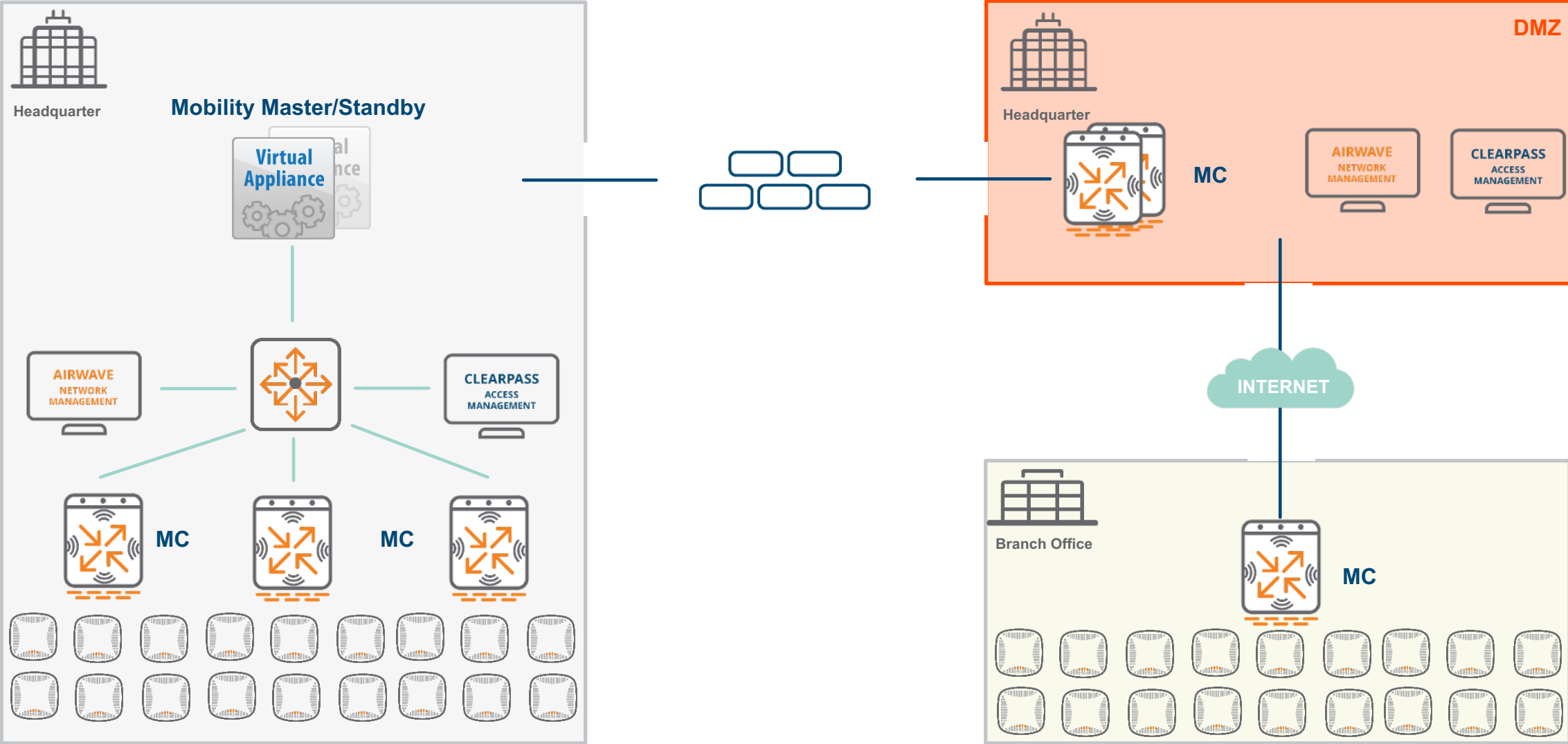


ArubaOS 8: Campus Design and Deployment Best Practices

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September 24, 2019

Aruba Enterprise WLAN Network Architecture



Access Points and Controllers

Campus AP Platform Portfolio



340 Series (AP-34x)
802.11ac 4x4:4SS, MU-MIMO, VHT160
1x 2.5GE + 1x 1GE, USB, BLE, dual 5GHz, 802.3at POE
11ac W2 Flagship



310 Series (AP/IAP-31x)
802.11ac 4x4:4SS*, MU-MIMO, VHT160
1x GE, USB, BLE, 802.3af POE
Baseline 4x4 11ac W2 platform



300 Series (AP/IAP-30x)
802.11ac 3x3:3SS*, MU-MIMO
1x GE, USB, BLE, 802.3af POE
Entry-level 3x3 11ac W2 platform



303 Series (AP-303/303P)
Dual radio, **802.11ac 2x2:2SS, MU-MIMO**
1xGE, BLE, 802.3af/at/bt POE, PSE*
Low-cost 2x2 11ac W2 platform

802.11ac Wave 2

AP 555
802.11ax 8x8:8SS / 4x4:4SS (Tri-Radio mode)
2x 5GE, USB, BLE / 15.4, 37RU, VHT160
11ax Flagship, 802.3bt POE

530 Series (AP-53x)
802.11ax 4x4:4SS / 4x4:4SS
2x 5GE, USB, BLE / 15.4, 37RU, VHT160
11ax High-end, 802.3bt POE

510 Series (AP-51x)
802.11ax 4x4:4SS / 2x2:2SS
1x 2.5GE + 1x 1GE, USB, BLE / 15.4, 16RU, VHT160
11ax Baseline / mid-range, 802.3at POE

802.11ax Wave 1

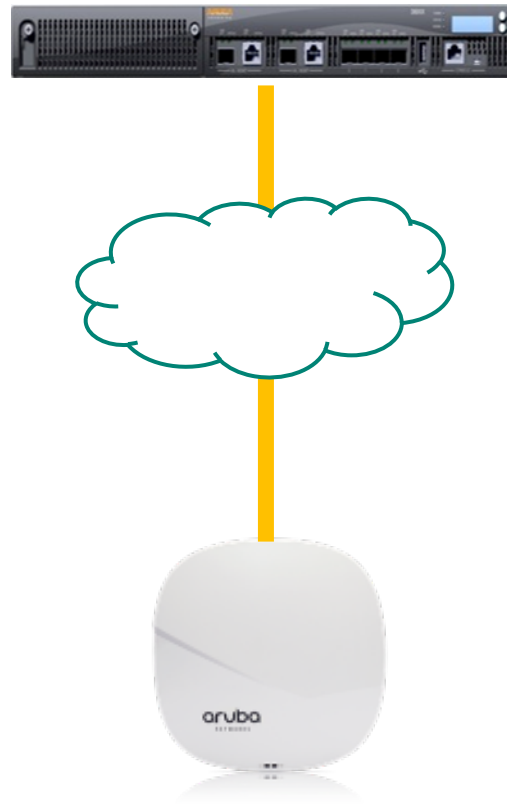


AP Modes

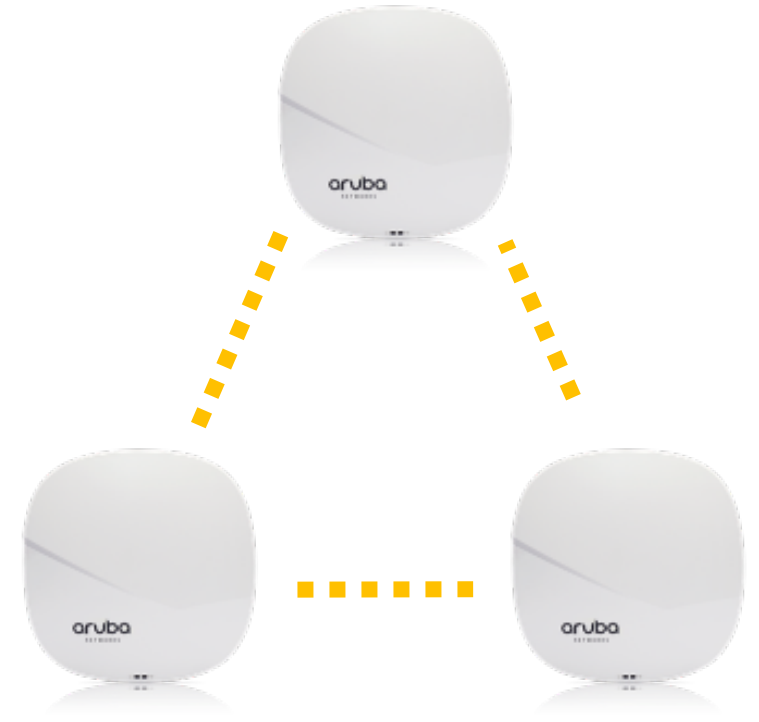
Controller-managed AP



Remote AP



Controller-less AP (Instant AP)



Flexible architecture supports both a centralized as well as a distributed (Instant) deployment mode

Remote APs,
VIA Mobile/Laptop Client



Small, temporary &
home office Wi-Fi

Distributed, controllerless
WLAN with Aruba Instant



Simplified branch
deployment with clusters

Controller-based
WLAN with ArubaOS



Centralized encryption with
advanced services at scale

SAME AP HARDWARE, SAME ENTERPRISE-GRADE PERFORMANCE & FEATURES

Unified Access Points: a new AP software architecture

- Merging AP and IAP product SKUs
- Same product supports both controller-based (AOS) and controller-less (Instant) deployment modes
- Applies to all new AP platforms introduced since the beginning of CY2017
 - AP-203H, AP-303H, AP-203R(P), AP-344/345, AP-303(P), AP-514/515
 - AP-365/367, AP-374/375/377, AP-318, AP-387
 - All roadmap Access Points
- No more worldwide AP SKUs. Always pick the right regulatory variant (RW/US/JP/IL/EG) depending on where the AP gets deployed. By default we can only ship a unified AP to a country that matches the regulatory variant. Special process to handle exceptions.
- Unified AP will look for a controller and come up in controller-based mode if successful. In controller-based mode, regulatory restrictions of the unified AP are ignored (controller takes over).
- If no controller is found, the unified AP may join an existing Instant cluster, or it will explore Activate, Airwave, etc. to determine the mode of operation.
- If all of this fails, the unified AP will start a new Instant cluster.

Mobility Master Hardware Appliance

- x86 platform based on Intel Haswell-EP / Broadwell-EP Technology using E5-2600 v3/v4 CPU family
- Solid State Drive for better reliability
- Three (3) Models
 - MM-HW-1K (JY791A): Support up to 1,000 Devices
 - MM-HW-5K (JY792A): Support up to 5,000 Devices
 - MM-HW-10K (JY793A): Support up to 10,000 Devices
- Dual redundant load shared power supplies
- TPM Module supporting SHA2
- Platform monitoring of power supplies, fans, thermal
- Mechanical Form Factor
 - 1 RU (H x W x D – 1.73” x 17.4” x 15.79”)
- Supported from ArubaOS 8.1.0

