aruba NETWORKS

atmosphere 2015
HOW TOMORROW MOVES

ARUBA WLANS 101 AND DESIGN FUNDAMENTALS

Tim Cappalli

March 2015

About Me

- **Sr. Mobility Solutions Architect**
  Wireless Practice Lead
- **Boston, MA**
- **Airheads Community: cappalli**
- **Favorite product? ClearPass**

@tcappy0707

about.me/timcappalli

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Agenda

- **Mobility controller architecture**
- **Aruba Instant architecture**
- **RAP-NG / IAP-VPN**
- **Management platforms**
  - Aruba Central
  - AirWave
- **Discussion & Questions**

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Deployment types

- **Mobility Controller: Master-local**
- **Mobility Controller: All masters**
- **Instant**
- **Instant: RAP-NG**
- **Hybrid! (all of the above, mix and match)**

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Mobility Controller Architecture

Mobility Controller Family

7200 SERIES

256 APs
4,096 IPSec

512 APs
16,384 IPSec

1,024 APs
24,576 IPSec

2,048 APs
32,768 IPSec

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Mobility Controller Family

CLOUD SERVICES CONTROLLERS

16 APs
Can be powered via PoE

64 APs

32 APs
10 PoE+

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Mobility Controller Family

CLOUD SERVICES CONTROLLERS

32 APs, 24 PoE+, 2x10G

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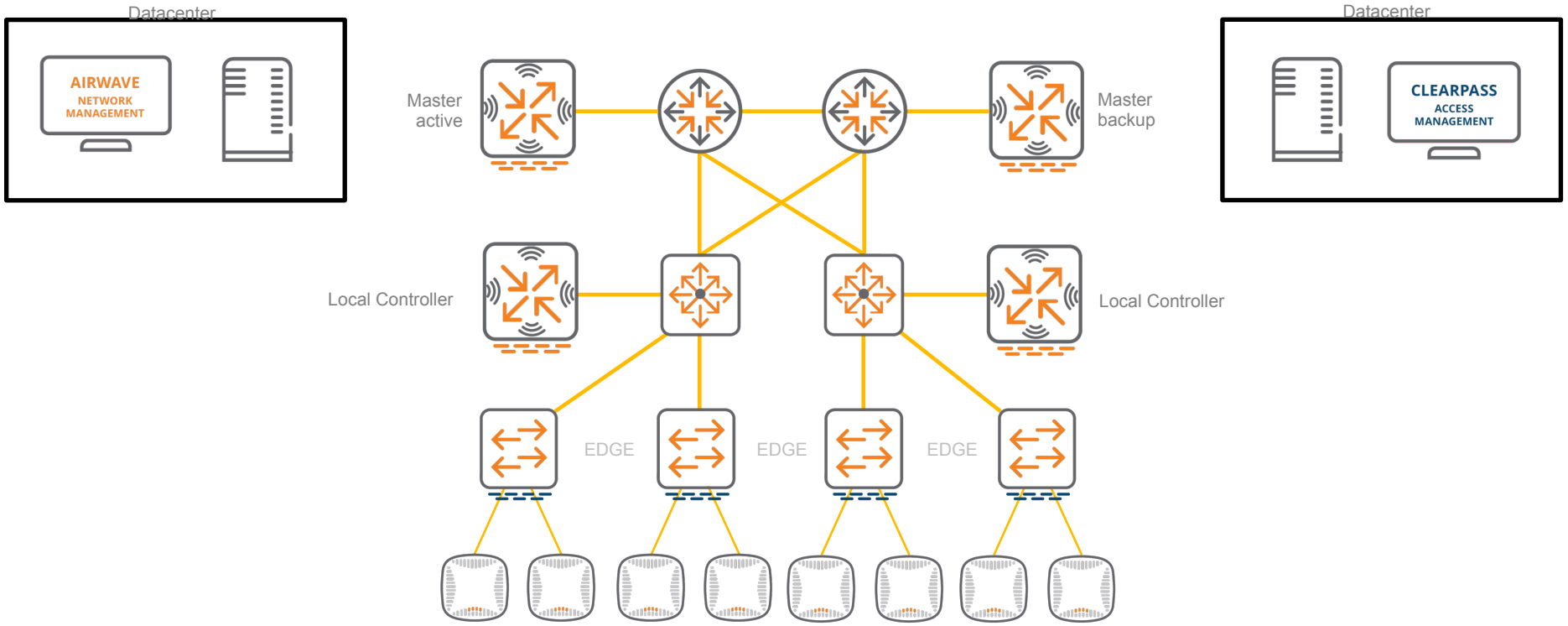
Campus physical topology



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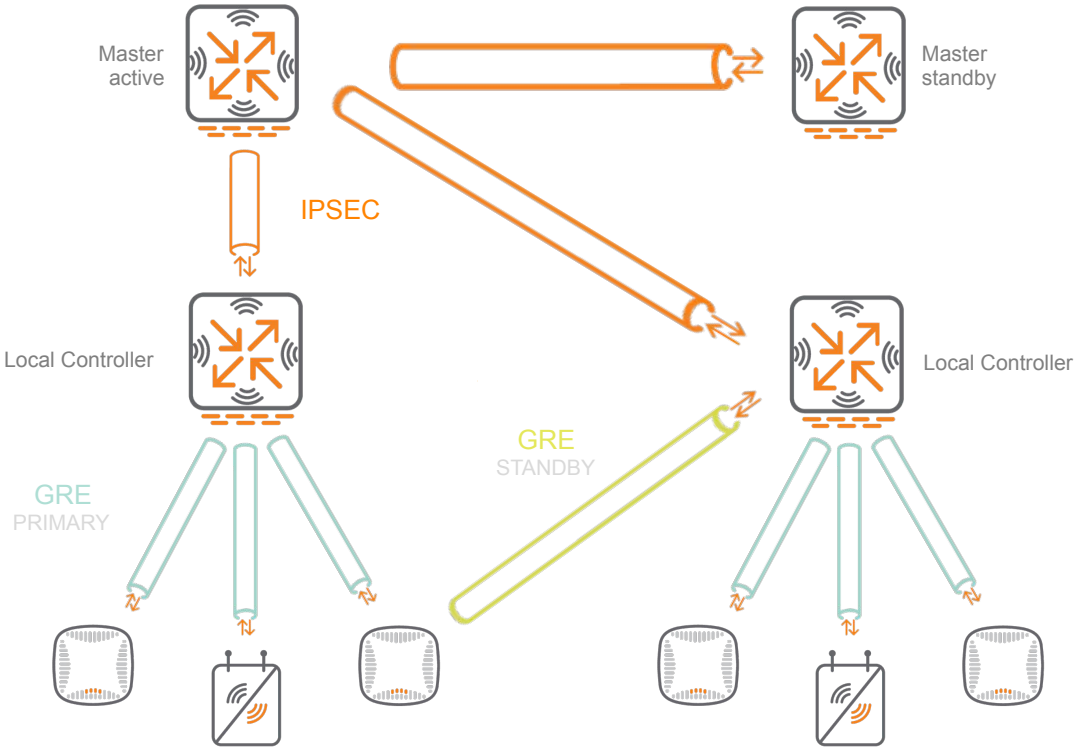
Campus logical topology



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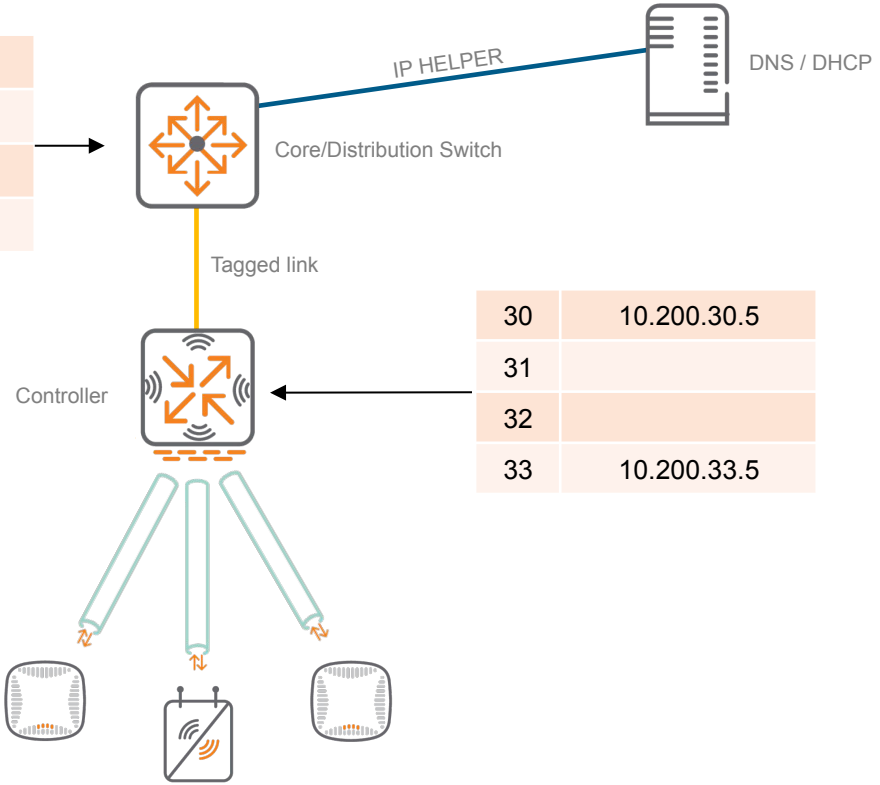
L2 Deployment

MGMT	30	10.200.30.1
CORP CLIENTS	31	10.200.31.1
BYOD CLIENTS	32	10.200.32.1
GUEST	33	10.200.33.1



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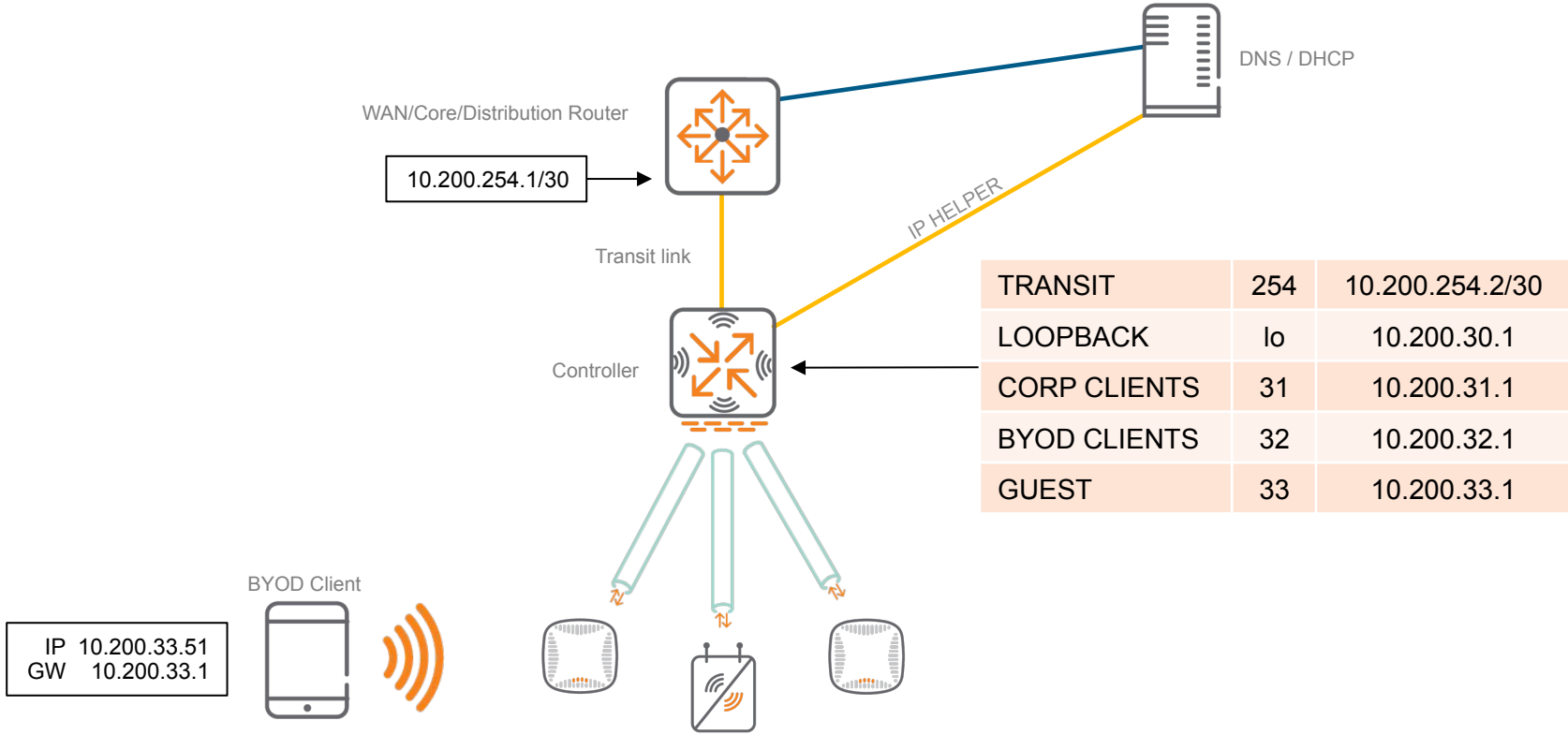
L3 Deployment



