aruba
a Hewlett Packard Enterprise company

ARUBA OS
HIGH AVAILABILITY WITH AP FAST FAILOVER

10:00 GMT | 11:00 CET | 13:00 GST
Jan 31st, 2017

Presenter: Britto Jagadesh

Britto.jagadesh@hpe.com

AIRHEADS COMMUNITY

SUMMARY OF HA FEATURES IN 6.3

HA FEATURES INTRODUCED IN 6.4:

1. INTER-CONTROLLER HEARTBEAT
2. CLIENT STATE SYNC
3. N+1 OVER SUBSCRIPTION

aruba
a Hewlett Packard Enterprise company

OVERVIEW OF HA FUNCTIONALITY IN 6.3

aruba
a Hewlett Packard
Enterprise company

Controller Roles in HA

A controller using this feature can have one of three high availability roles: active, standby or dual.

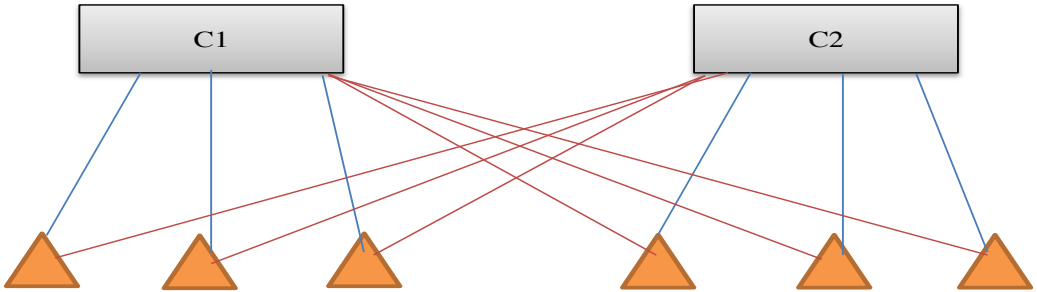
Active - Controller serves APs, but cannot act as a failover standby controller for any AP except for those that it serves as active.

Standby - Controller acts as a failover backup controller, but cannot be configured as the primary controller for any AP.

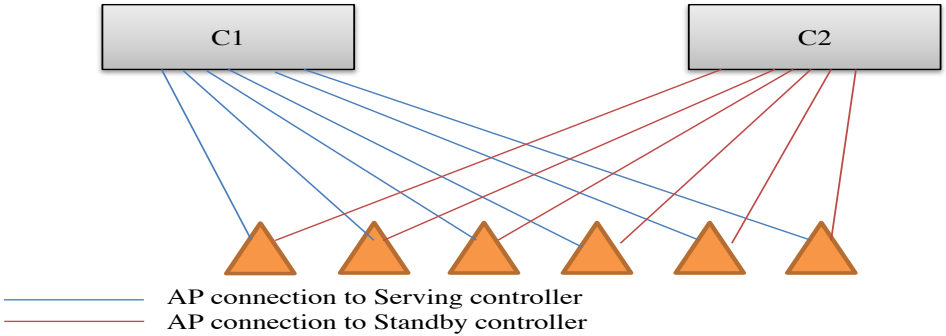
Dual - controller can support both roles, acting as the active controller for one set of APs, and as a standby controller for another set of APs.