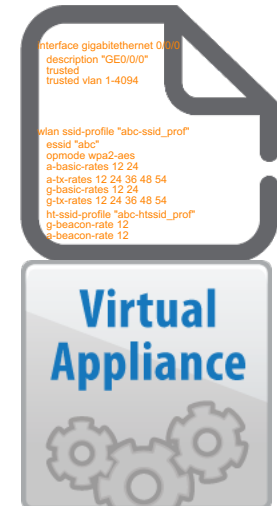


Mobility Master

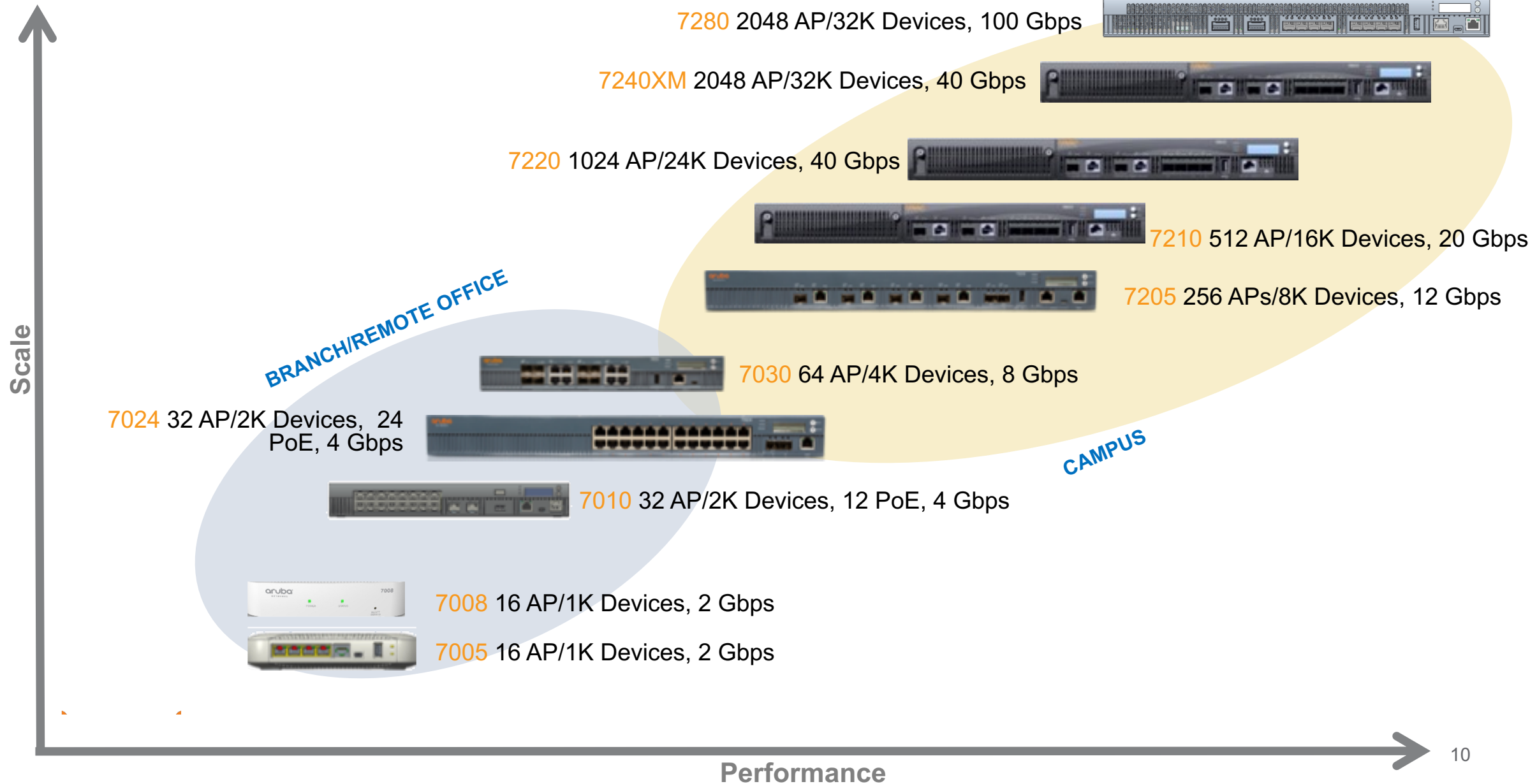
- Next Generation of Master Controller
 - Centralized Management and Visibility
- Deployment Flexibility
 - Virtual Mobility Master
 - Mobility Master Hardware Appliance (1H2017)
- Highly Scalable
 - 10k Devices
 - 100k Clients
- Centralized Licensing
-



vmware®



Branch and Campus Controller Portfolio



Introducing the 9004 Gateway

- Ships with SD-WAN code (R1.7), and managed in Aruba Central
- Controller mode: supported on ArubaOS 8.5
- Desktop and Fan-less
- Wired network interface - 4x 100/1000Base-T Ethernet
- 1x USB 3.0
- Power: 20W max (excluding USB)

Front

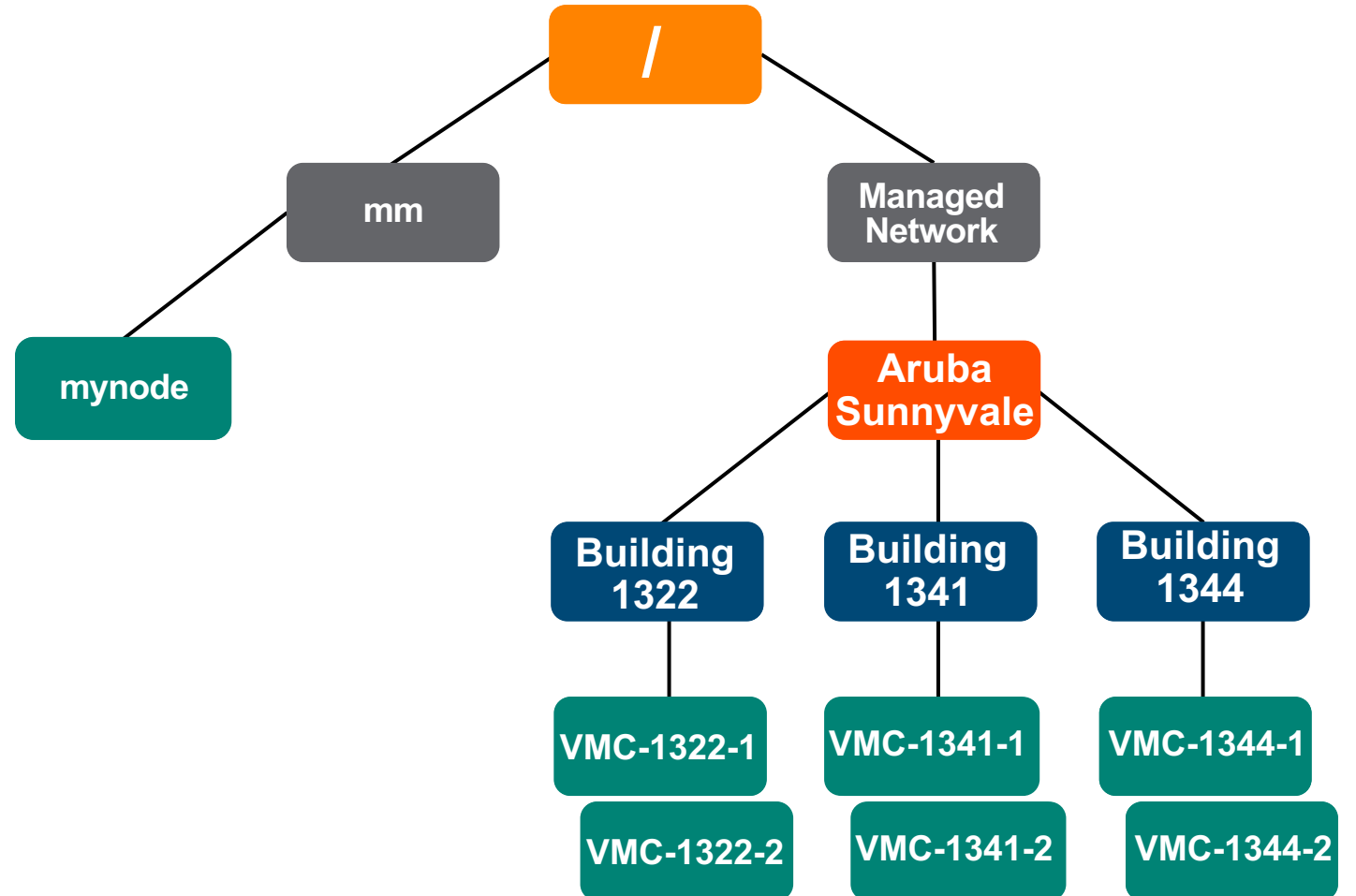
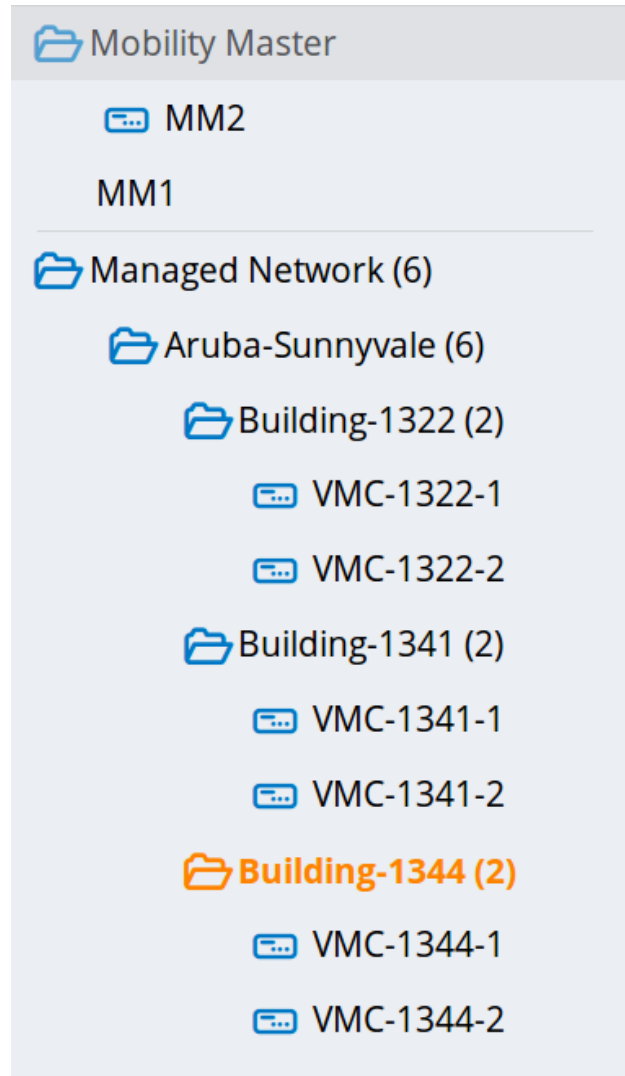


Back



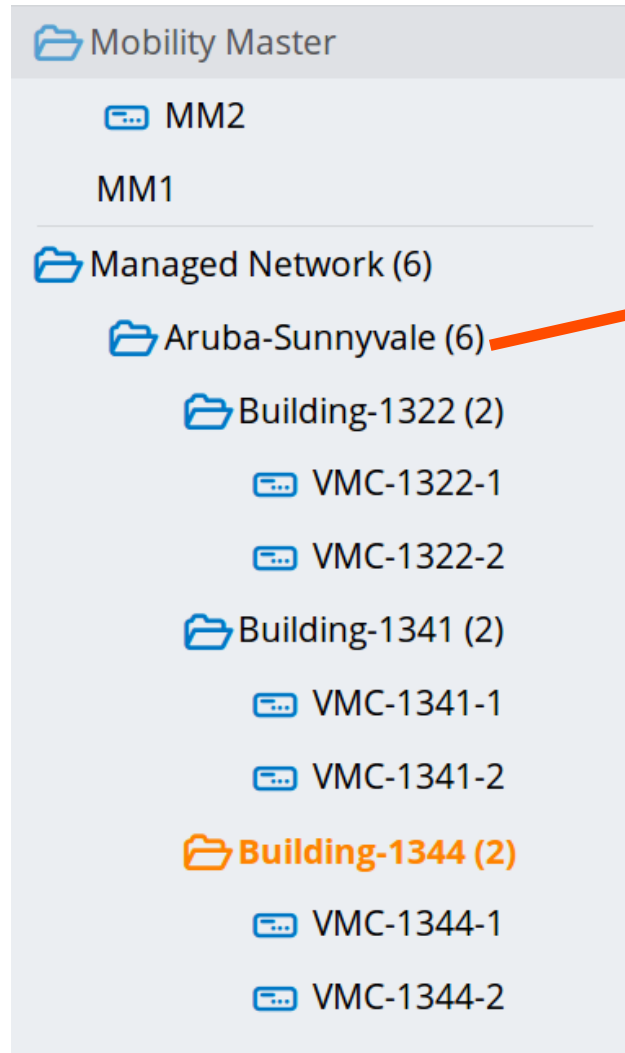
Hierarchy Based Configuration

New Hierarchical Config Model in Mobility Master



Hierarchical Configuration

Inheritance/ Override



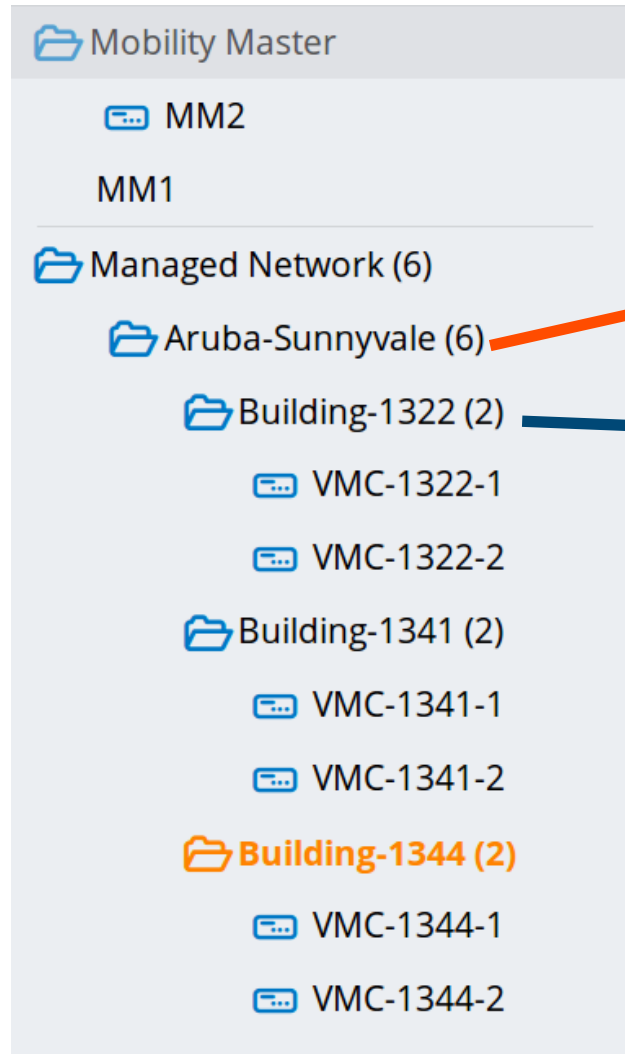
Override Radius IP

```
aaa authentication-server radius
"aruba-west"
  host "2.2.2.2"
  key ddf573d07a415e3a0b4ed2a1
!
aaa server-group "aruba-employee"
  auth-server aruba-west position 1
!
aaa profile "aruba-employee"
  authentication-dot1x "aruba-employee"
  dot1x-default-role "login"
  dot1x-server-group "aruba-employee"
!
wlan ssid-profile "aruba-employee"
  essid "aruba-employee"
  opmode wpa2-aes
!
wlan virtual-ap "aruba-employee"
  aaa-profile "aruba-employee"
  vlan 1
  ssid-profile "aruba-employee"
!
ap-group "default"
  virtual-ap "aruba-employee"
!
```