TRANSIT	254	10.200.254.2/30
LOOPBACK	lo	10.200.30.1
CORP CLIENTS	31	10.200.31.1
BYOD CLIENTS	32	10.200.32.1
GUEST	33	10.200.33.1

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Master controller responsibilities

- **Policy configuration**
- **Wireless security (WIPS / RFProtect)**
- **AP white lists (CAPs w/ CPsec and RAPs)**
- **Initial AP configuration**
- **Authentication and roles**

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Local controller responsibilities

- **AP and session termination**
  - Terminates AP tunnels
  - User traffic processed and forwarded
- **RFProtect enforcement and blacklisting**
- **ARM**
- **Mobility**
- **QoS**

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Controller scaling

- **Controller scaling table (VRD)**
- **The important numbers**
  - AP capacity
  - User/device capacity << important!
  - Tunnel capacity
- **WMS scaling for master controller**
  - Master controller may need to be larger than the locals depending on the environment

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Controller scaling

- **Platform**
  - 7000 series (7005/7010/7024/7030) should only be used as local controllers*
  - 7200 series should be master for multiple 7000 locals
- **Failover capacity**

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Campus Forwarding Modes

- **Tunnel**
- **Bridge**
- **Decrypt-tunnel**

- **Configured per virtual-ap and per ethernet interface**
- **Choose based on network topology and requirements**

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Tunnel

- All traffic is tunneled back to controller
- User VLANs live in controller
- Wired network is a high-speed overlay network
- User traffic passes through stateful firewall and deep packet inspection engine (*on 7 series controllers)

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Bridge

- User traffic bridged out to local network
- User VLANs live in edge network
- Authentication traffic tunneled to controller
- Control plane security (cpsec) required
- Captive portal authentication is not supported

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Decrypt-tunnel (d-tunnel)

- User VLANs live in controller
- AP decrypts traffic and strips 802.11 headers
- AP adds 802.3 headers and frame is encapsulated in GRE tunnel to controller
- Controller applies firewall policies to traffic
- Solves double-encryption issues when using a VPN
- Control plane security (cpsec) required

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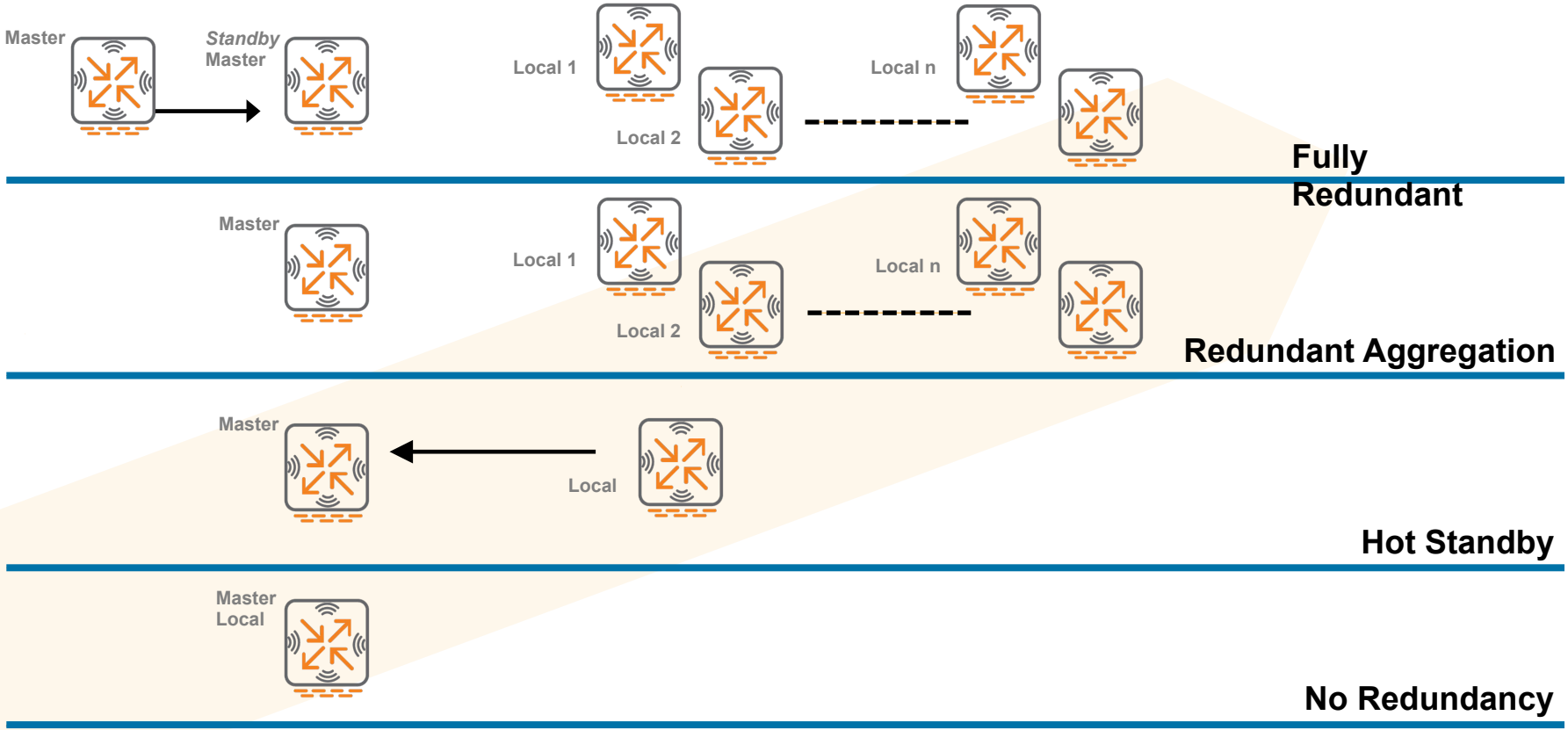
Campus Redundancy

Master-Local Redundancy



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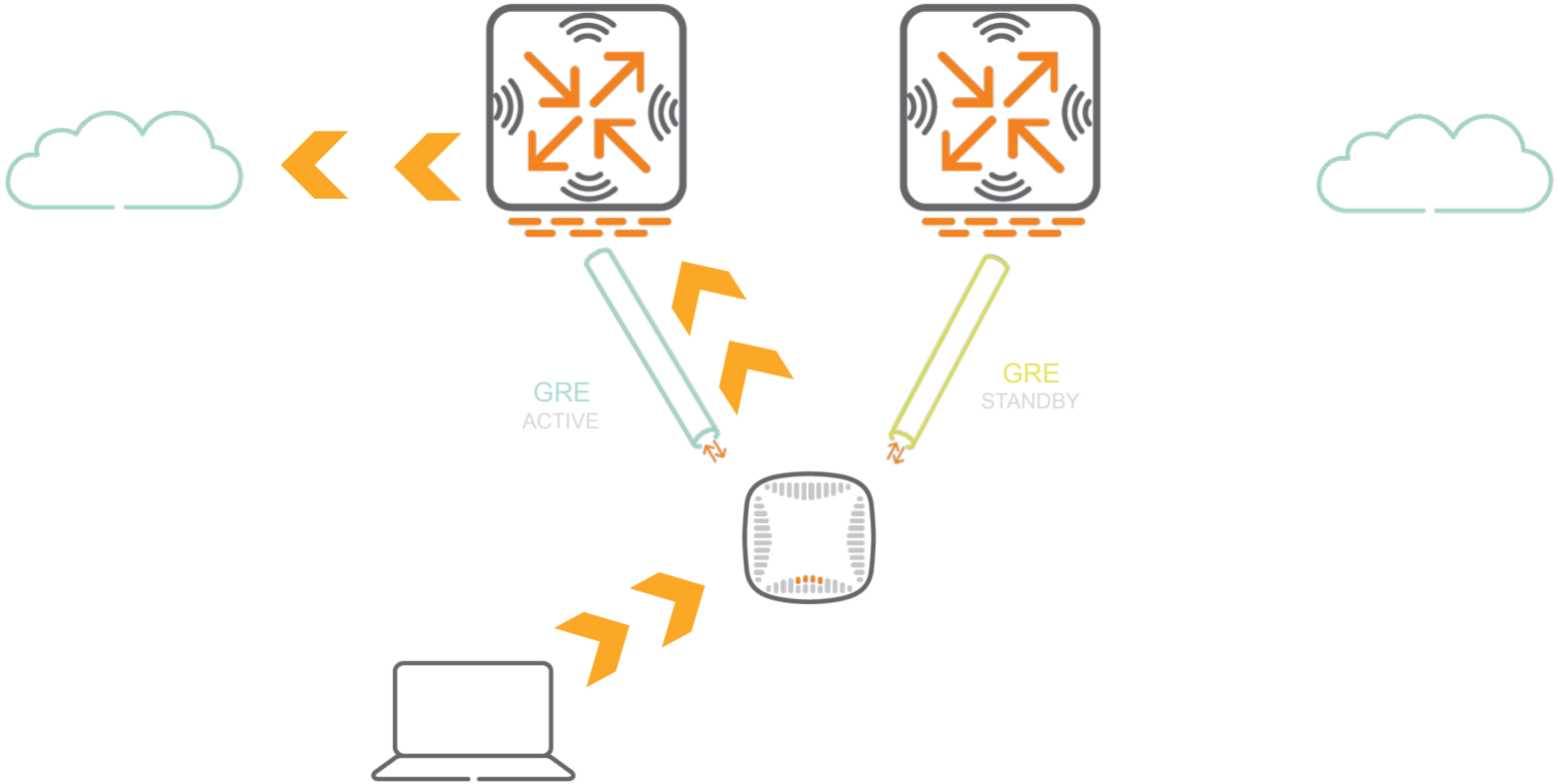
HA: AP Fast Failover