1:1 in either Active-Active or Active-Standby mode

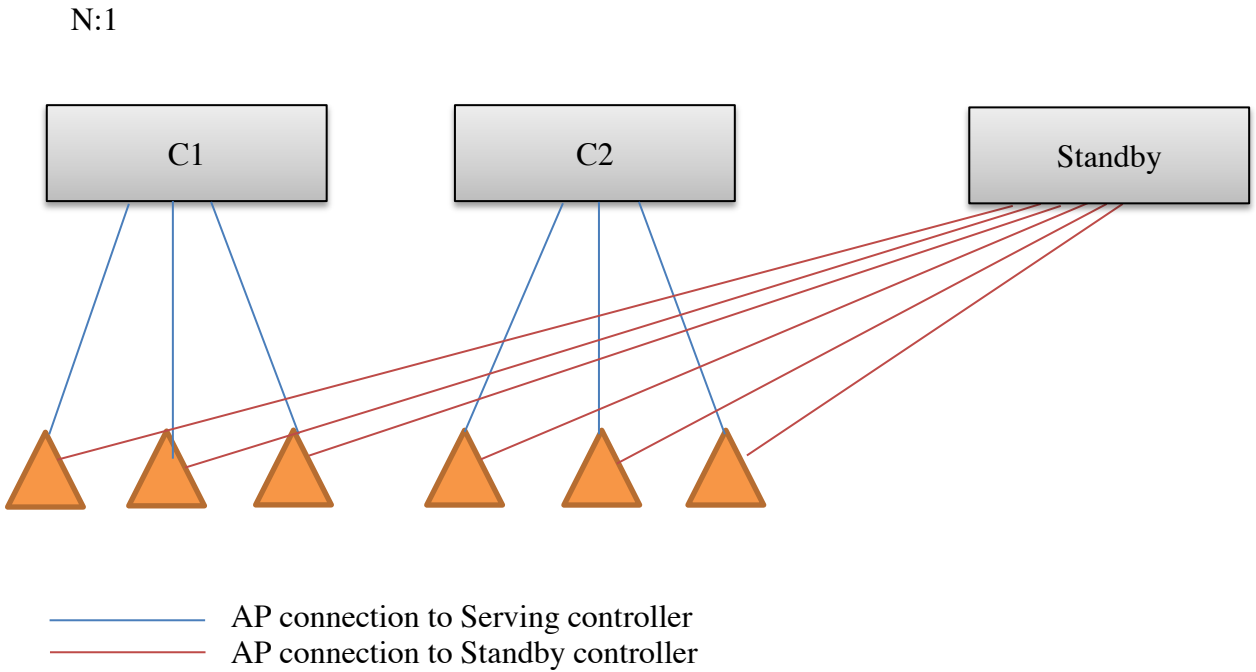
1:1 in active-active mode



1:1 in active-standby mode



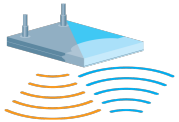
N:1 mode


N:1
C1
C2
Standby
AP connection to Serving controller
AP connection to Standby controller

AP Fast Failover – AOS 6.3

Active Controller

1. AP sending Heartbeat every second



2. Consecutive 8 Heartbeat missed

3. AP deauth client

4. Standby tunnel becomes active; AP failover to backup controller.

Standby Controller

5. Client re-associate to AP, authenticate and start passing traffic

How Fast Failover worked in 6.3

1. With 8 consecutive heartbeat misses (default), AP will detect that the Active controller is no longer available and will failover to Standby controller.

2. AP will deauth clients before failover to ensure that client will come up properly on backup controller.

3. AP's standby tunnel will become active without having to rebootstrap. The SSIDs remains up during failover.

4. Clients will reconnect to SSID, authenticate and start passing traffic again.

5. Once primary controller is back up, APs will form standby tunnels to it.

6. If preemption for HA is enabled. APs will move back to primary controller after "LMS hold down" time configured in AP system profile.

Simple Configuration Model

Existing configuration using backup LMS

ap system-profile aruba

lms-ip 10.1.1.1
bkup-lms-ip 10.1.1.6
lms-preemption
lms-hold-down-period

New config using HA

Configuration in the master controller
!
ha group-profile aruba
controller 10.1.1.1 role active
controller 10.1.1.5 role standby

Configuration in the HA controllers
!
ha group-member aruba
<This needs to be executed on all HA controllers>

6.4 HA FEATURE: INTER-CONTROLLER HEARTBEAT

aruba
a Hewlett Packard
Enterprise company

Inter-Controller Heartbeat Overview

Quicker Failure Detection

- Heartbeat are sent from standby to active controller.
- Heartbeat interval is 100ms.
- Heartbeat threshold is 5.