VMC-1322-1 MC Config

Hierarchical Configuration

Inheritance/ Override



Override Radius IP

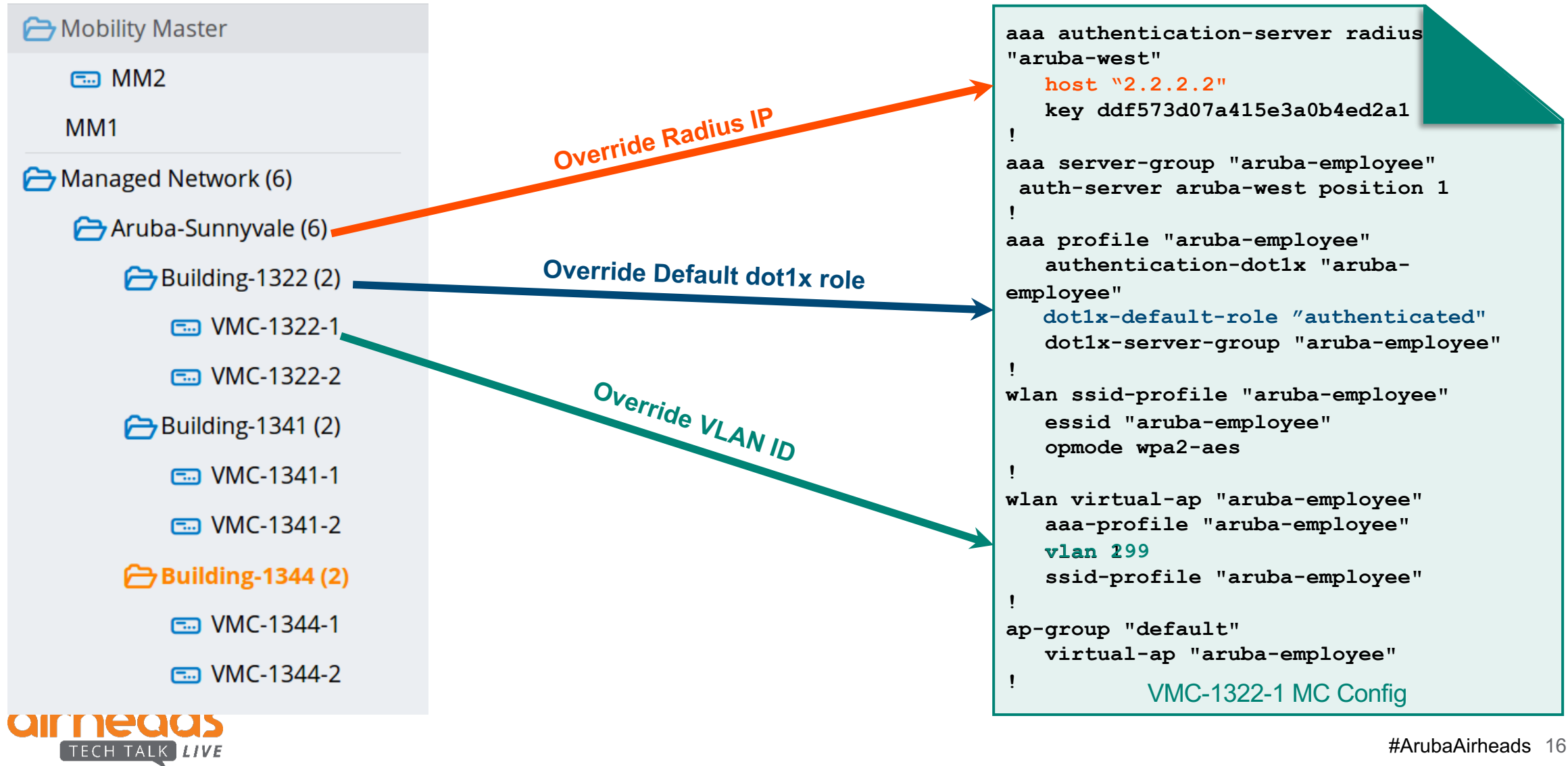
Override Default dot1x role

```
aaa authentication-server radius
"aruba-west"
  host "2.2.2.2"
  key ddf573d07a415e3a0b4ed2a1
!
aaa server-group "aruba-employee"
  auth-server aruba-west position 1
!
aaa profile "aruba-employee"
  authentication-dot1x "aruba-
employee"
  dot1x-default-role "authenticated"
  dot1x-server-group "aruba-employee"
!
wlan ssid-profile "aruba-employee"
  essid "aruba-employee"
  opmode wpa2-aes
!
wlan virtual-ap "aruba-employee"
  aaa-profile "aruba-employee"
  vlan 1
  ssid-profile "aruba-employee"
!
ap-group "default"
  virtual-ap "aruba-employee"
!
```

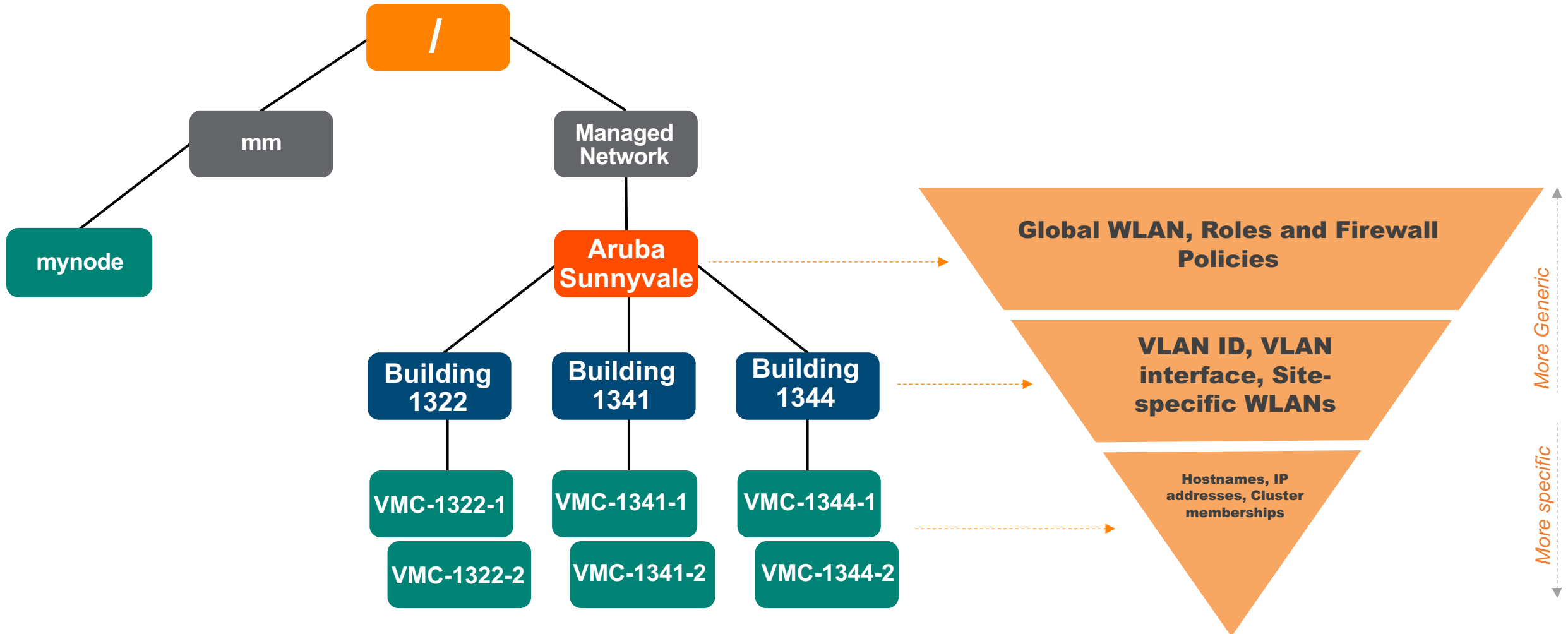
VMC-1322-1 MC Config

Hierarchical Configuration

Inheritance/ Override



New Hierarchical Config Model in Mobility Master



Zero Touch Provisioning

How does a Controller find Mobility Master?

1

Automatic Provisioning via Aruba Activate

- MD → MM Provisioning Rules

2

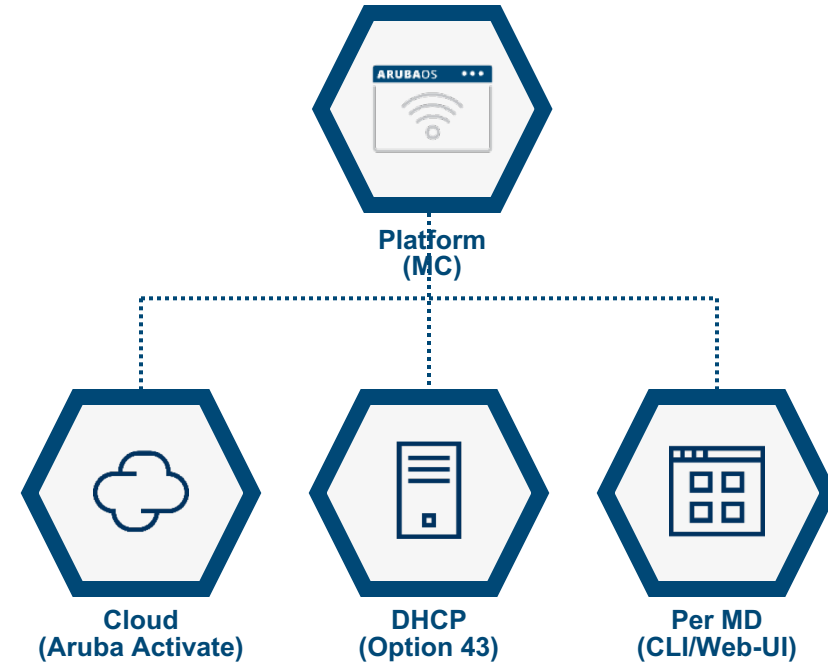
DHCP Option 43 (New in AOS 8.4)