AOS 6.3+

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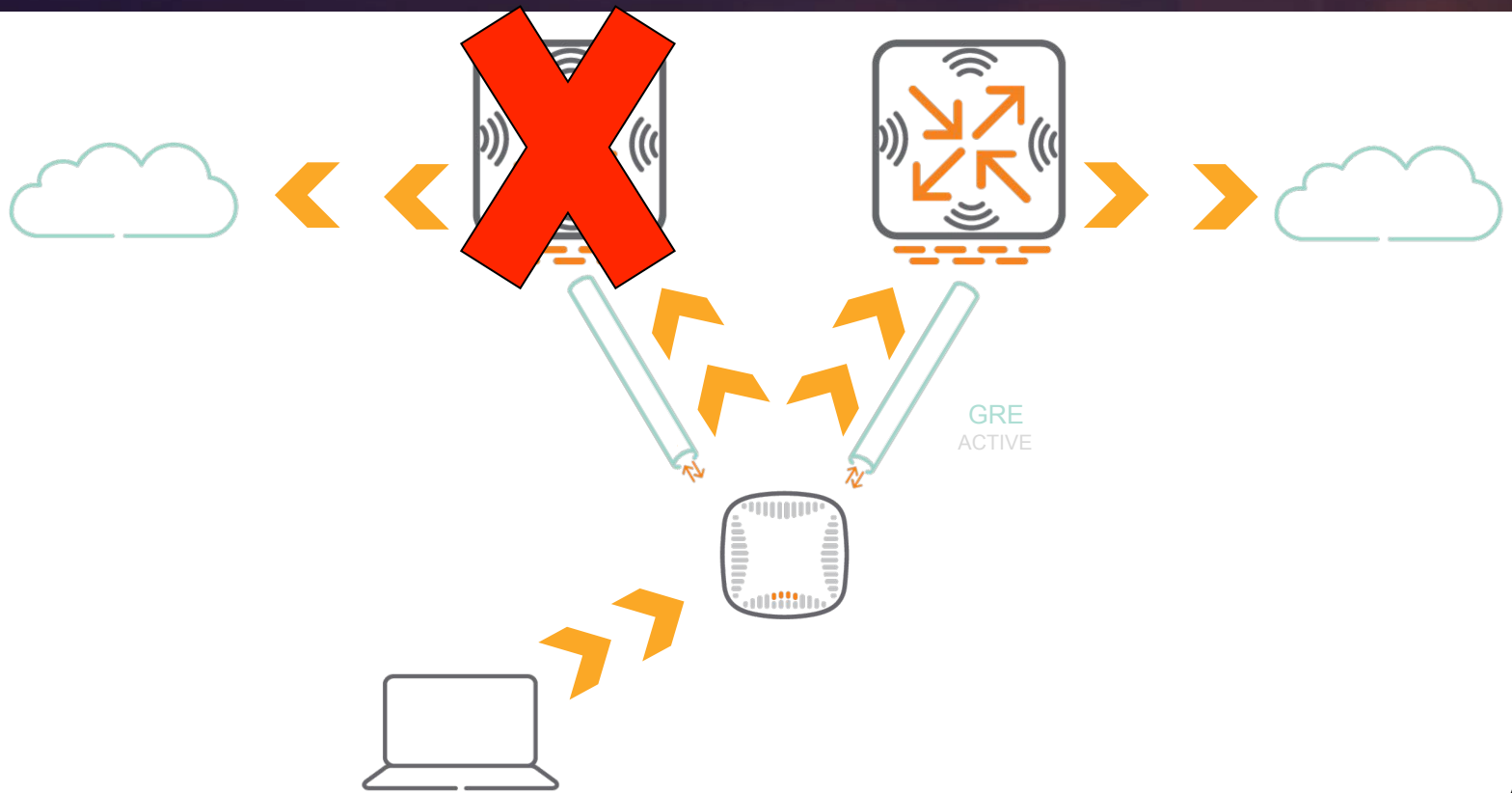
HA: AP Fast Failover



AOS 6.3+

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AP FF: Controller Roles

- **DUAL:** Primary for some APs, standby for others
- **ACTIVE**: Controller does not terminate standby tunnels for other controllers
- **STANDBY**: Controller only terminates standby tunnels

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AP FF: N+1 Oversubscription

Controller Platform	Ratio	Max GRE tunnels
7000-series (70-05/10/24/30)	1:1	--
7210	4:1	16K
7220	4:1	32K
7240	4:1	64K
M3 & 3600	2:1	16K

AOS 6.**4**+

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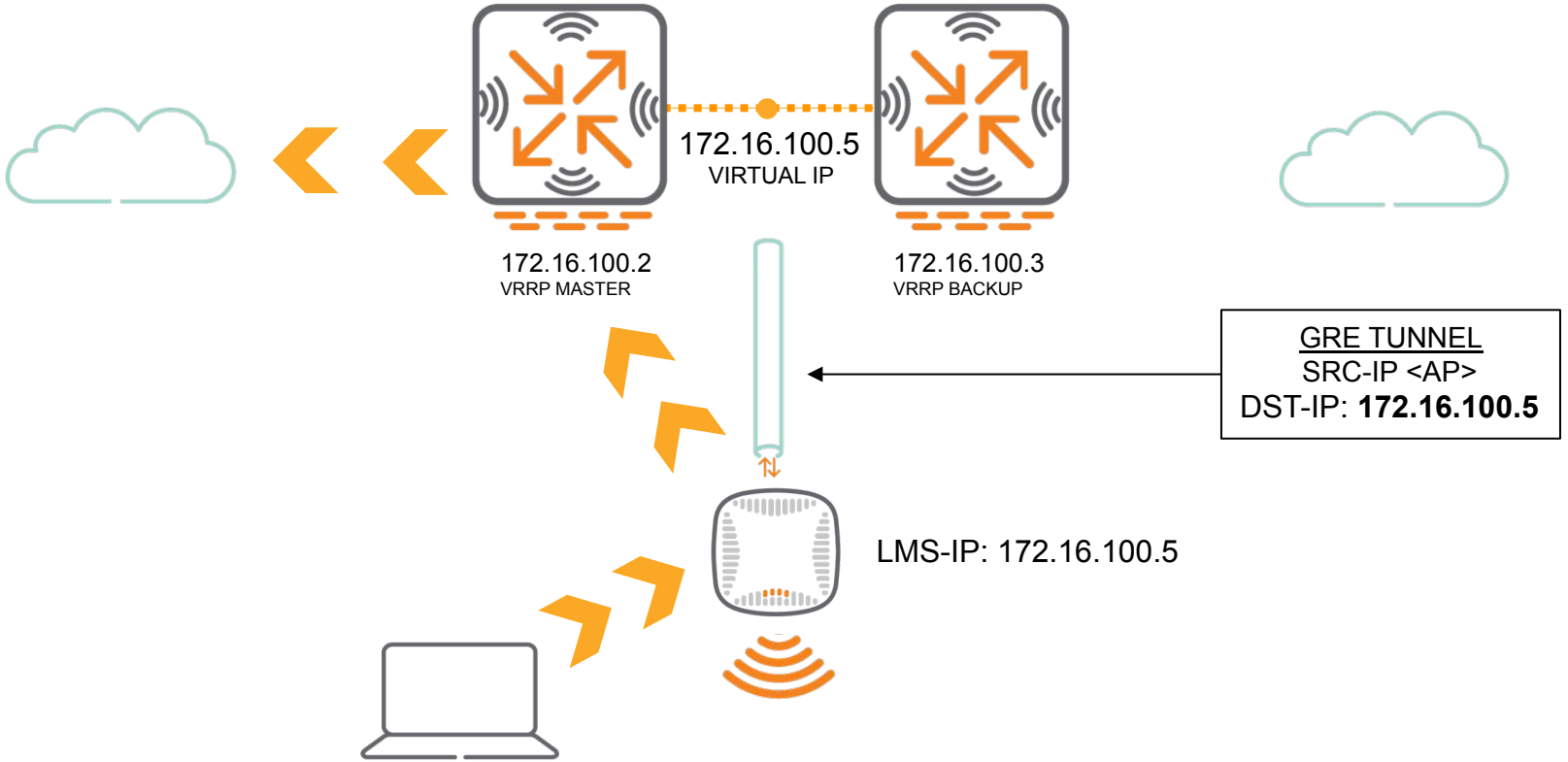
VRRP Failover (L2)



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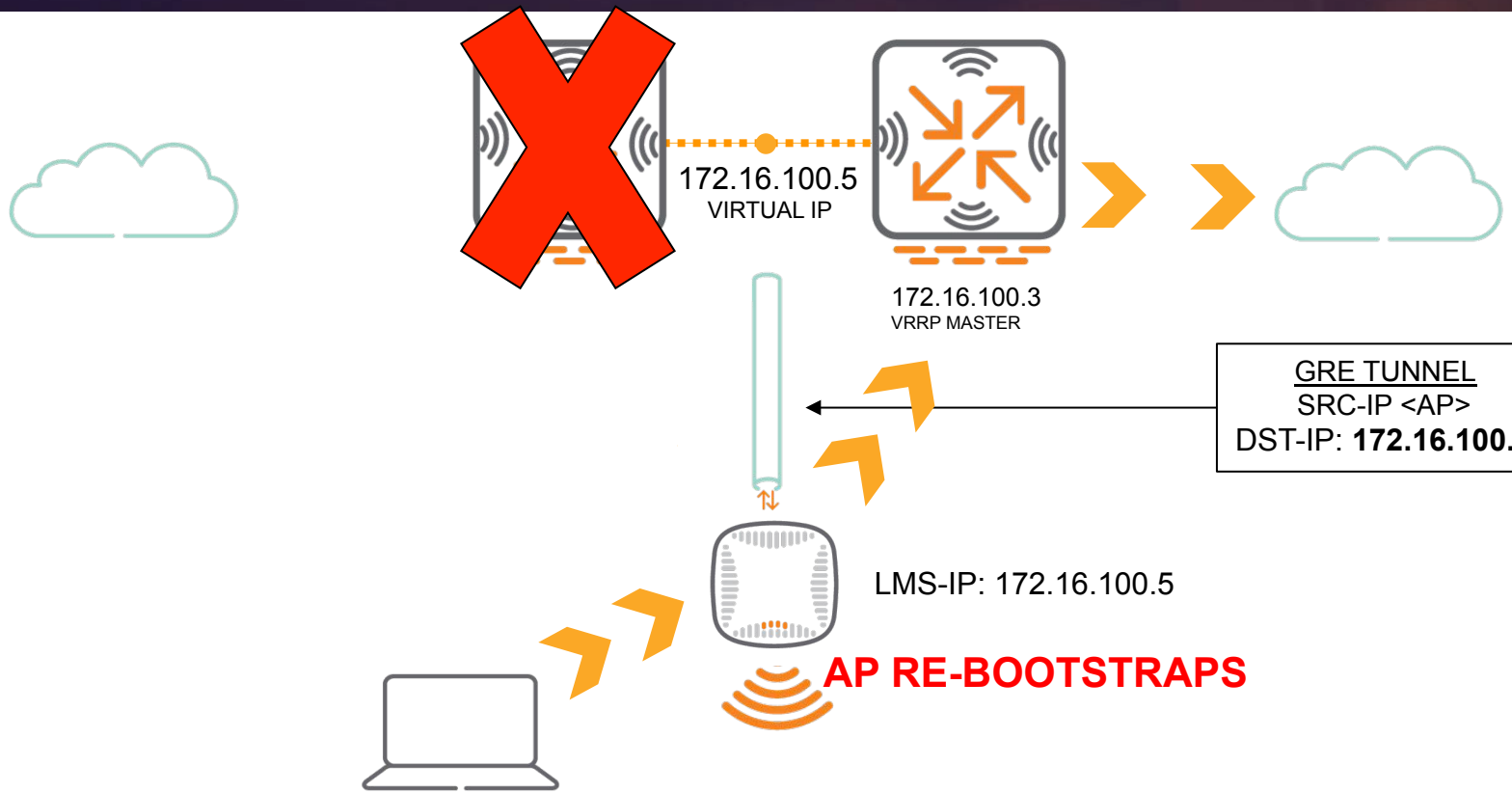
VRRP Failover (L2)