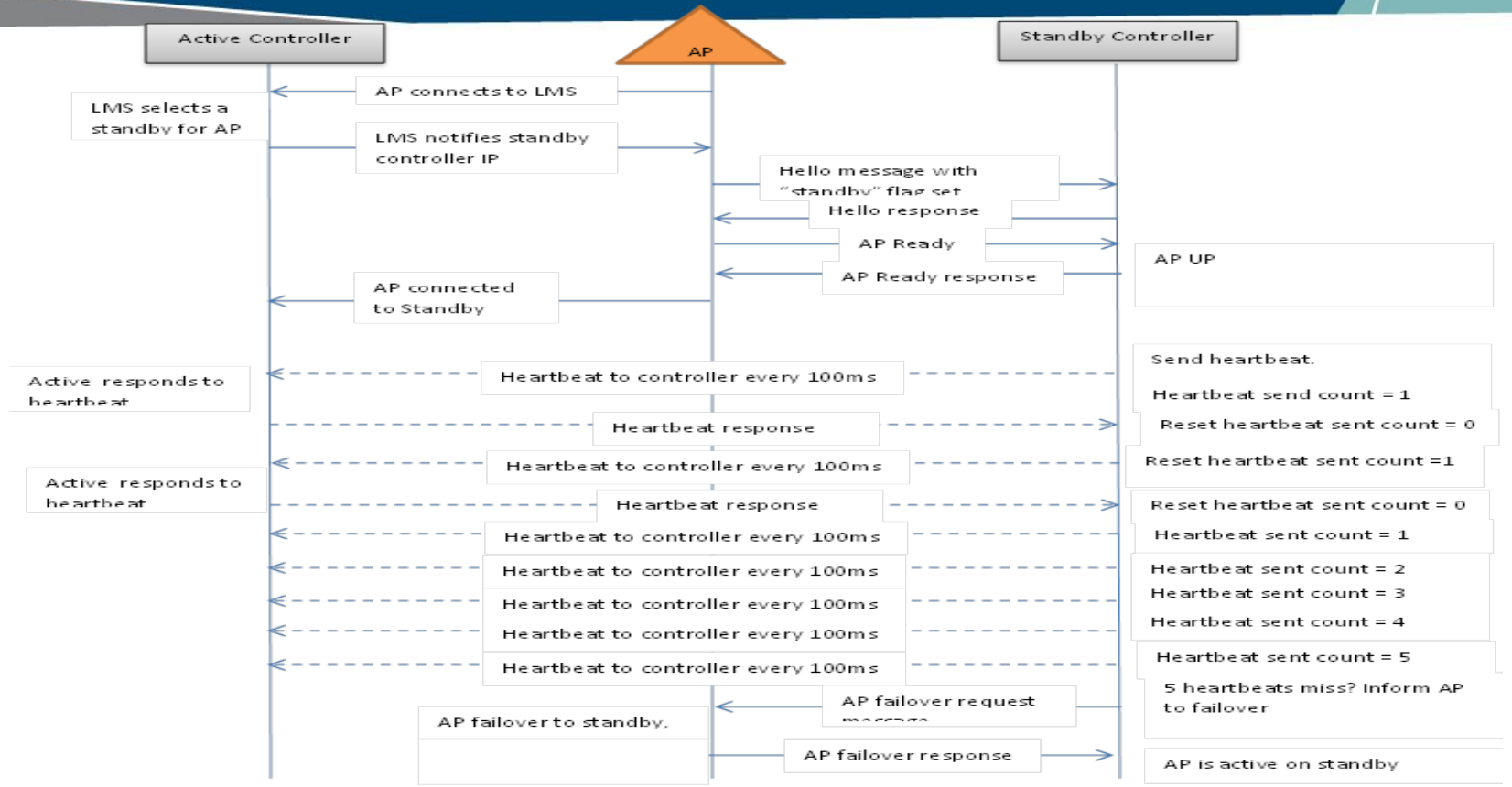
Triggers AP failover faster scenarios

- Active controller is rebooted
- Network connectivity issues

How Inter-controller Heartbeat Works

1. AP comes up on Active controller.
2. AP sends hello message to Standby controller's ip (From HA group-profile).
3. Standby identifies the active controller IP from the hello message that is received from the AP.
4. Standby will start heartbeat to identified active controller as soon as the AP's status on standby is up.
5. Standby will pro-actively heartbeat with the active controllers at configured interval (100ms by default).
6. If there is a response from active controller, standby controller would mark active controller as reachable.
7. If active controller goes down, standby detects the heartbeat miss with active controller, and standby informs AP's to failover.
8. AP's receive the failover request message from standby controller and failover immediately.

Inter-Controller HB Functional Description



Inter-Controller Heartbeat Frame

1. Heartbeat frame is a PAPI message that is initialized and sent from HA-Mgr.