- Using Global or Per Scope Options

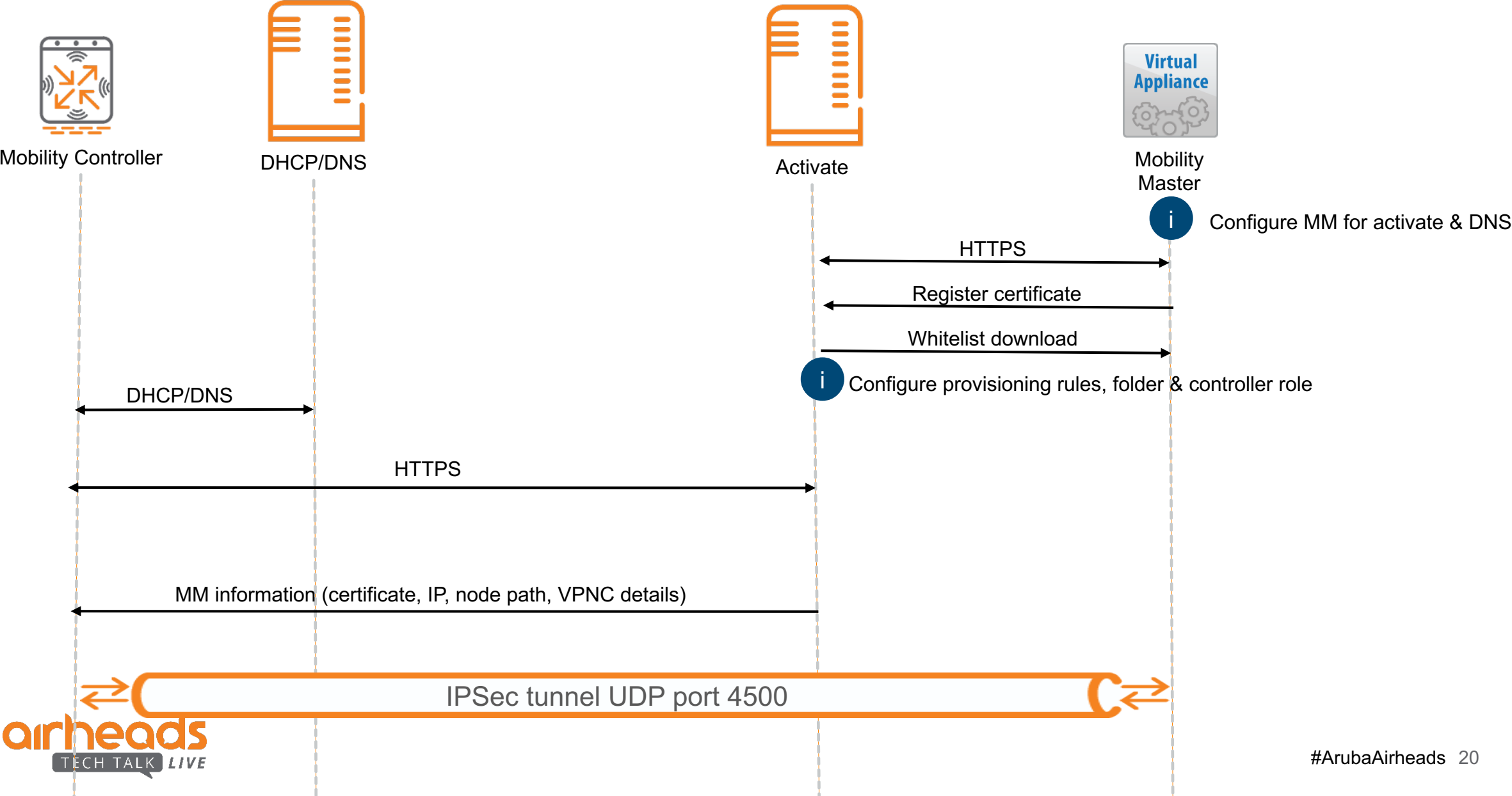
3

Manual Provisioning

- Full-Setup using CLI or Web-UI for each Mobility Controller (one at a time)



Zero Touch Provisioning



Redundancy with Clustering

Benefits of Clustering

1

Seamless Campus Roaming

Clients stay anchored to a single MC when roaming across controllers

2

Stateful Client Failover

User traffic uninterrupted upon cluster member failure

3

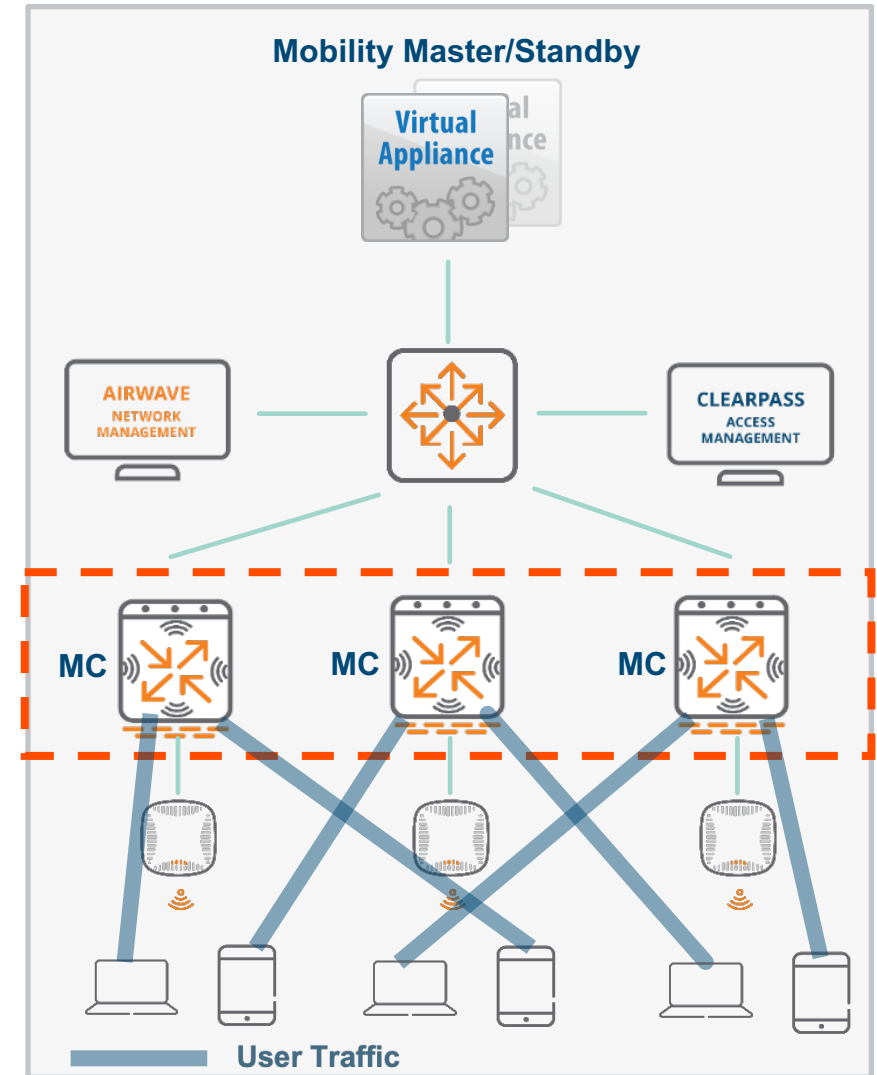
AP and Client Load Balancing

Users and APs automatically load balanced across cluster members

4

Live Upgrade

Live rolling upgrade of cluster members and APs



Cluster Capacity Planning

<https://ase.arubanetworks.com/solutions/id/197>

Cluster AP Sizing Calculator for AOS 8 Provides AP sizing recommendations when deploying a cluster of mobility controllers running AOS 8

Description

Cluster Model

Specify 7200 Series Cluster Details

⚠ 7200 Cluster: AP Sizing Recommendation

Actions ▾

👍 1 Kudo

💬 Compatibility

☆ Follow

← Previous

→ Next

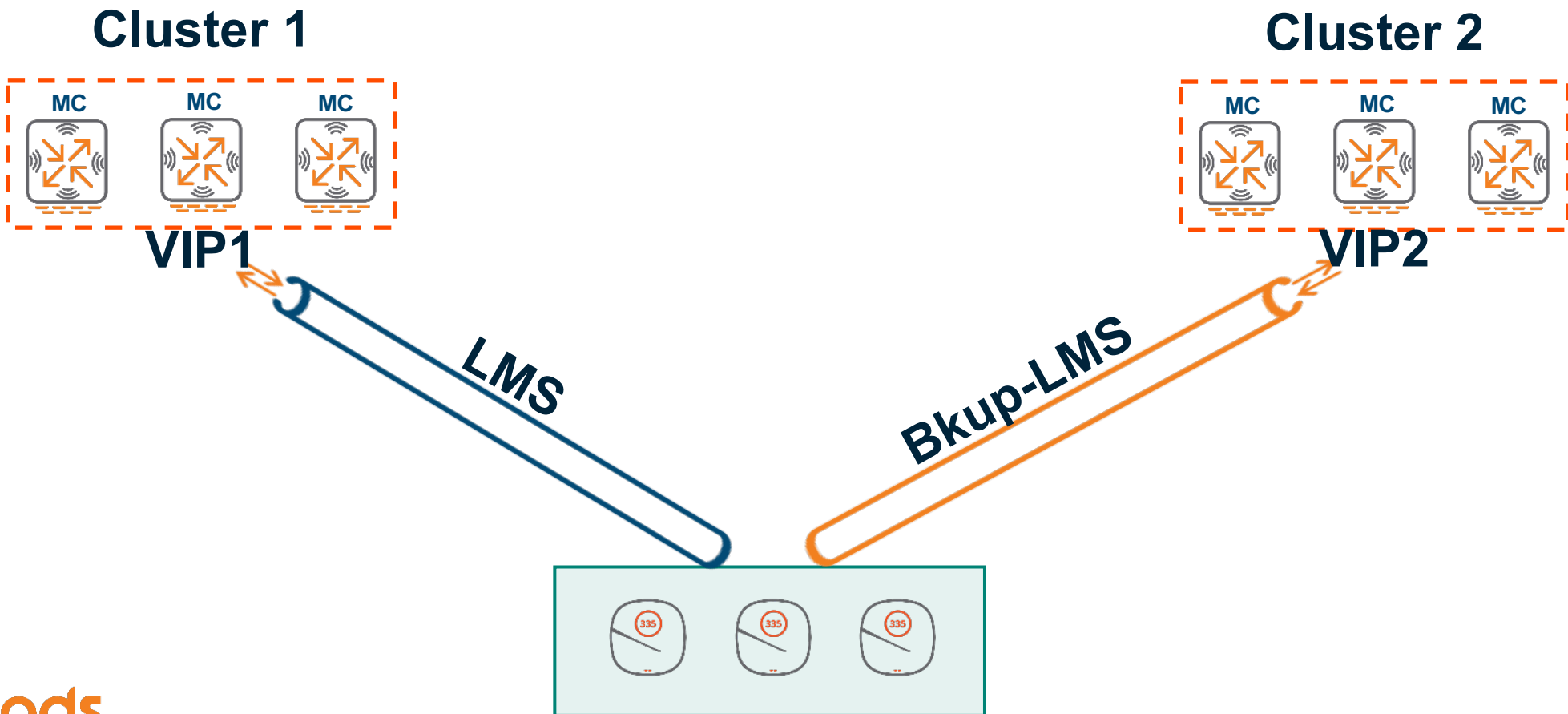
⚠ Finish

–How many controllers do I need in cluster?

- # of controllers in cluster depends on #of AP you plan to deploy on that cluster
- Example:
 - If you have 3*7240 controller, you can deploy up to 3072 AP with full redundancy

What happens if entire cluster goes down?