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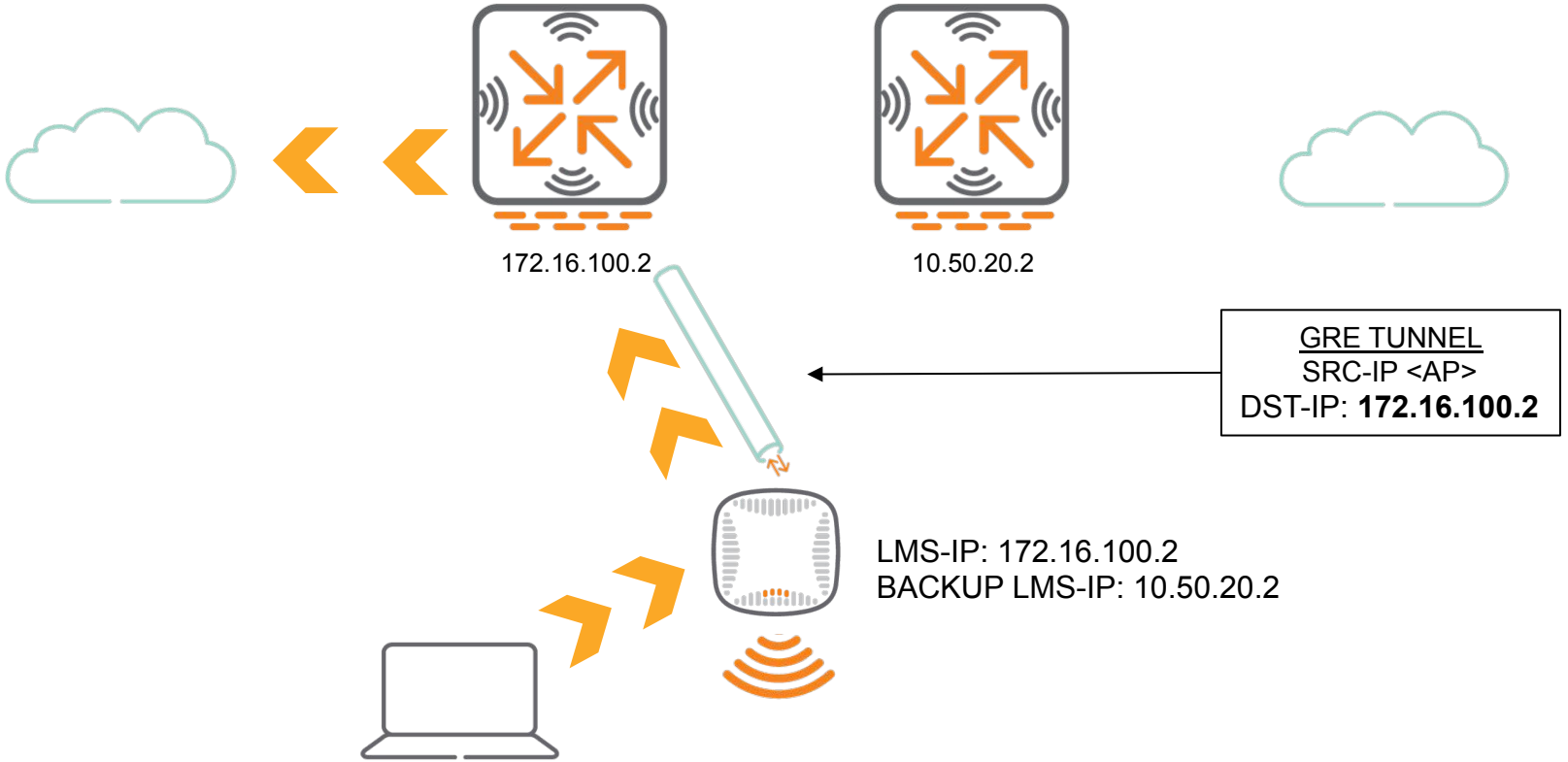
Backup-LMS (L3)



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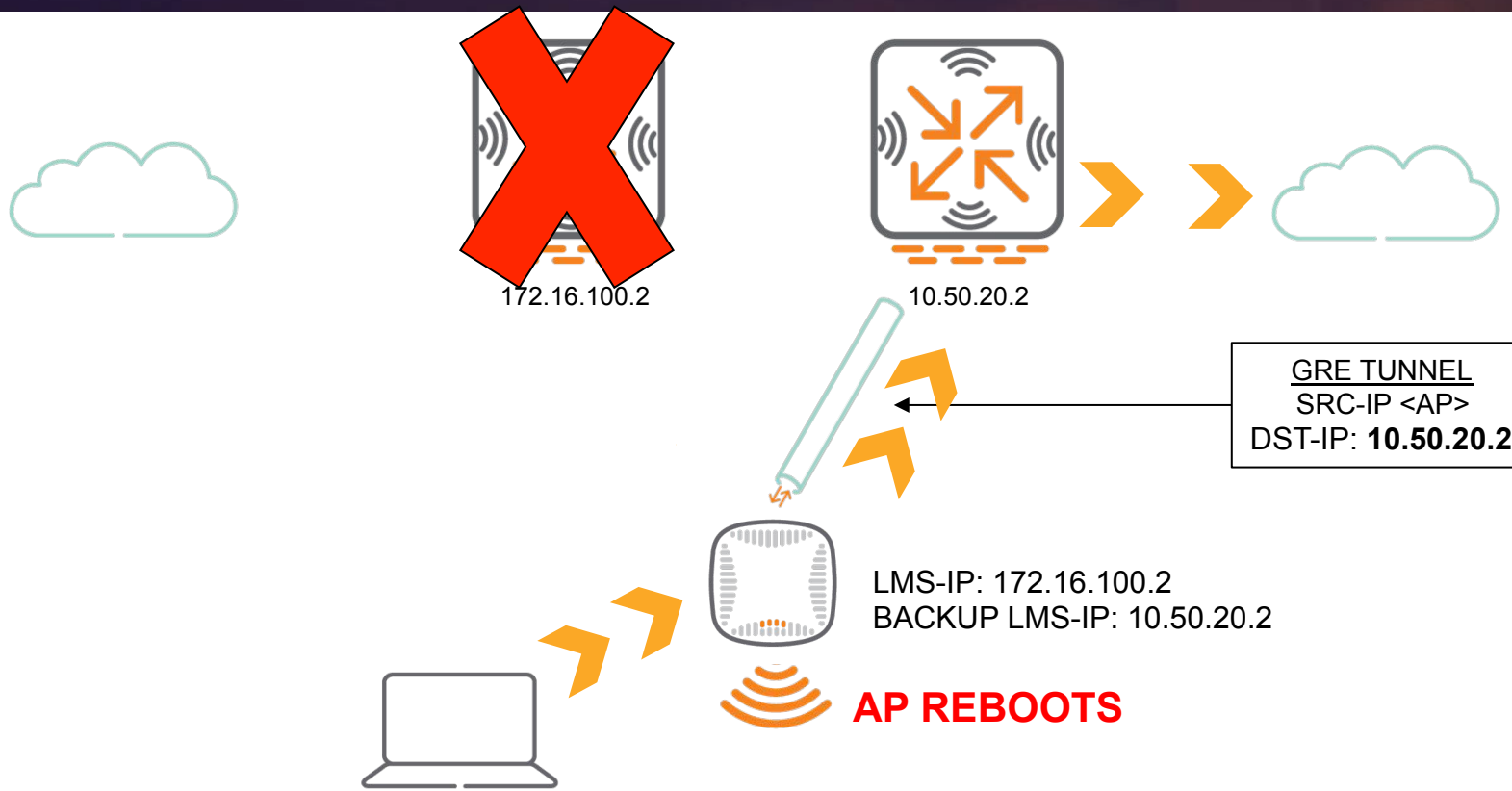
Backup-LMS (L3)



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Remote AP (RAP)

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Remote AP (RAP)

- Purpose-built RAPs and campus APs
- Certificate-based provisioning
- Secure wired and wireless remote access
- RAPs are Instant out of the box
- Aruba Activate

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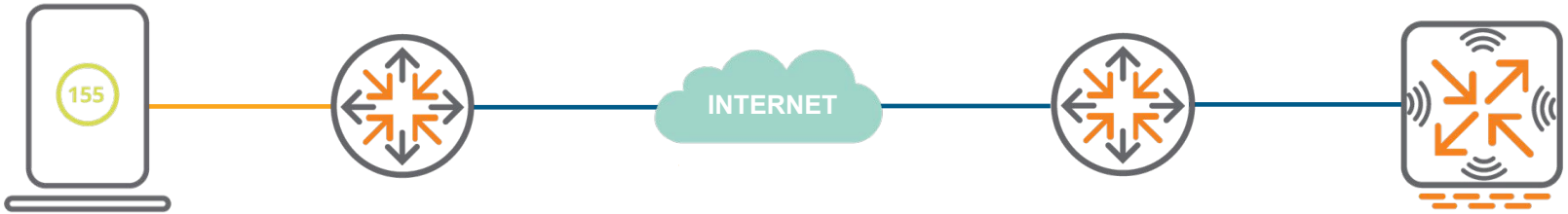
Remote AP



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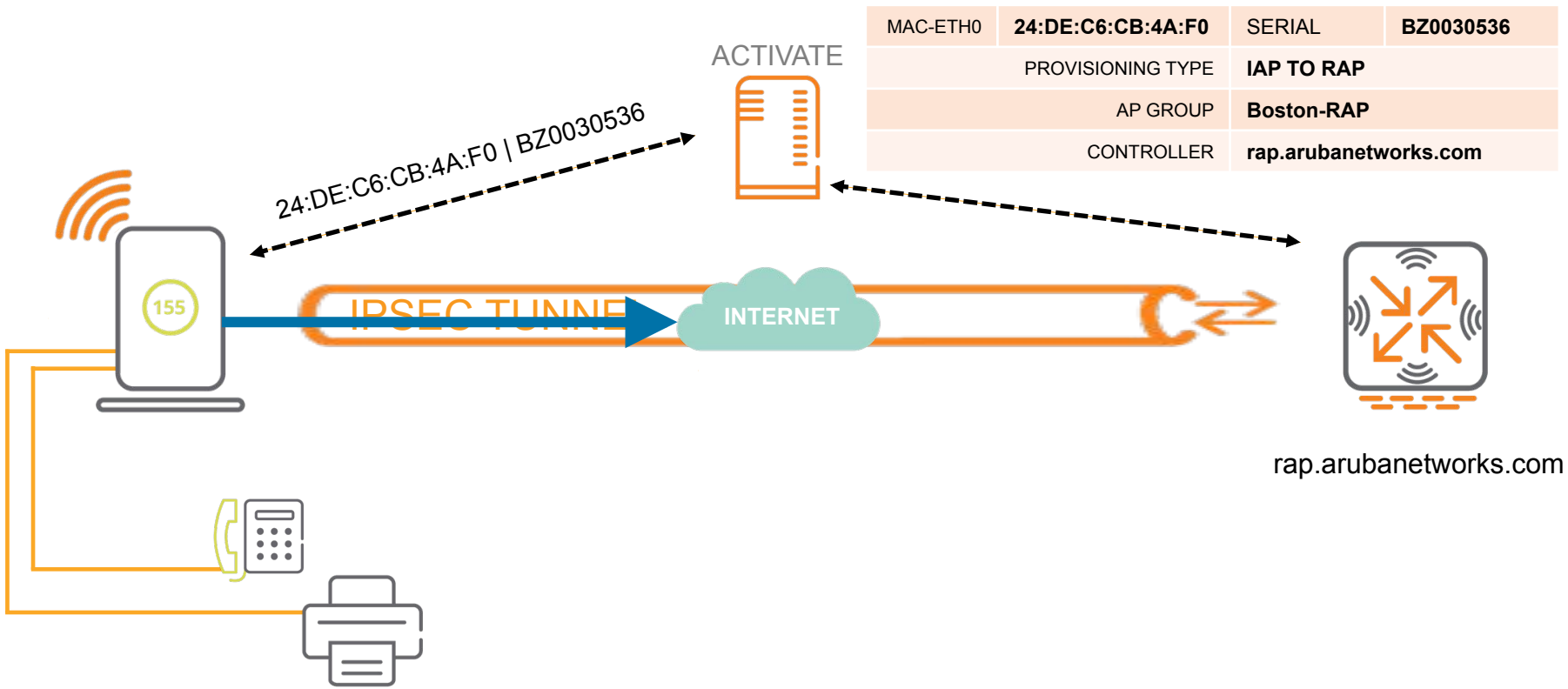
Remote AP - Logical



MAC-ETH0	**24:DE:C6:CB:4A:F0**	SERIAL	**BZ0030536**
PROVISIONING TYPE	**IAP TO RAP**		
AP GROUP	**Boston-RAP**		
CONTROLLER	**rap.arubanetworks.com**		

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RAP Forwarding Modes

- **Tunnel**
- **Bridge**
- **Decrypt-tunnel**
- **Split-tunnel**

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Split-tunnel

- Tunnels certain traffic back to controller via IPSec tunnel (defined in user roles)
- Allows non-corporate traffic to be bridged out locally saving bandwidth.
- RAP handles encryption, decryption and firewall enforcement locally