2. IPSEC connection is not required for inter-controller heartbeat.

3. If IPSEC tunnel exists (master-local,etc), then heartbeat would go over the IPSEC tunnel.

Inter-Controller Heartbeat Logging

“logging level debugging system process ha_mgr”

Inter-Controller Heartbeat Configuration

- **Configure "ha group-profile"**
  - Enable "heartbeat"
  - Modify "heartbeat interval" and "heartbeat threshold" if needed

Sample config:

Ha group-profile cluster-A

controller 10.163.132.12 role dual

controller 10.163.132.13 role dual

preemption

heartbeat

heartbeat-interval <100 to 1000 ms>

heartbeat-threshold <3 to 10>

AP system-profile cluster-A

lms-ip 10.163.132.12

6.4 HA FEATURE: CLIENT STATE-SYNC

aruba
a Hewlett Packard
Enterprise company

Client State Sync Overview

- Reduces time taken by dot1x clients to reconnect after controller failover
- PMK entries are synced between Active and Standby controllers
- Full dot1x does not occur after failover
- Only 4-way handshake without EAP exchange is done.

Client State Sync Support

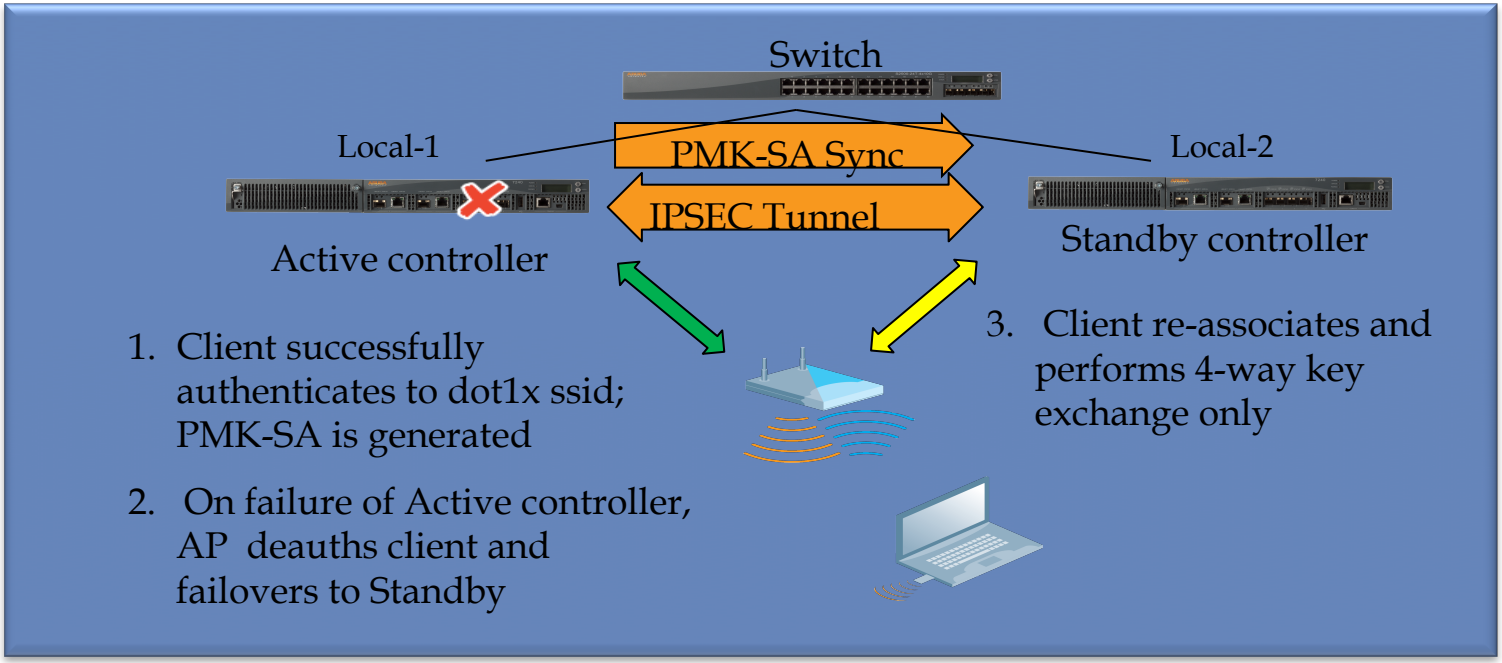
Supported:
- 1:1 Active/Standby, 1:1 Active/Active Models
- 72XX,M3 and 3600 controllers