LMS / Bkup-LMS to provide Redundancy w/ Preemption between 2 Clusters



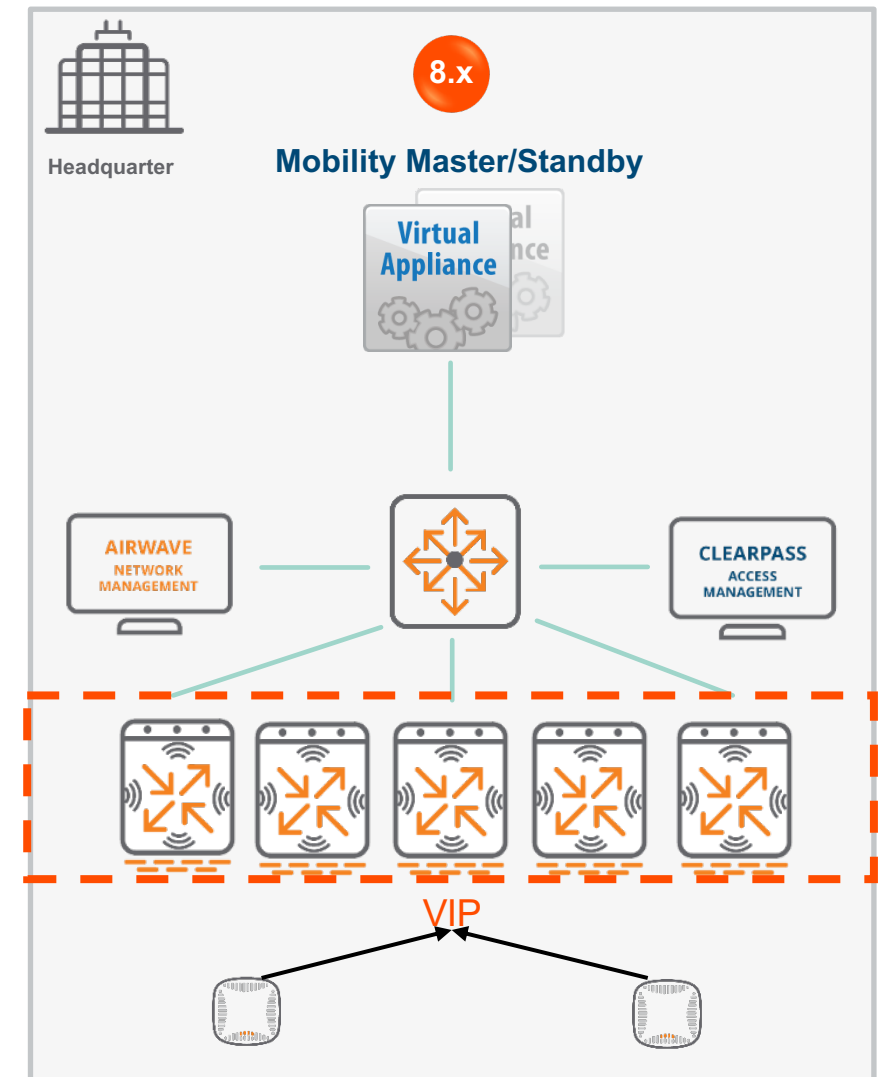
AP Provisioning

How does AP discover Mobility Controller

- Static Assignment (rare)
 - Controller IP address is provisioned and saved in AP Flash
- Dynamic Assignment
 - DHCP request (Option 43)
 - AP multicasts Aruba Discovery Protocol (ADP) packets to group 239.0.82.11
 - AP broadcasts ADP packets to L2/L3 recipients
 - AP sends DNS query
 - Who is “aruba-master.domain.com”
 - “domain.com” supplied by DHCP
 - “DNS server” supplied by DHCP

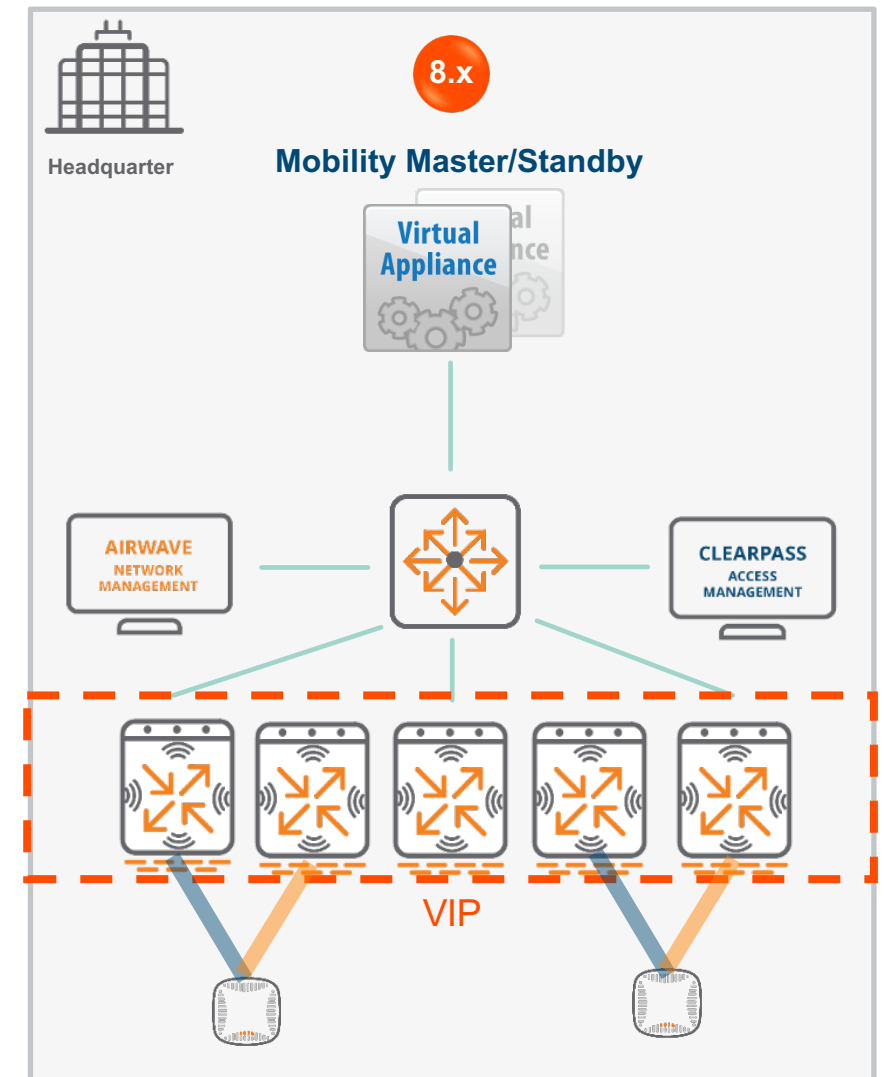
How does AP Join a Cluster?

- 1 MM does not terminate AP's
- 2 AP communicates with Cluster VIP
- 3 AP is assigned AAC and S-AAC



How does AP Join a Cluster?

- 1 MM does not terminate AP's
- 2 AP communicates with Cluster VIP
- 3 AP is assigned AAC and S-AAC
- 4 AP creates active and standby tunnels with AAC and S-AAC respectively



Campus Deployment Topologies

Large Campus

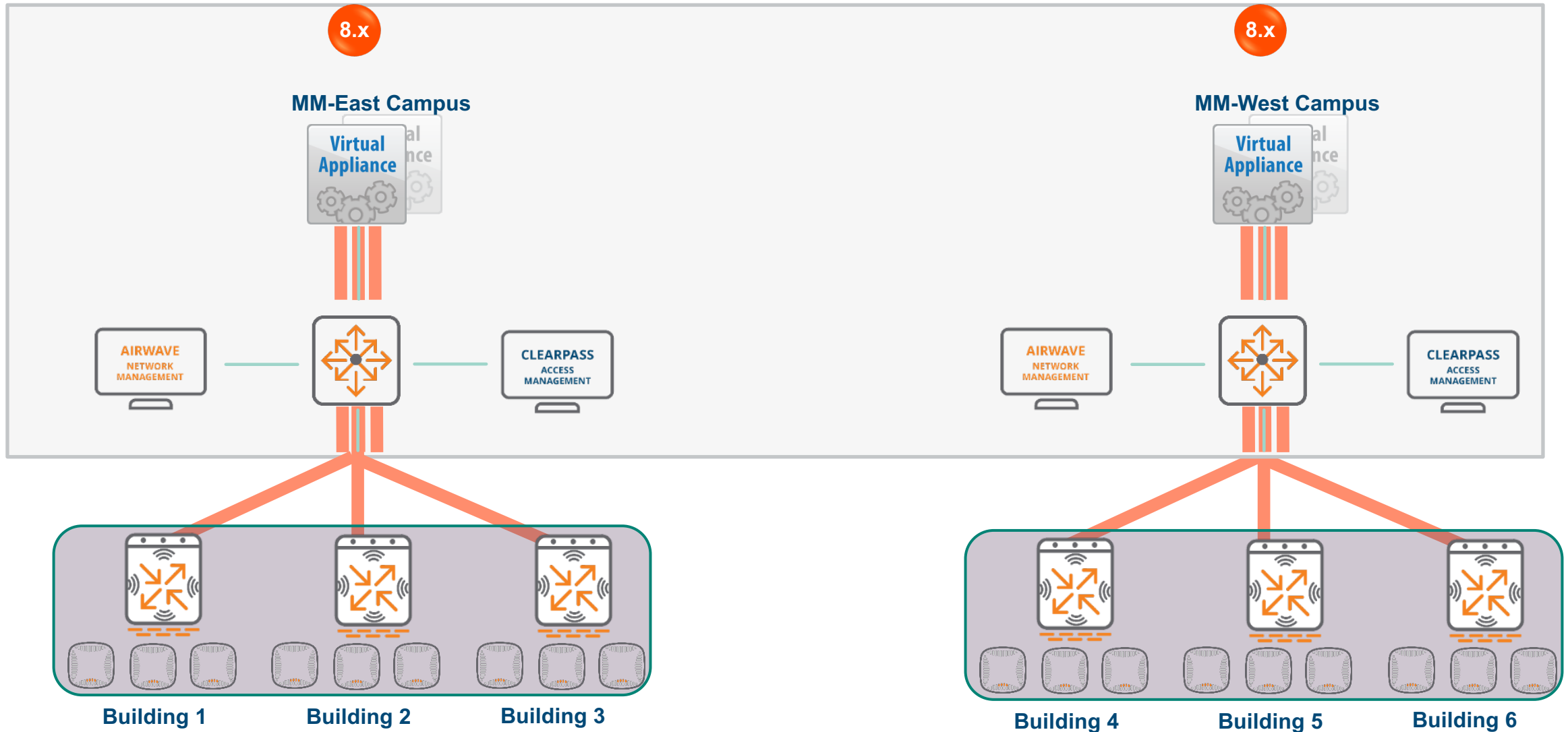
– Definition

- Large number of buildings (3 – 500+)
- Large number of users (2,000+)
- Good backhaul between buildings. 10 gig or higher depending on building type and device usage
- Universities, Healthcare, Global HQs, etc.

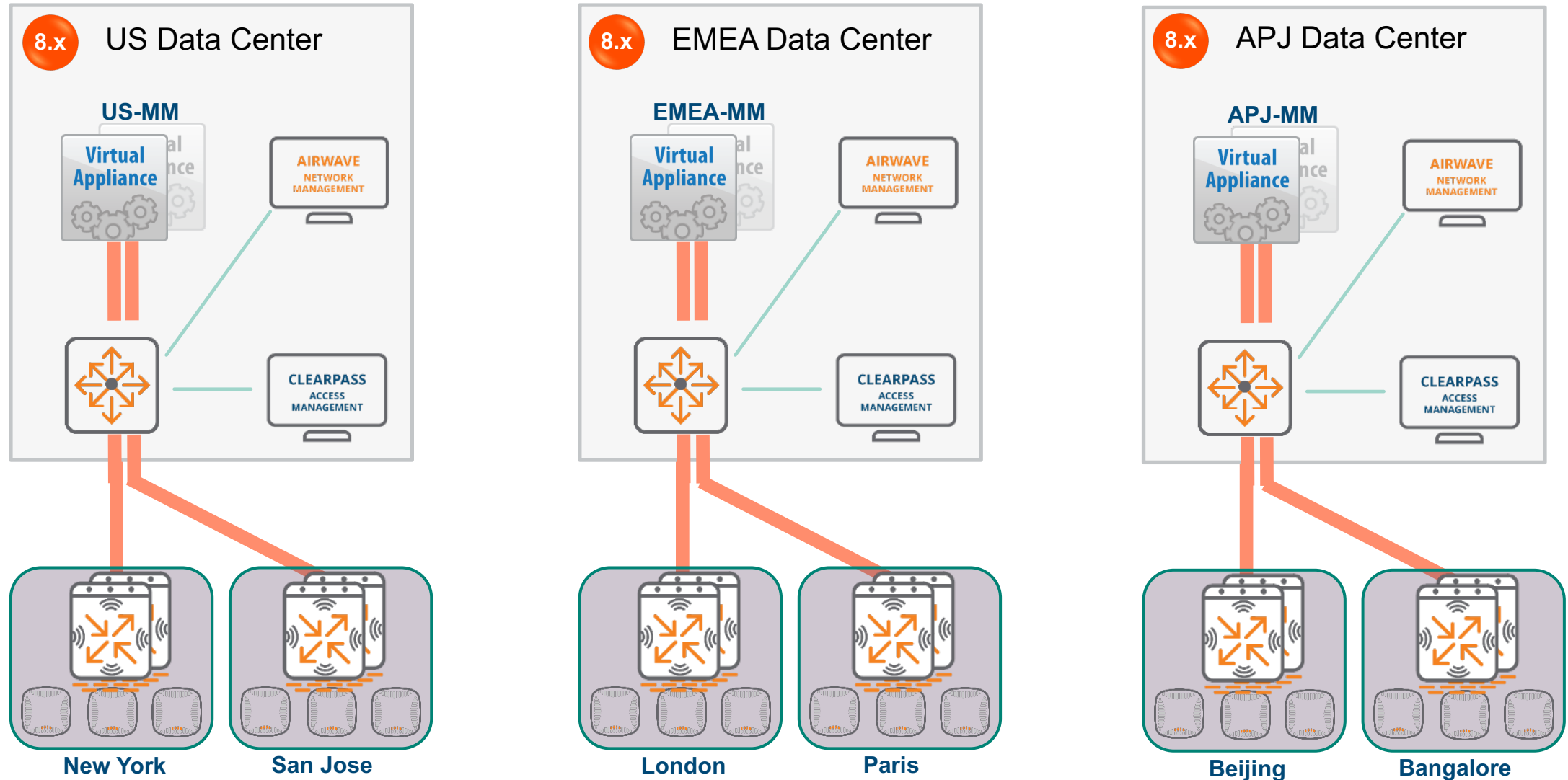
– Typical Deployment

- Mobility Master Architecture with AOS 8
- Up to 10k devices, 100k users in one Mobility Master domain
- Mobility Controllers for AP termination
- DHCP/DNS for controller discovery
- Seamless Redundancy with Controller Clustering
- Centralized licensing