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Limitations

- **Roaming**
- **ARM features**
- **Requires controller licenses**
- **Limited visibility**

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Aruba Instant Architecture

Aruba Instant Overview

- **AP model begins with the letter I**
  - IAP-225, IAP-215, IAP-205, etc
- **Instant APs can be converted to controller-based APs**
- **No feature licensing with local management**
- **Manage locally, via AirWave, or Aruba Central (cloud)**
- **Dynamic provisioning via Aruba Activate (free)**

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Aruba Instant Overview - Technical

- Cooperate locally at L2
- Multiple uplink options (Ethernet, 4G/LTE, WiFi)
- ARM, ClientMatch, AppRF, AirGroup, L3 Mobility
- IAP-VPN/RAP-NG for distributed environments

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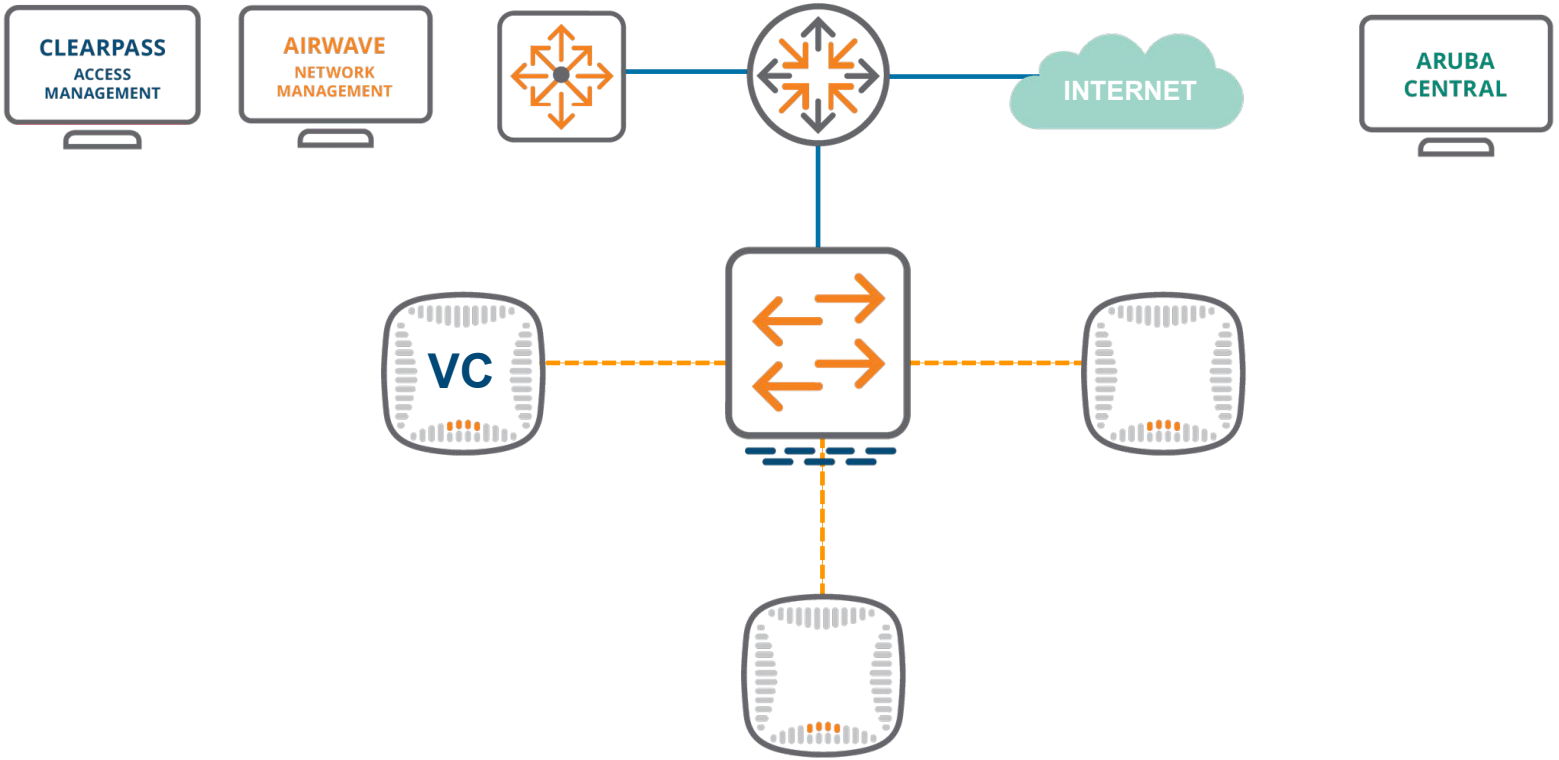
Instant topology



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Instant traffic flow

- **Traffic destined for tunnels goes through VC**
- **NAT'd traffic (guest) goes through VC**
- **Regular user traffic firewalled, processed and switched out at AP**

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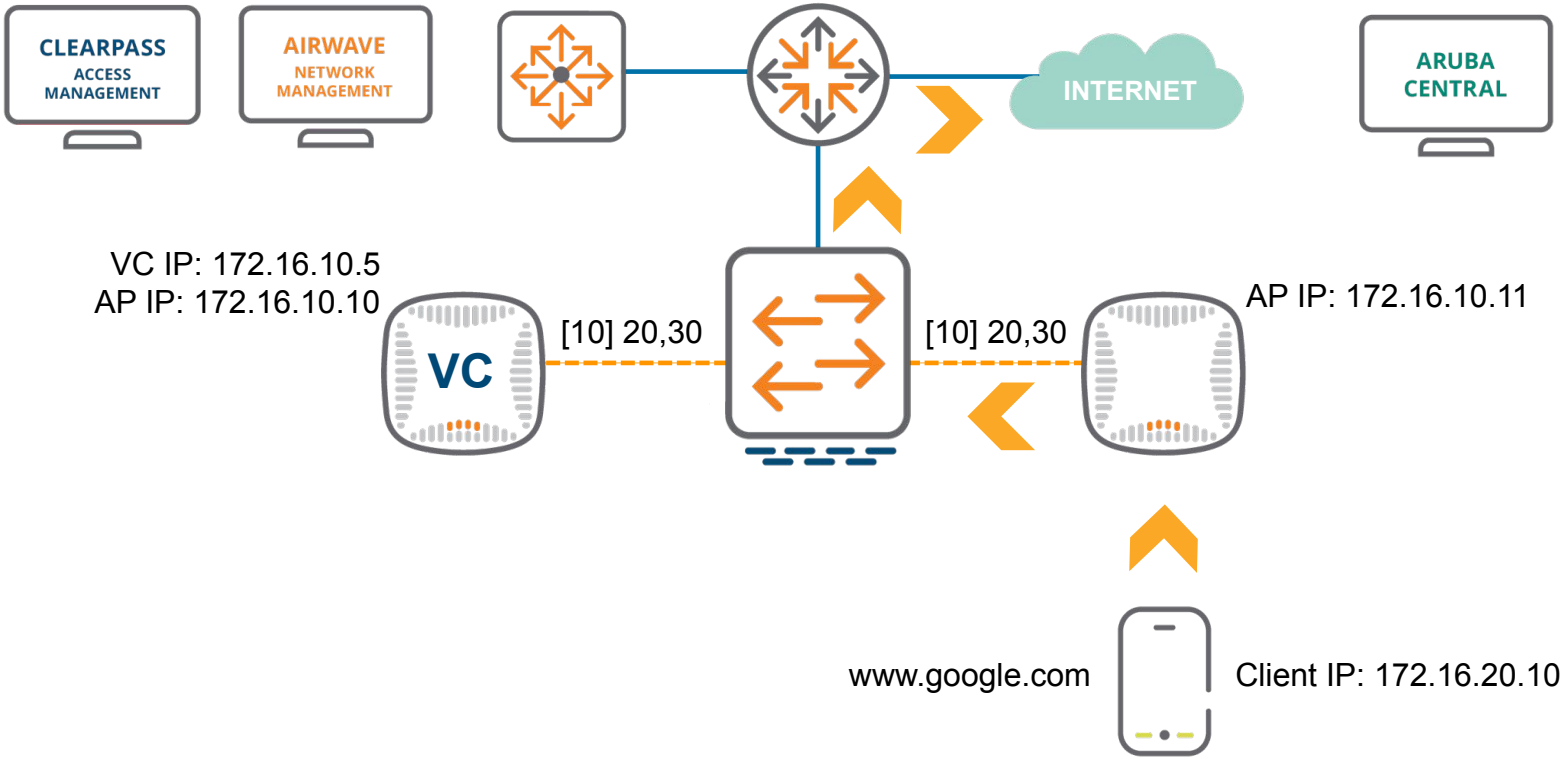
Instant traffic flow



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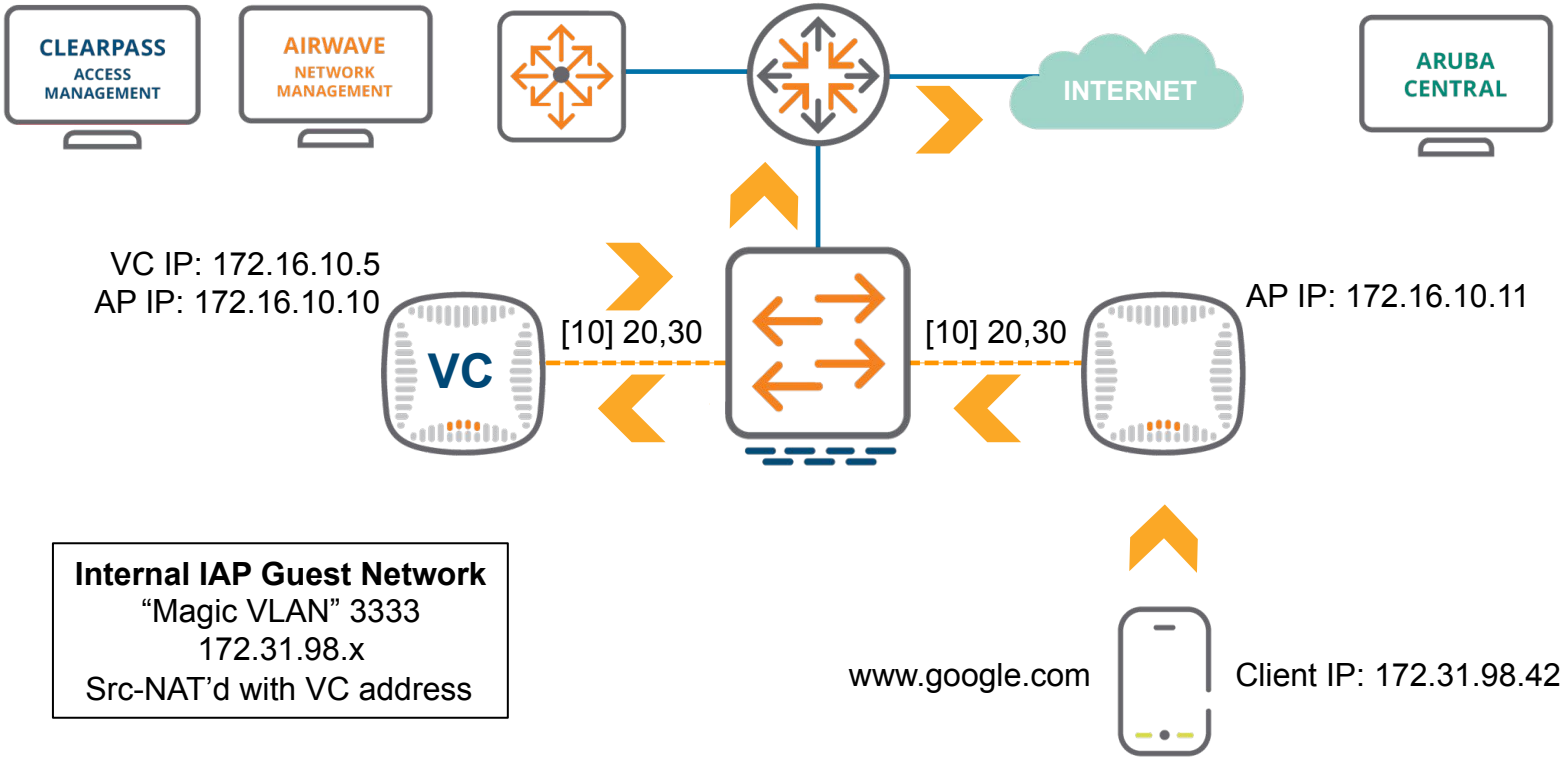
Instant traffic flow – Guest/NAT