Unsupported:
- N:1 Model
- Feature cannot be enabled with Capacity Extension feature
- 6xx controllers

State Sync Limitations

- State-sync functionality is mutually-exclusive with standby-AP capacity extension (oversubscription). If one is already enabled, attempt to enable the other would result in a configuration error.
- State-sync functionality is supported only with 1:1 active-standby and 1+1 active-active. Hence, following checks would be enforced at configuration time.
    1. If state-sync is enabled, and attempt is made to add more than one standby role controller to the ha group-profile, an error would be reported back to the user like “Cannot configure more than two IPv4 and two IPv6 controllers with statesync enabled”.
    2. If oversubscription is enabled and attempt is made to enable state-sync then an error would be reported back to the user like “Over-subscription is enabled. State-sync cannot work with over-subscription enabled. Please disable it first.”

Client State Sync – Failover Scenario



Check pmkid matches on Active and Standby

Active

```
(Aruba3600) #show dot1x supplicant-info pmkid

PMKID Table
-----------
MAC               BSSID             PMKID                                                            Expiry           Name  Role(how)  VLAN(how)  ESSID    Server    Reauth-Time
---               -----             -----                                                            ------           ----  ---------  ---------  -----    ------    -----------
08:ed:b9:29:5d:54  6c:f3:7f:ef:8a:00  8e:b6:dd:1c:d4:65:a6:7d:00:d2:b0:92:5c:10:af:0c  Apr 22 12:41:22  test  guest(2)   0(0)       pgtest2  Internal  0
Total KeyCache entries            : 1
Total PMKID entries               : 1
```

Standby

```
(Aruba7210) #show dot1x supplicant-info pmkid

PMKID Table
-----------
MAC               BSSID             PMKID                                                            Expiry           Name  Role(how)  VLAN(how)  ESSID    Server    Reauth-Time
---               -----             -----                                                            ------           ----  ---------  ---------  -----    ------    -----------
08:ed:b9:29:5d:54  6c:f3:7f:ef:8a:00  8e:b6:dd:1c:d4:65:a6:7d:00:d2:b0:92:5c:10:af:0c  Apr 22 12:41:22  test  guest(2)   0(0)       pgtest2  Internal  0
Total KeyCache entries            : 1
Total PMKID entries               : 1
```

State-sync Configuration

- **Configure "ha group-profile"**
  - Enable "state-sync"
  - Configure "pre-shared-key"

  (Pre-shared key for secure tunnel between HA controllers)

  Note: State-sync will not be enabled until pre-shared-key is configured

Sample config:

```
ha group-profile cluster
  controller 10.163.132.12 role dual
  controller 10.163.132.13 role dual
  preemption
  state-sync
  pre-shared-key <shared key>
ap system-profile cluster
  lms-ip 10.163.132.12
```

COA Processing

RADIUS server stores nas-ip-address received in user authentication request, and uses the same to send any COA messages for that user.