Large Campus Deployment



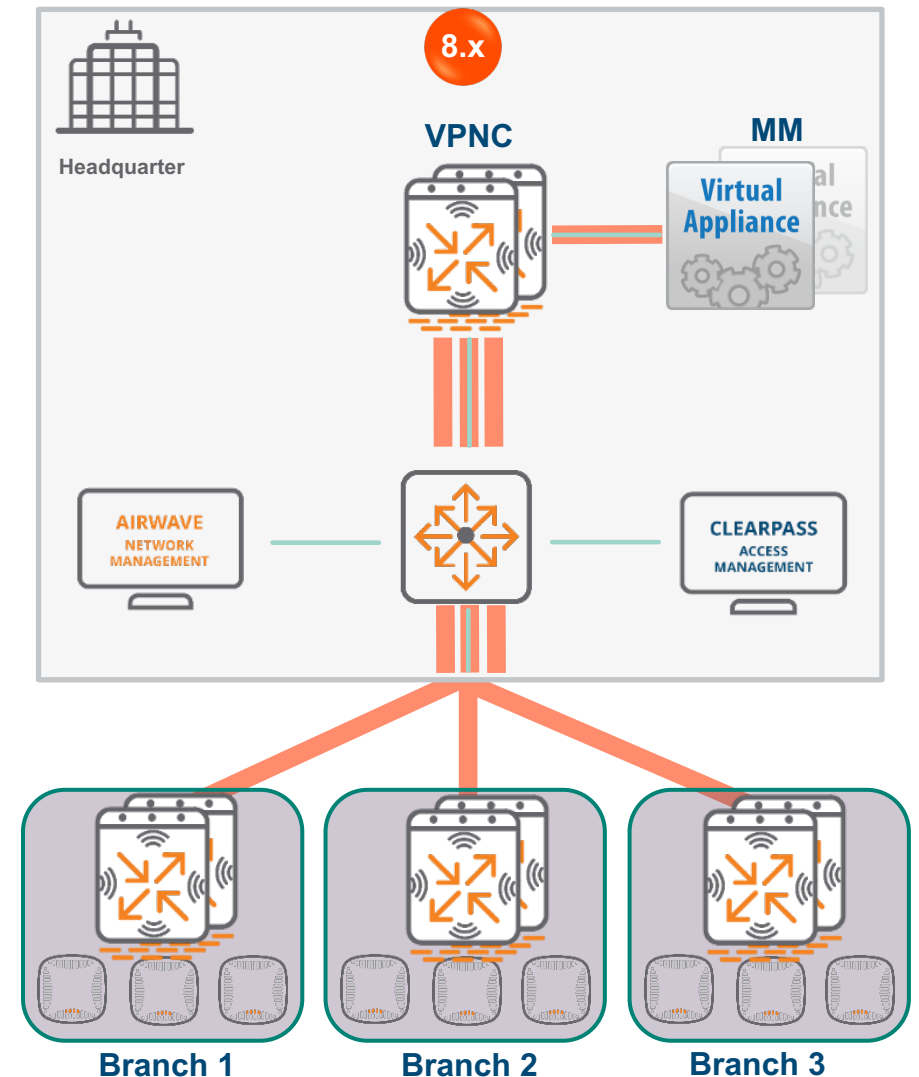
Global Enterprise Deployment



Campus with Distributed Branches

- 1 Deploy a Mobility Master
- 2 Convert Master and Standby Master to VPNC
- 3 Optional - Terminate MC's on VPNC
- 4 Branch Redundancy available with Clustering

VPN Tunnel



MultiZone

MultiZone Framework

Zone

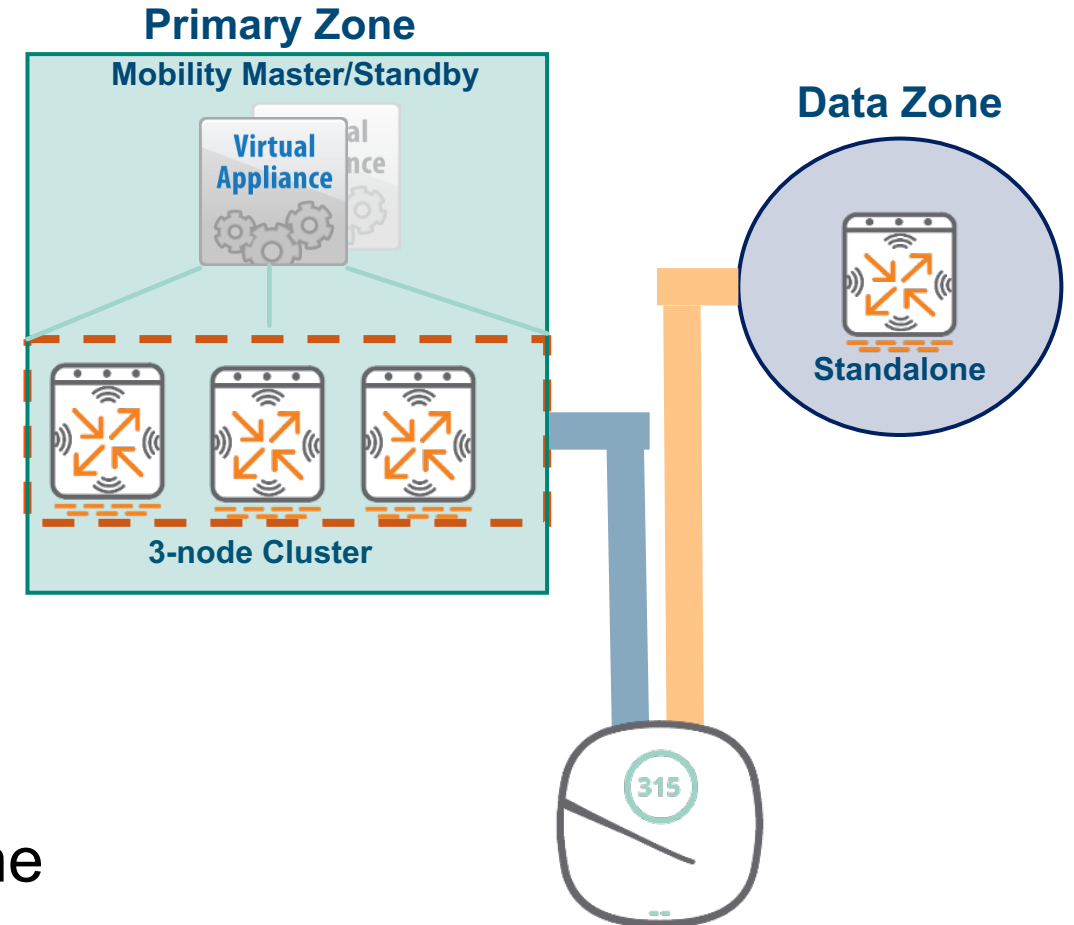
- Collection of controllers under a single administration domain
- Single controller or a cluster of controllers

MultiZone AP

- Same AP hardware - tunnels terminating in different controller domains
- Secured Containers for different SSIDs

Primary Zone

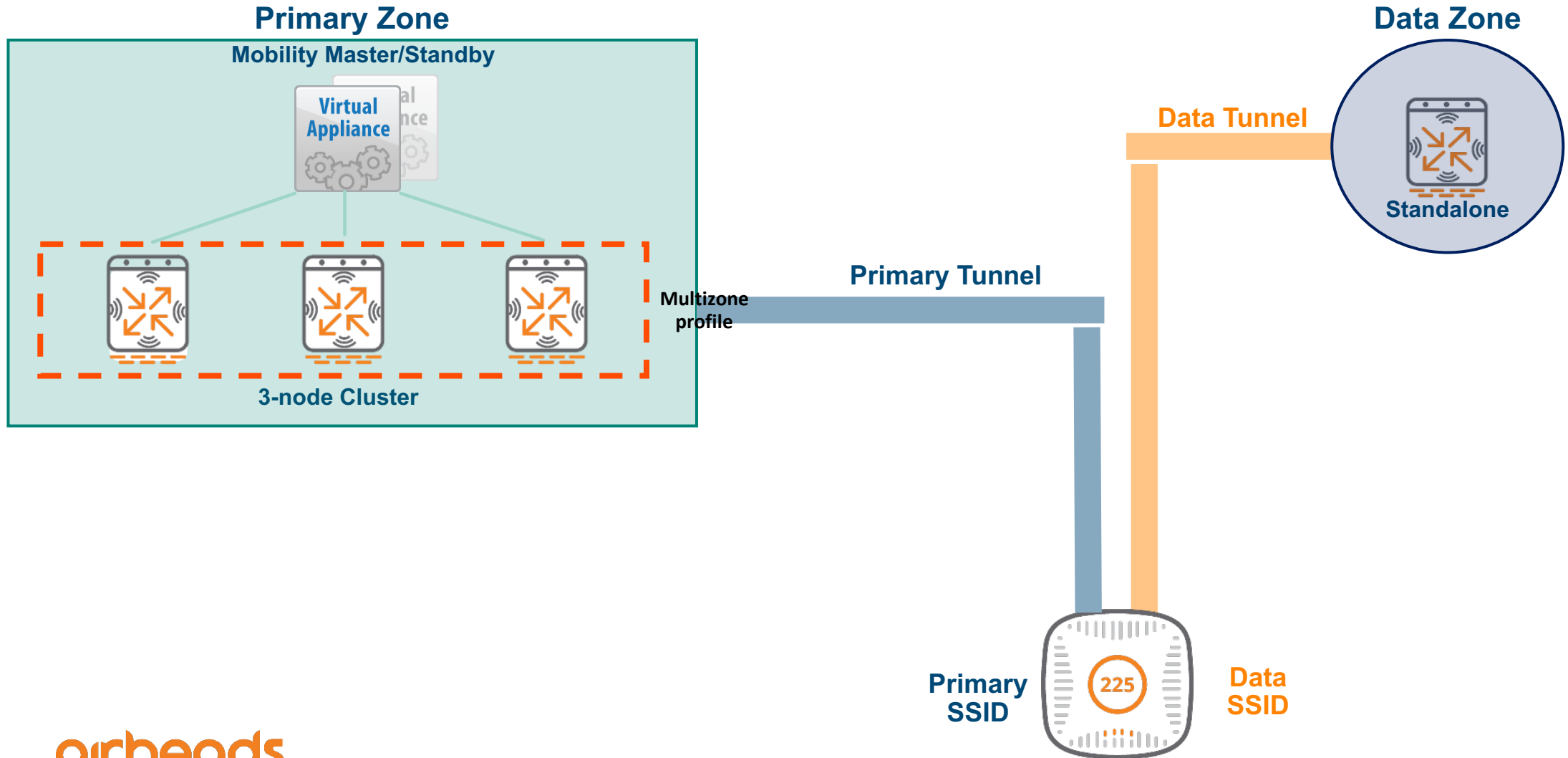
- Zone AP connects to when booting up
- Full Management and configuration of the AP features
- Enables the feature during config