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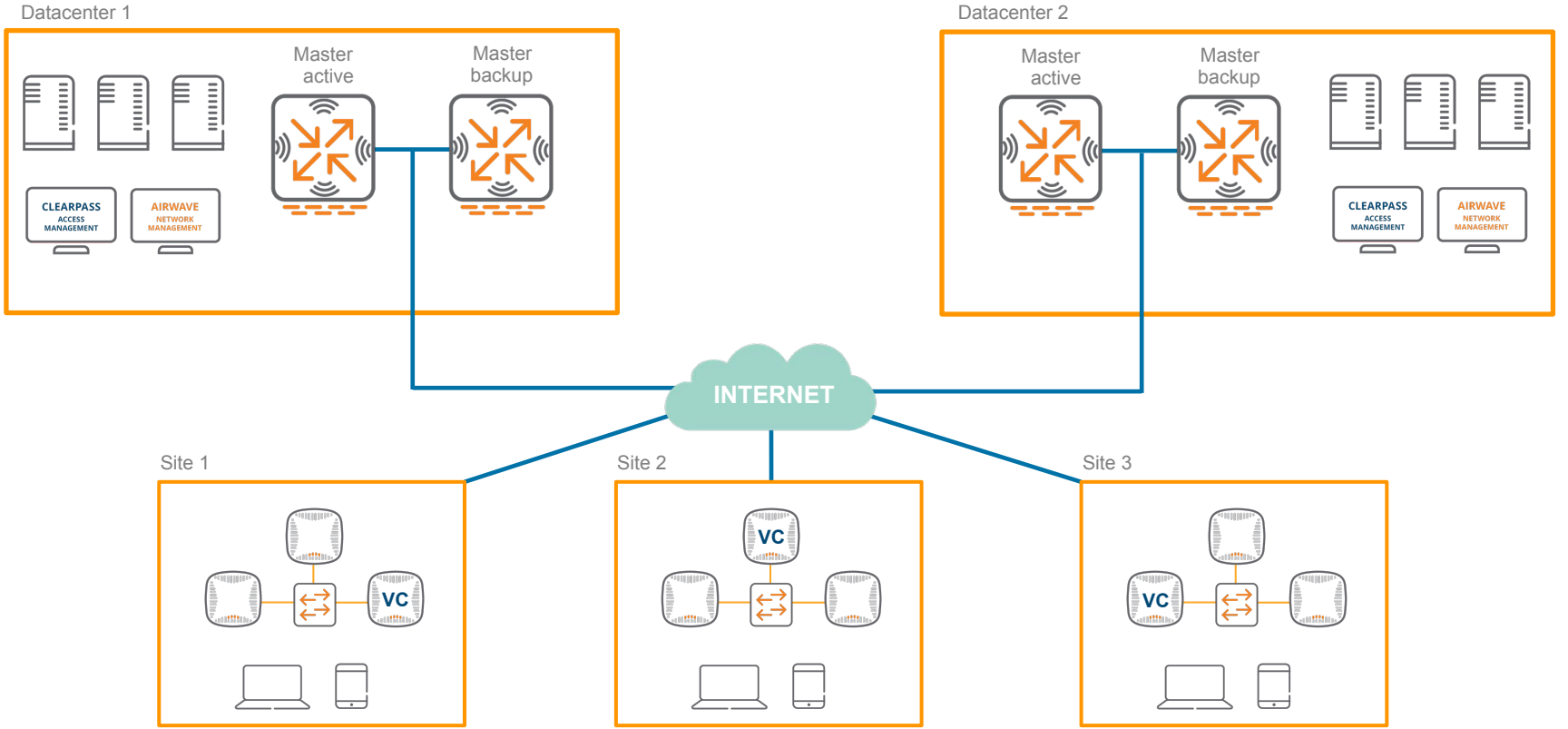
RAP-NG / IAP-VPN

RAP-NG / IAP-VPN Topology



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Benefits

- **Local RF coordination**
- **Roaming**
- **Isolated broadcast domains for each cluster**
- **Authentication survivability**
- **MAS integration**

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DHCP modes

- **Local**
- **Centralized L2**
- **Distributed L2**
- **Centralized L3**
- **Distributed L3**

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DHCP modes

DHCP MODE	SUBNET	DHCP	CLIENT GW	CORP TRAFFIC	LCL/INTERNET
Local	Local	Master AP	Master AP	Src-NAT IPSec tunnel	Src-NAT Master AP IP
Centralized L2	CORP	Datacenter	Datacenter	Tagged & switched to datacenter via tunnel	Src-NAT Master AP IP
Distributed L2	CORP	Master AP	Datacenter	Tagged & switched to datacenter via tunnel	Src-NAT Master AP IP
Centralized L3	CORP	Datacenter	Master AP	Routed to datacenter inside IPSec tunnel	Src-NAT Master AP IP
Distributed L3	CORP	Master AP	Master AP	Routed to datacenter inside IPSec tunnel	Src-NAT Master AP IP

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RAP-NG/IAP-VPN licensing

- **For basic VPN connectivity (single role), a single PEFNG license is required**
- **To use different roles for individual IAP clusters, the PEFV license is required for each controller**

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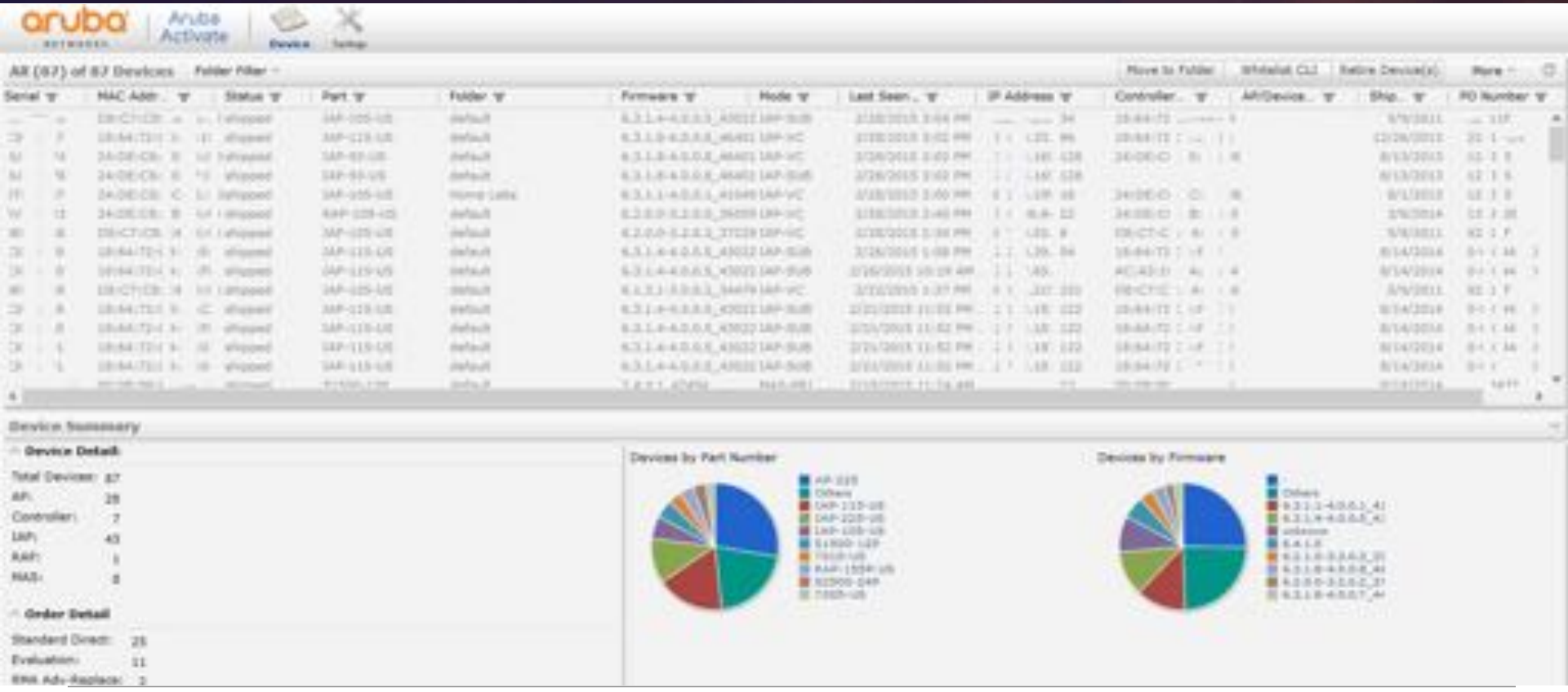
Aruba Activate

Aruba Activate



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Aruba Activate

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MANAGEMENT

Aruba Central

Aruba Central Overview

- **Cloud management for Instant and MAS**
- **ZTP with Aruba Activate**
- **Firmware management**
- **Reporting**
- **Responsive UI (adaptive to any display)***
- **AppRF management and visibility***
- **Cloud captive portal w/ social***

* Central 2.0 – Coming Soon

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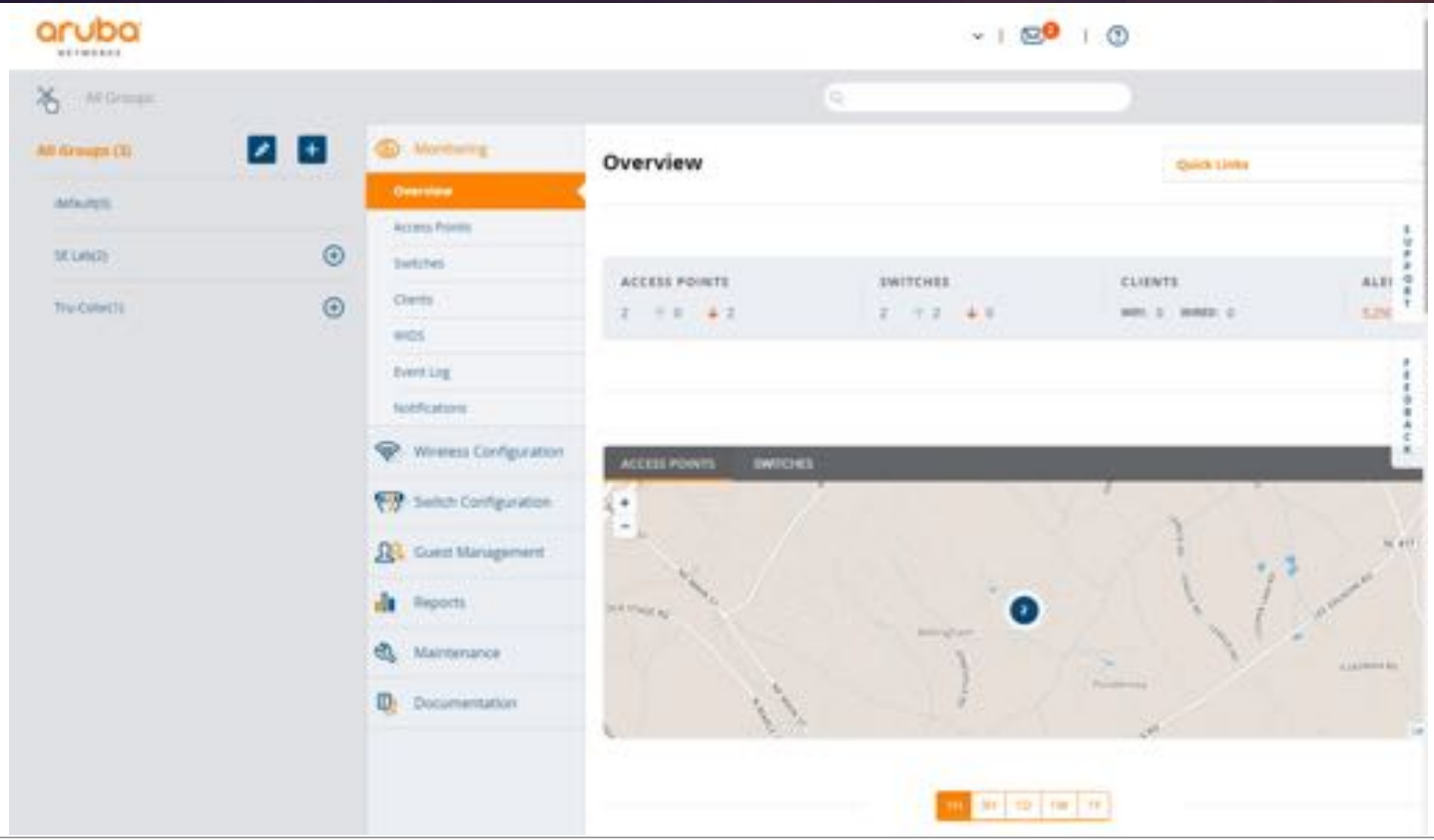
Aruba Central