For HA failover with state-sync, no new authentication request is sent to RADIUS server after AP failover to C2, so RADIUS server will keep sending COA messages to C1 (as RADIUS server has C1's nas-ip).

To solve this, we need to configure VRRP between the two controllers, and set the nas-ip in the authentication server profile as the VRRP IP address.

Recommendation is to have VRRP and HA preemption to be enabled or disabled together.

6.4 HA FEATURE: CAPACITY EXTENSION

aruba
a Hewlett Packard
Enterprise company

Capacity Extension Overview

- Allows Standby controller to terminate standby AP tunnels above its platform limit.

- Supported only for 72xx, M3 and 3600 controllers.
- 72xx allows 4 times oversubscription
- M3 and 6000 allows 2 times oversubscription

Example:
C1 – 7210 – platform limit 512 AP’s
C2 – 7210 – platform limit 512 AP’s
Standby Controller – 7210 – can now have 1024 AP tunnels (Max limit is 2048)

Capacity Extension Configuration

- **Configure “ha group-profile”**
  - Enable “over-subscription”
  - Make sure centralized licensing is enabled

Error: Centralized licensing is disabled. Enable it before enabling over-subscription, using command 'license profile centralized-licensing-enable'

Sample config:

Ha group-profile cluster
controller 10.1.1.100 role active
controller 10.1.1.101 role active
controller 10.1.1.102 role active
controller 10.1.1.103 role standby
over-subscription
AP system-profile cluster
lms-ip 10.1.1.100

Capacity Extension – Standby AP Support

Platform	Ratio	GRE Tunnels
7210	4:1	16K
7220	4:1	32K
7240	4:1	64K
M3/6000	2:1	16K

How to Check Oversubscription Capacity

```
(Aruba7210) #show ha oversubscription statistics

Platform oversubscription factor :          4

APs Limits
------------------
APs                        Number
----                       ------
Platform Limit             512
Current Active             0
Current Standby            1
Active remaining           511
Standby remaining          2047
Maximum allowed Standby    2048

BSS Limits
--------------------
Tunnels                  Limits
-------                  ------
Maximum BSS tunnels      16384
Average BSS/AP           2
BSS tunnels in use       2
BSS tunnels available    16382
```

Standby Capacity Extension (Oversubscription) Caveats

- Centralized licensing must be enabled with this feature.
- Client State Sync feature cannot be enabled with this feature.

Master-Redundancy Deployment Model

Support for Master Redundancy deployment was introduced in 6.4

Recommended configuration:

1. Master – standby controller should be configured in dual role.
2. The inter-controller heartbeat feature is not recommended for backup-master and master controller pairs using the high availability feature.
3. If the inter-controller heartbeat feature is enabled then inter-controller failover time must be greater than the VRRP failover time.
4. LMS ip should be configured as Active master controller ip address.

Master-Redundancy Deployment Model

1. Its recommended not to enable intercontroller heartbeat.
2. Controllers role should be configured only as dual.

Sample config:

```
ha group-profile master-standby
  controller 10.1.1.100 role dual
  controller 10.1.1.101 role dual
ap system-profile cluster
  lms-ip 10.1.1.100
  bkup-lms-ip 10.1.1.101
```

Caveats

1. AP will receive configuration only from the lms-ip address.

2. Command “ap-move” can be used to move AP to its standby controller.

3. Campus APs supports tunnel, decrypt-tunnel and bridge mode but on bridge forwarding mode HA is supported on the 7000 Series and 7200 Series controllers only.

4. HA is not supported on remote APs or mesh APs in any forward mode.

THANK YOU!

aruba
a Hewlett Packard
Enterprise company