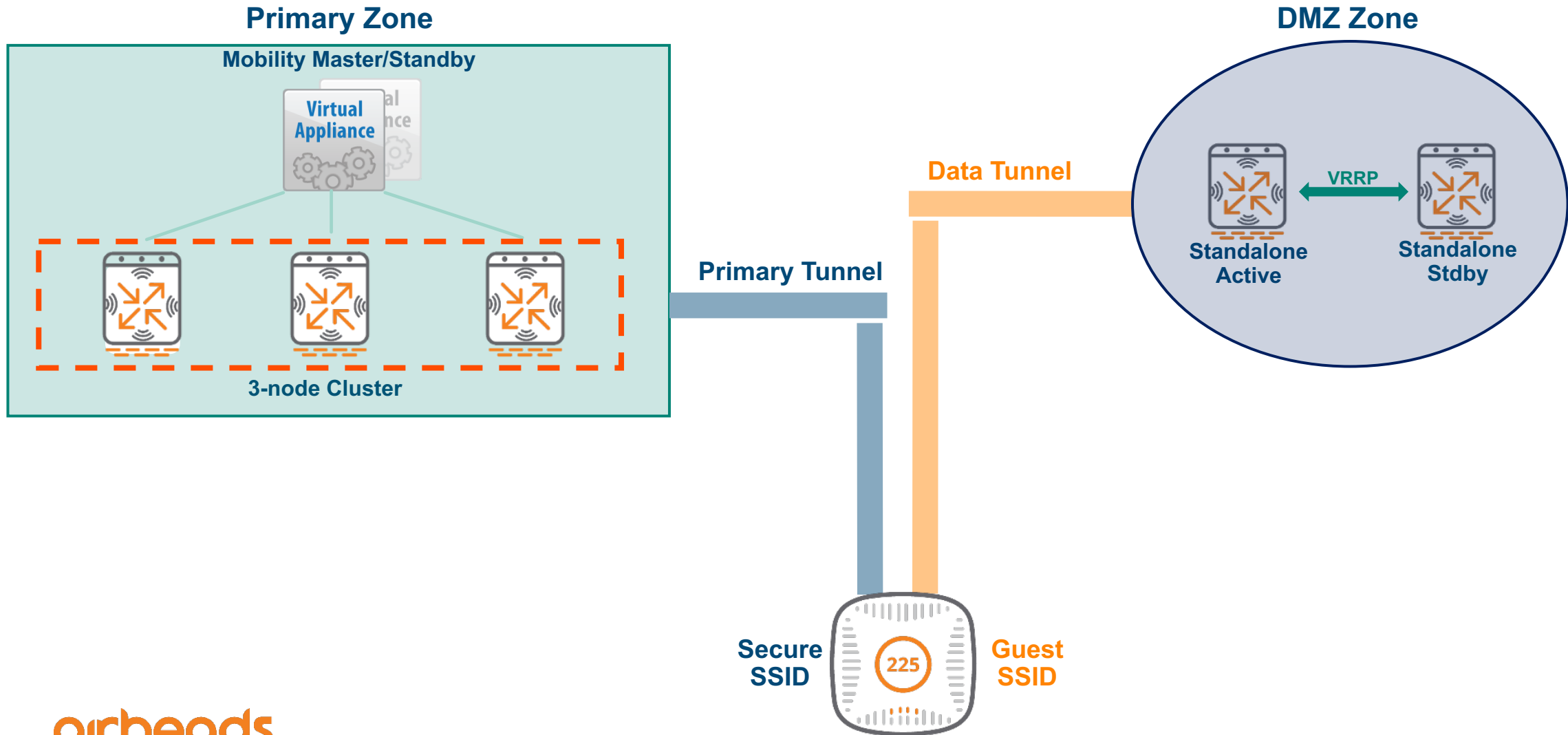
Data Zone

- Zone AP connects to after receiving multizone profile
- Cannot reboot, provision or upgrade AP image
- Tunnel mode configuration related to its SSID ONLY

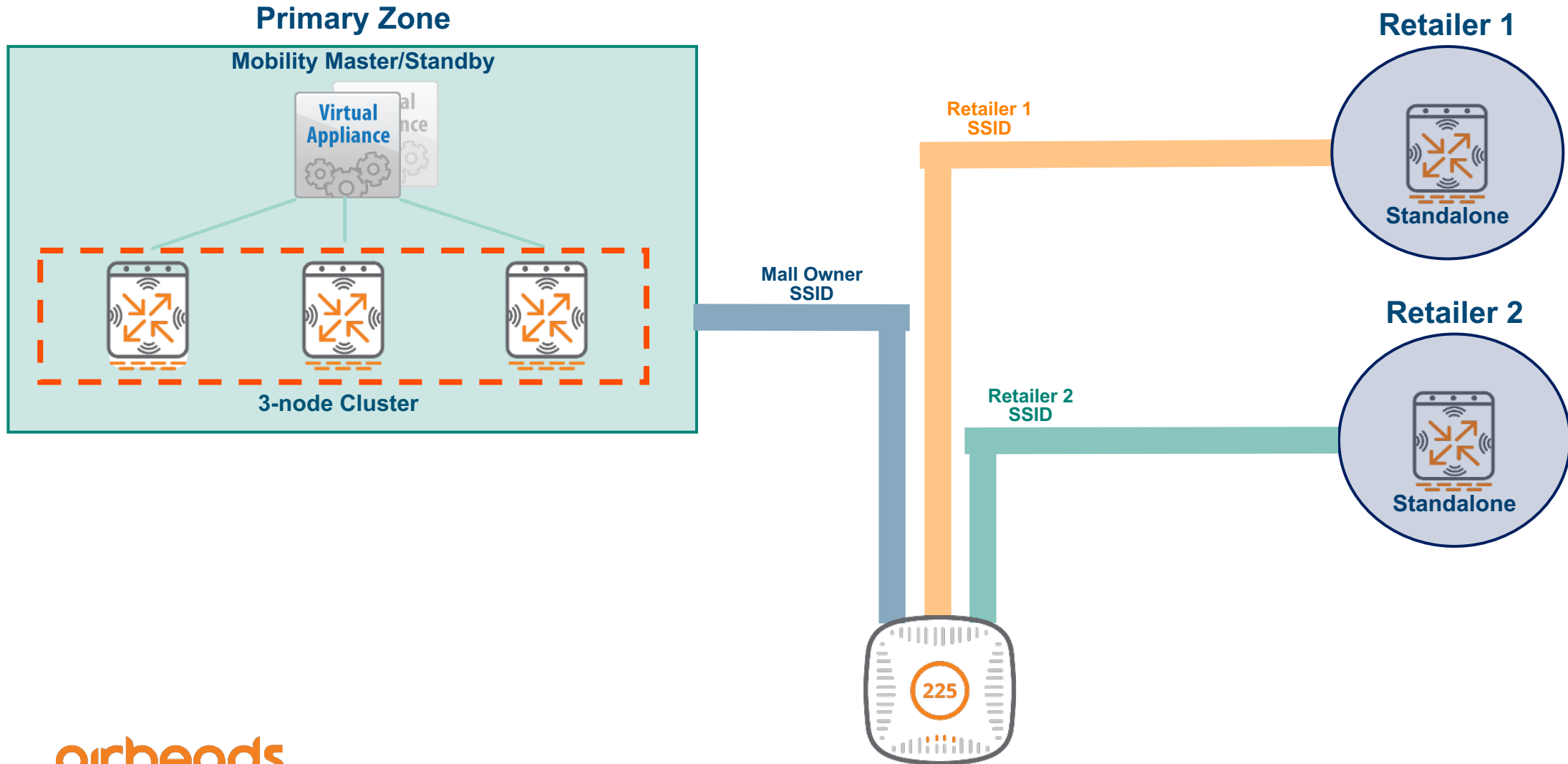
MultiZone Architecture



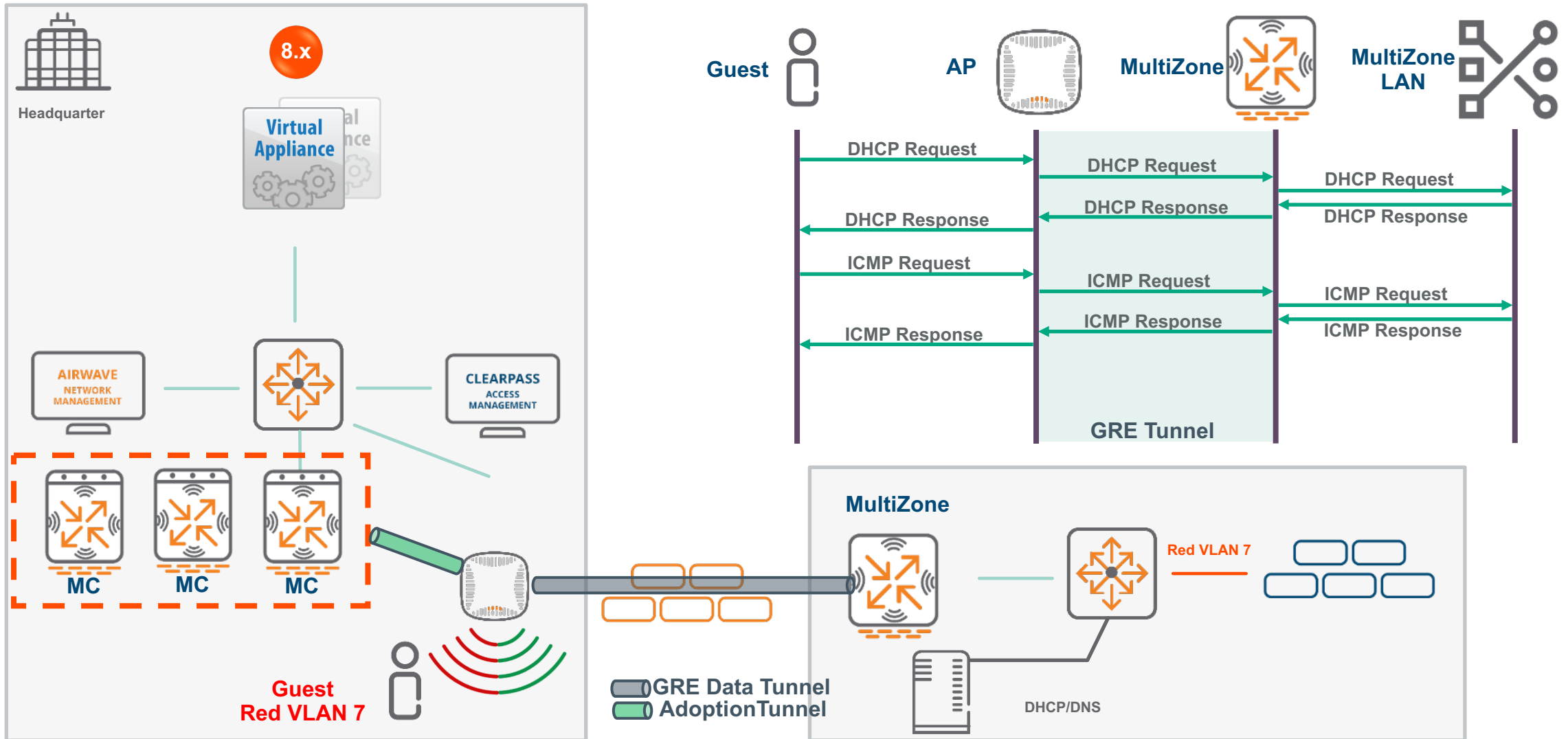
MultiZone Use Case: Guest Access



MultiZone Use Case: Multi-tenancy (Shopping Mall)



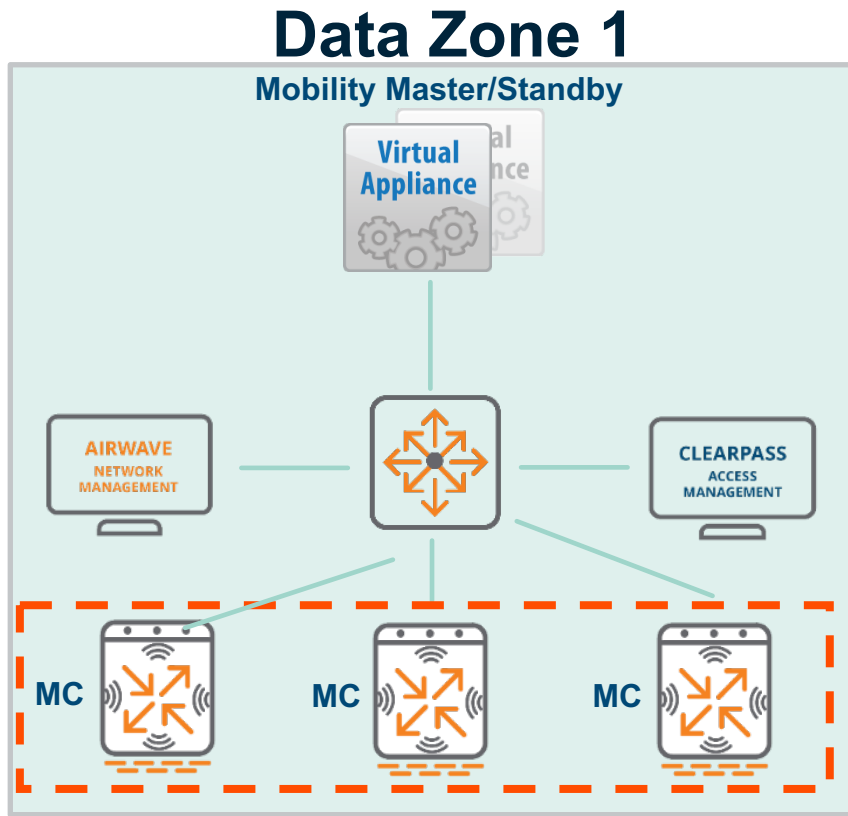
MultiZone Controller for Guest Data Termination in 8.x