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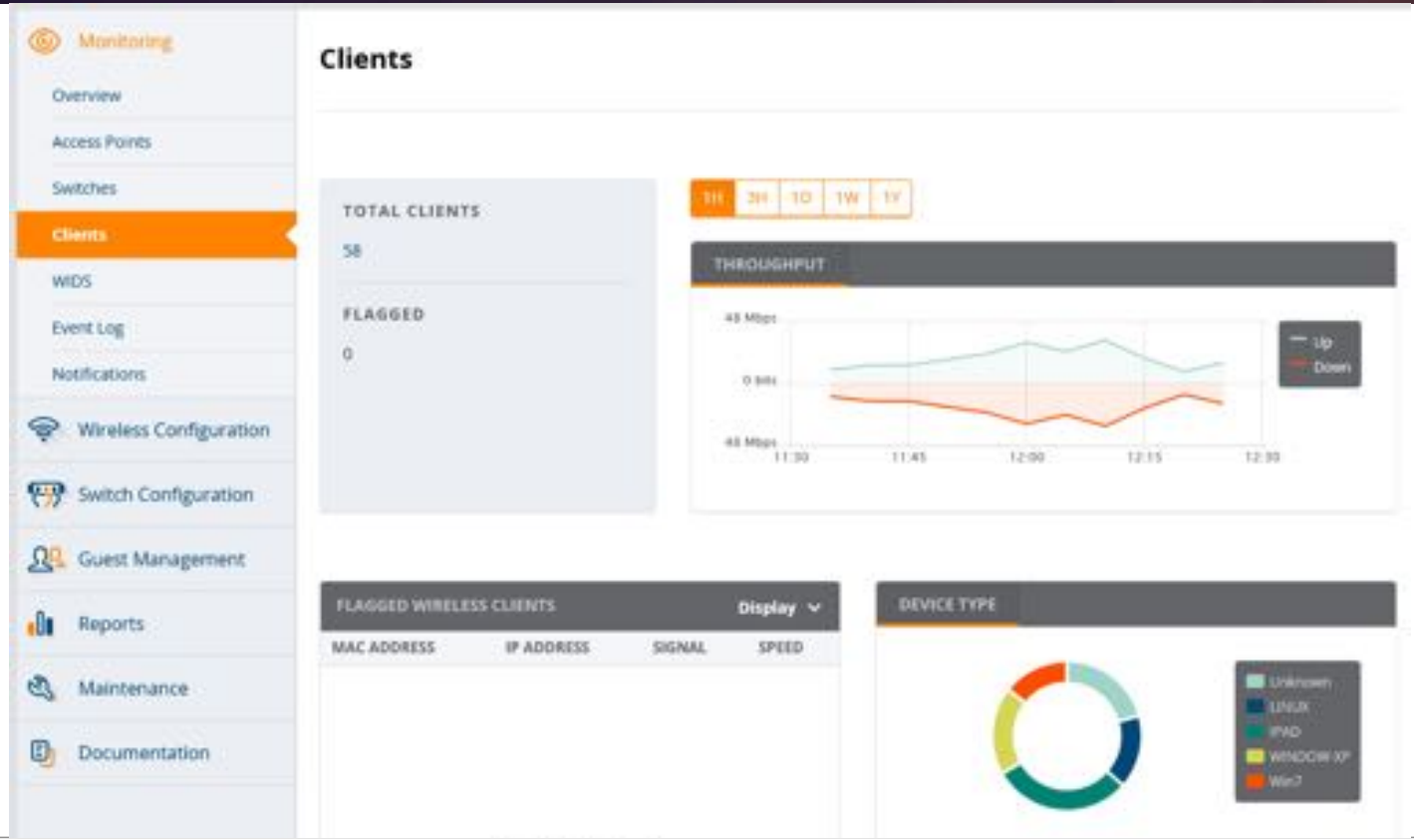
Aruba Central



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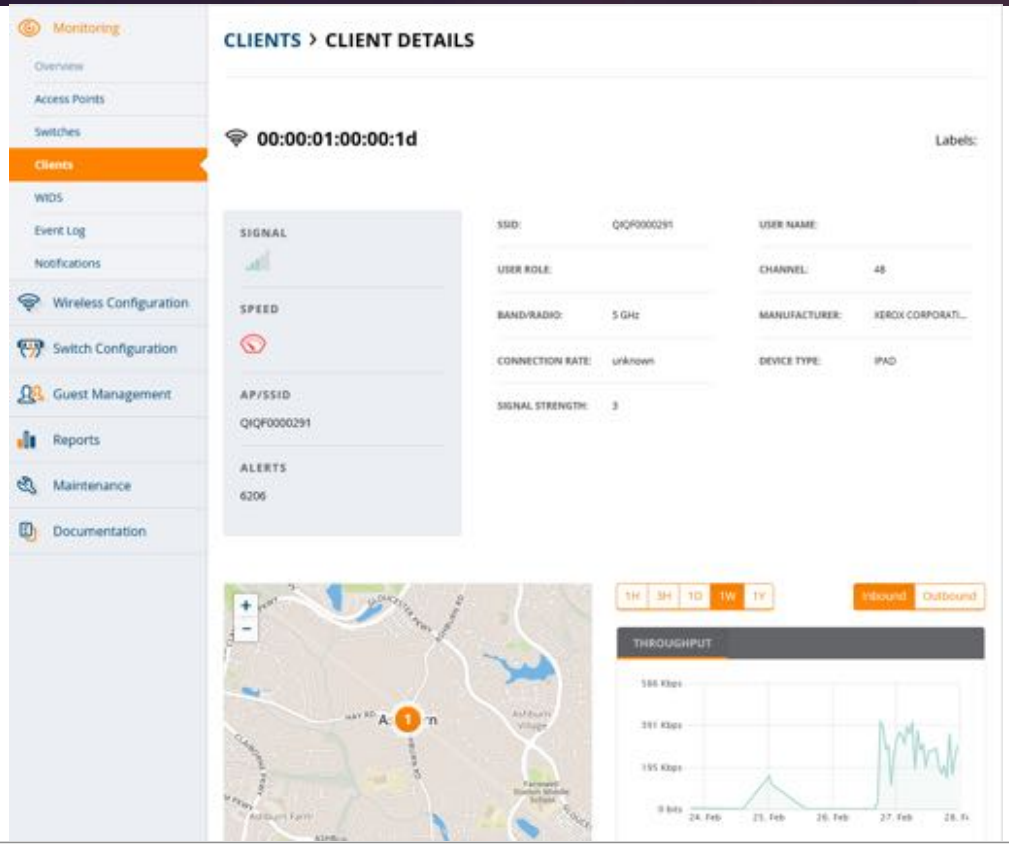
Aruba Central



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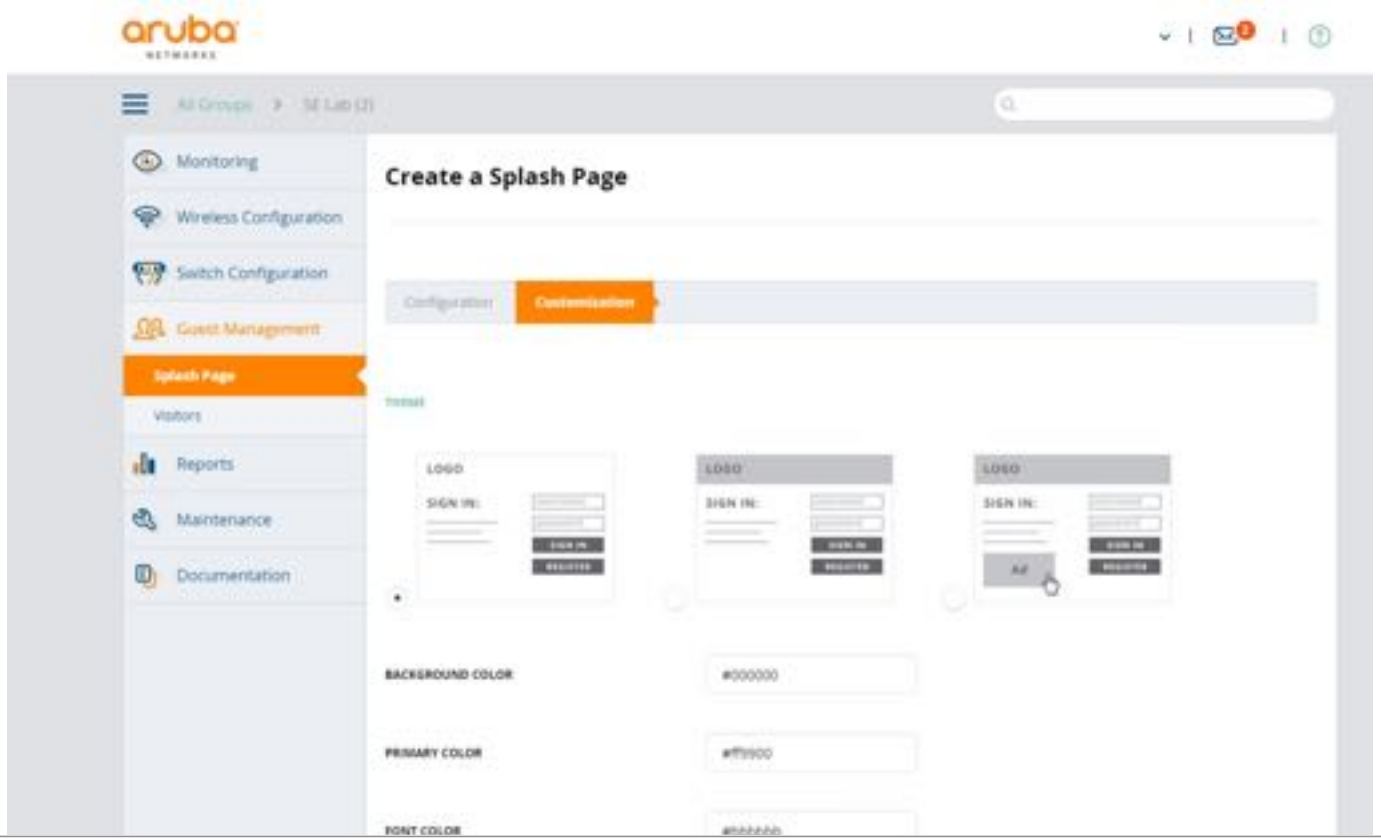
Aruba Central



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AirWave

AirWave Overview

- On-premise solution (VM or physical)
- Management, monitoring and reporting of Aruba controllers, Instant clusters, and MAS
- Multi-vendor
- In a hybrid controller-Instant environment, AirWave recommended
- Single pane of glass

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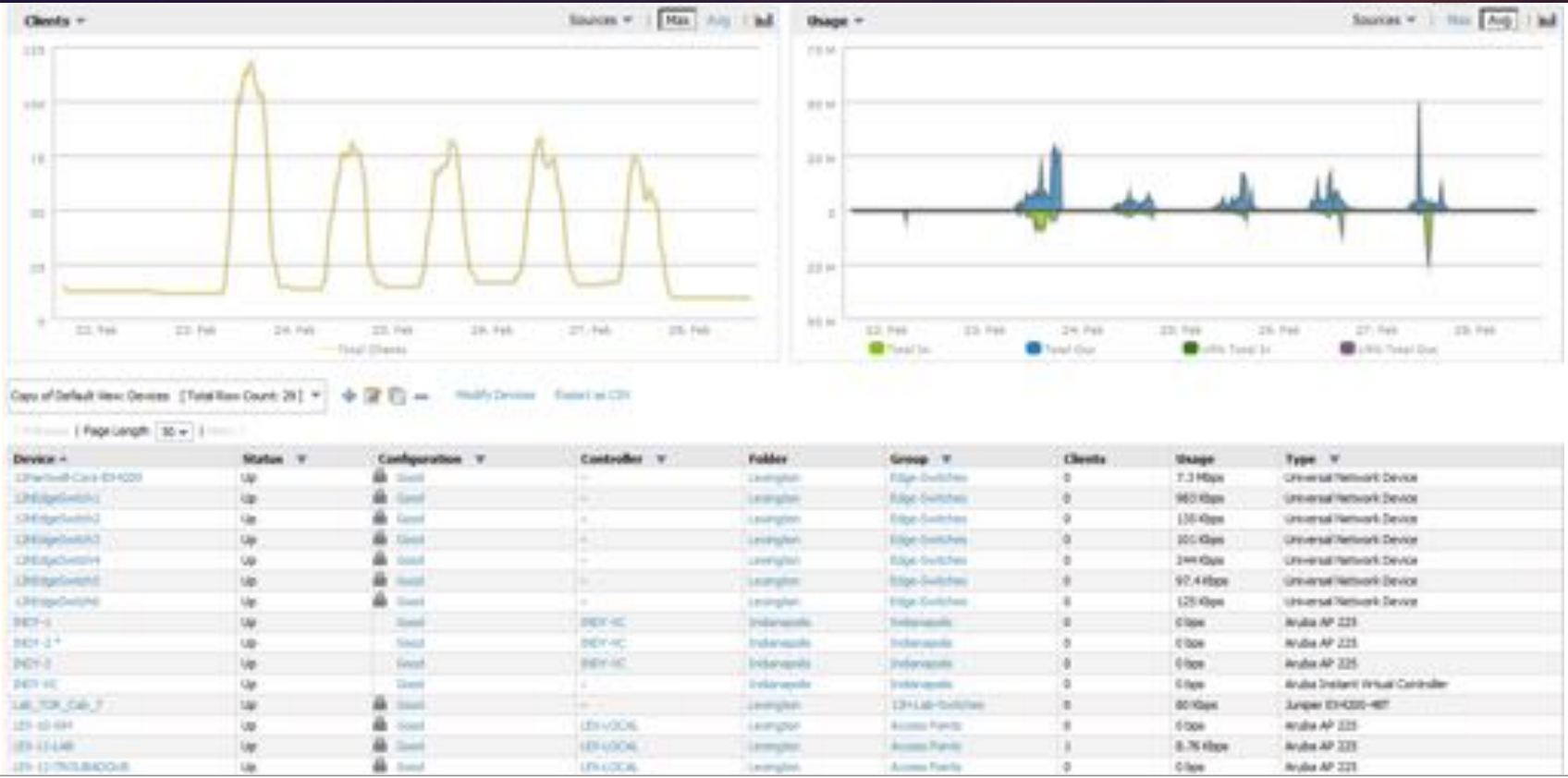
Single pane of glass



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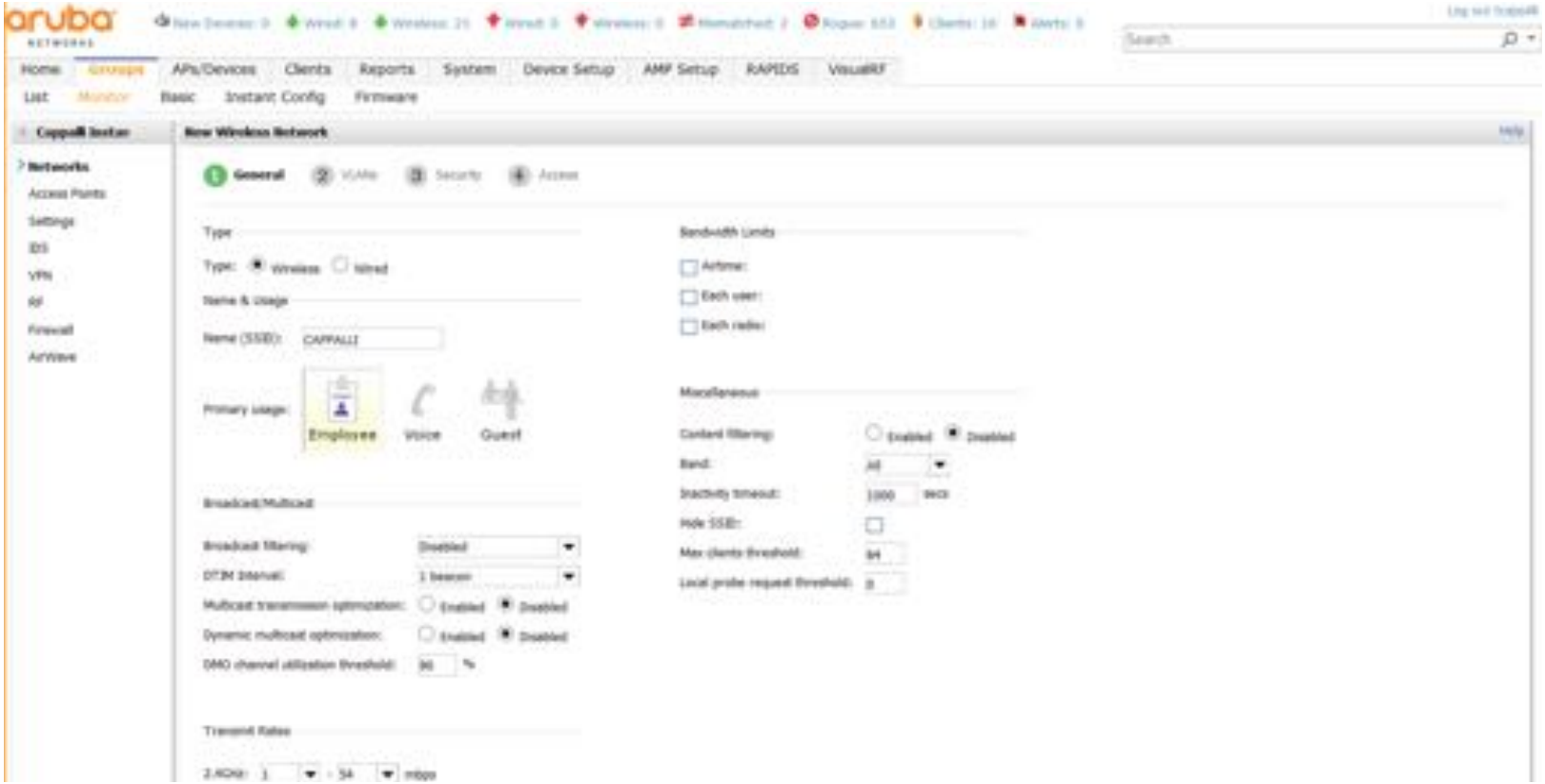
Instant GUI config



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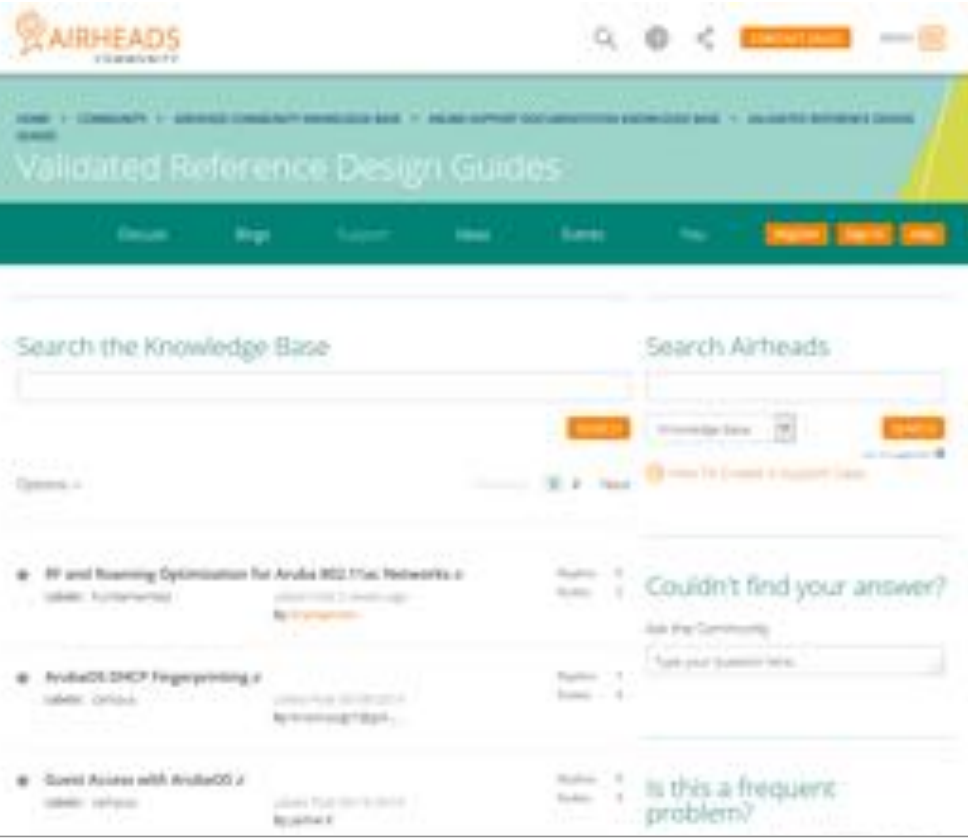
Discussion & Questions

arubanetworks.com/vrd



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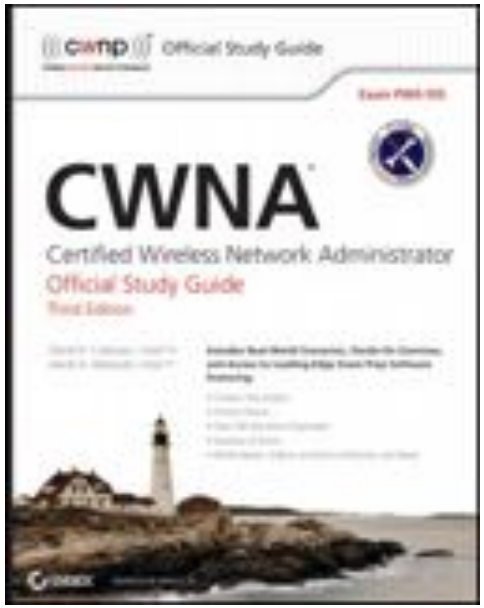
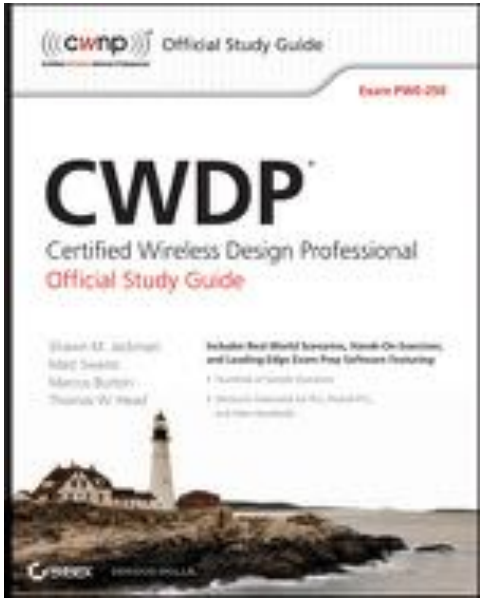
Other resources

In-depth Wireless Architecture
cwnp.com





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