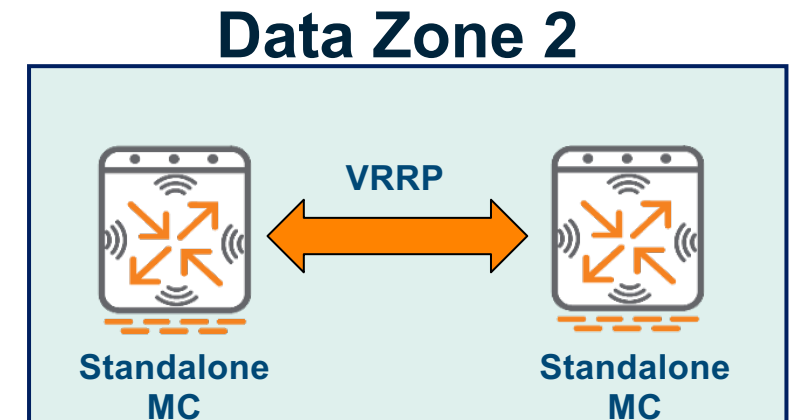
Multizone Deployments

Redundancy in the Data Zone

A Cluster (requires DZ Mobility Master)



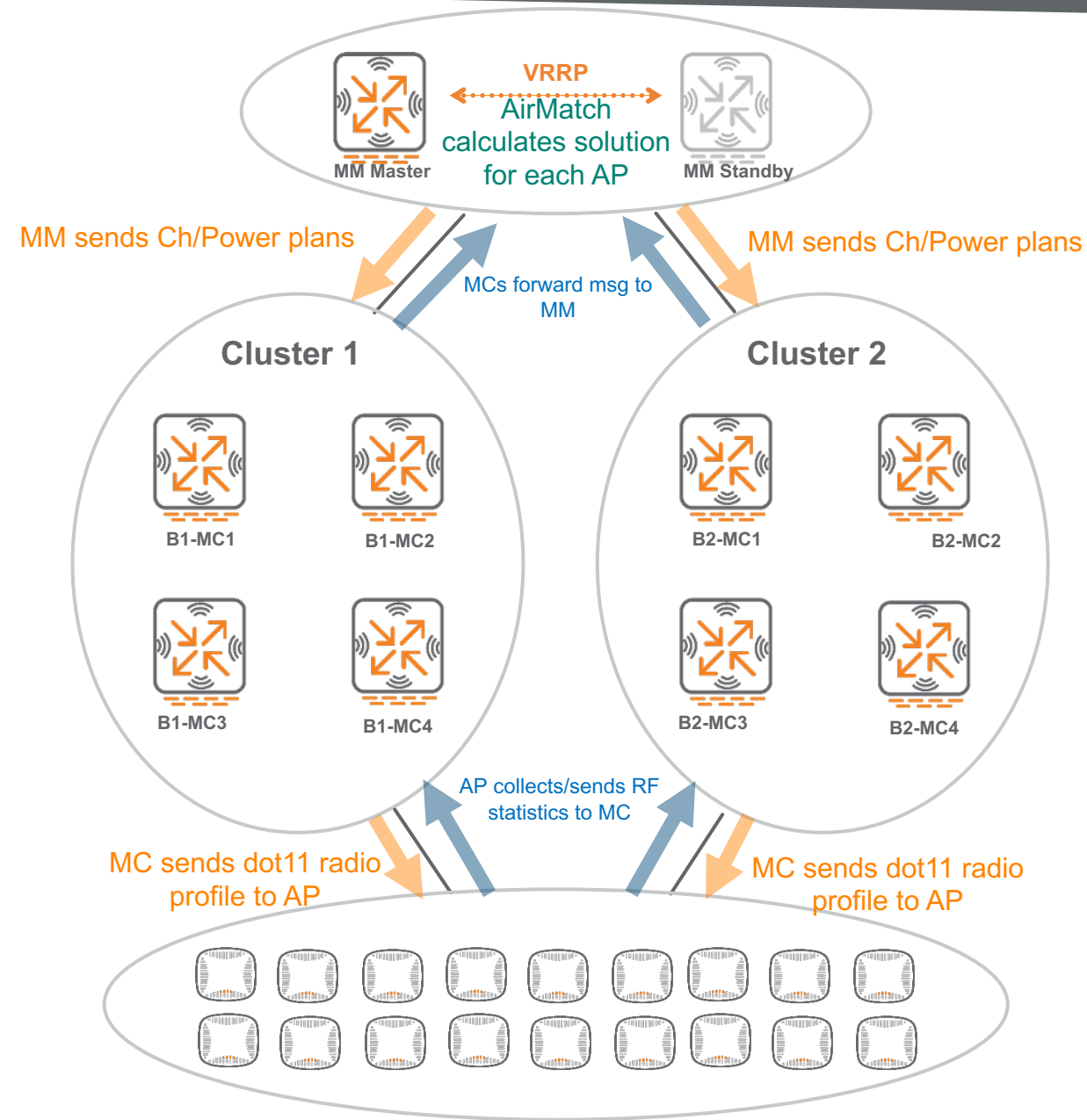
A pair of standalone MCs w/vrrp



RF Optimization with AirMatch

AirMatch for RF Optimization

- Centralized RF optimization service, models the network as a whole
- Based on AP neighbour path-loss metrics
- Channel bandwidth aware
- Prior 24 hours RF info used for calculation



AirMatch Proactive Solution – When Deployed?

1. Sufficient improvement in the quality of the new channel plan
2. New APs are added to the network
3. Static channel configurations changes are removed ('airmatch ap unfreeze')
 - AirMatch honors static channel settings
4. Percentage of radios on radar/noise prone channels
5. Percentage of radios requiring updated channel bandwidth

AirMatch Reactive Solution

– High Noise Events

- AP changes channel using ARM intf_index
- Noise threshold configurable in ARM profile
- AP moves back after 30 mins
- If noise again detected, AP moves to new channel and stays there for 12 hrs

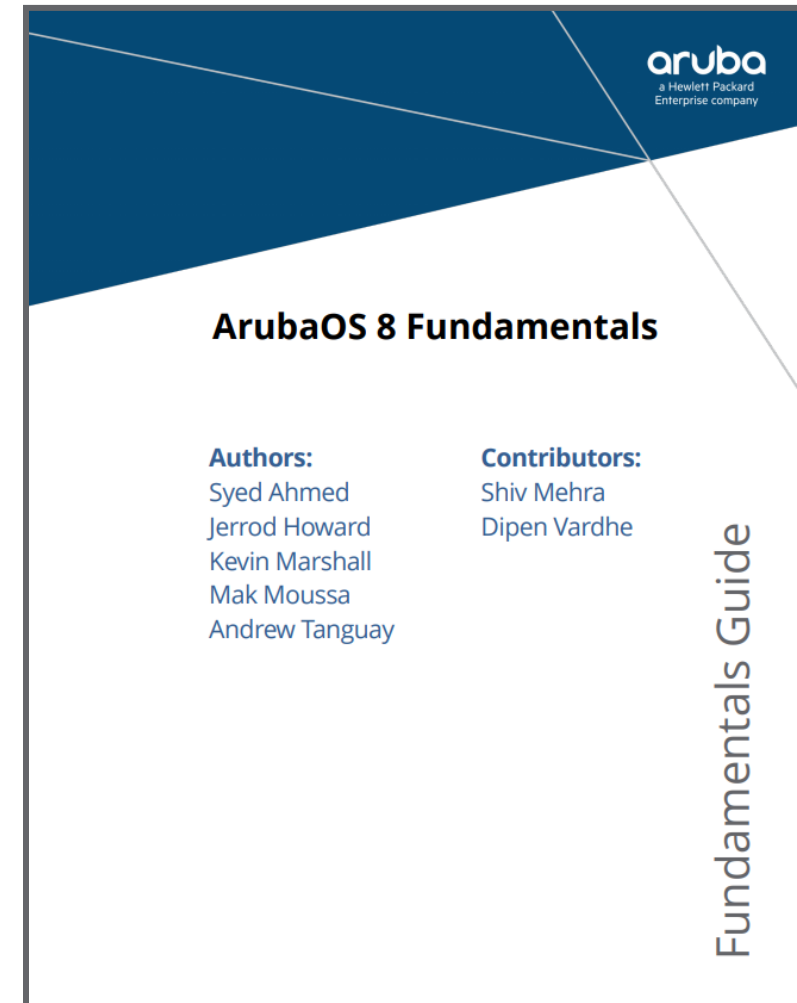
Radar Events

- AP immediately vacates the channel
- AP moves back after the radar event timer has expired
- Two consecutive Radar events blacklists the channel

Resources

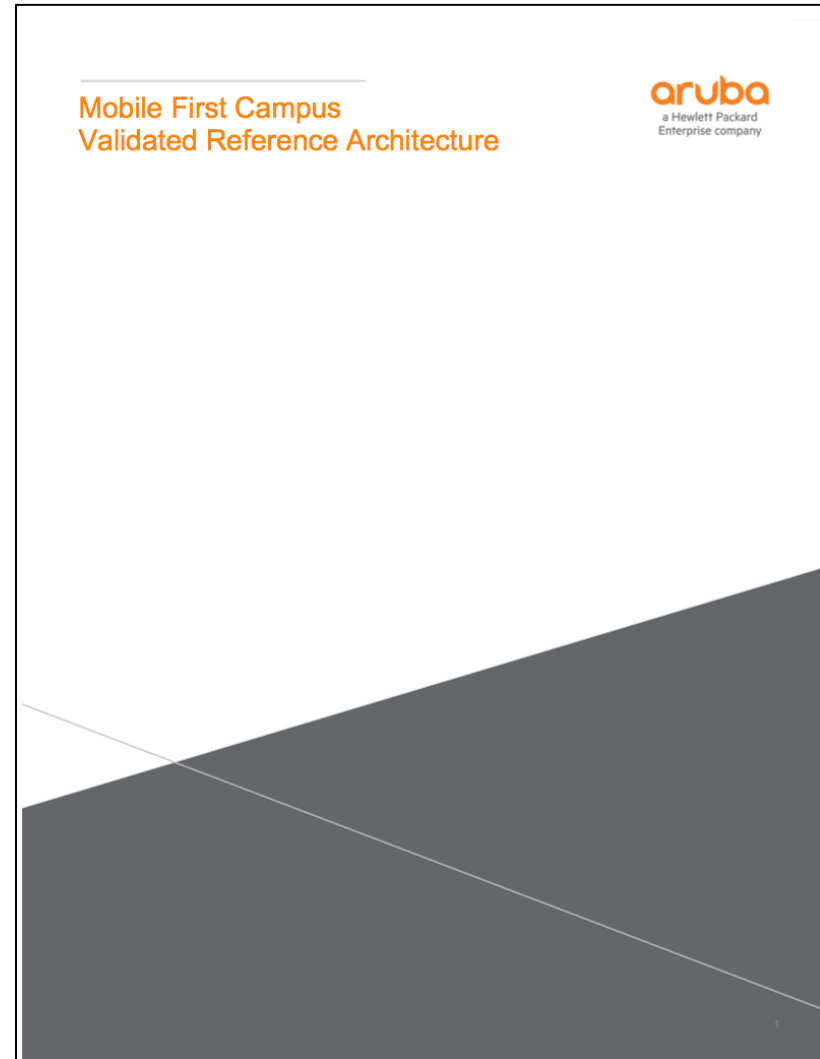
Recommended Reading

- All the key concepts covered in this session are documented in the ArubaOS 8 Fundamentals Guide in the Reference Architectures section
- https://arubapedia.arubanetworks.com/arubapedia/index.php/File:ArubaOS_8_Fundamentals_Guide.pdf
- <http://community.arubanetworks.com/t5/Controller-Based-WLANs/ArubaOS-8-Fundamentals-Guide/tap/428914>



Recommended Reading

- Mobile First Campus VRD covering campus deployments with wired and wireless networks
- Excellent companion to AOS 8 Fundamentals Guide
- https://support.hpe.com/hpsc/doc/public/display?docId=a00056448en_us



airheads

TECH TALK *LIVE*

Thank You