



Channel Layering with Load Balancing Configuration Note

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Introduction

In addition to the Context-aware Application Layers (CALs) available as part of MobileFLEX, which allow you to dedicate specific channel layers to specific applications (such as voice), you can use Channel Layering to increase capacity or provide redundant RF coverage.

By combining Channel Layering with load balancing, you can scale WLAN network capabilities for higher client densities and/or higher throughput requirements. Channel Layering with load balancing can be deployed pervasively or only where extra capacity is needed. This configuration note describes how Channel Layering with load balancing works and how to configure it.

What's New in this Configuration Note

The following lists additions to this document:

- [Creating an ESSID](#) was added.
- [Applying an ESSID to APs/Radios](#) was added.

What's Changed in this Configuration Note

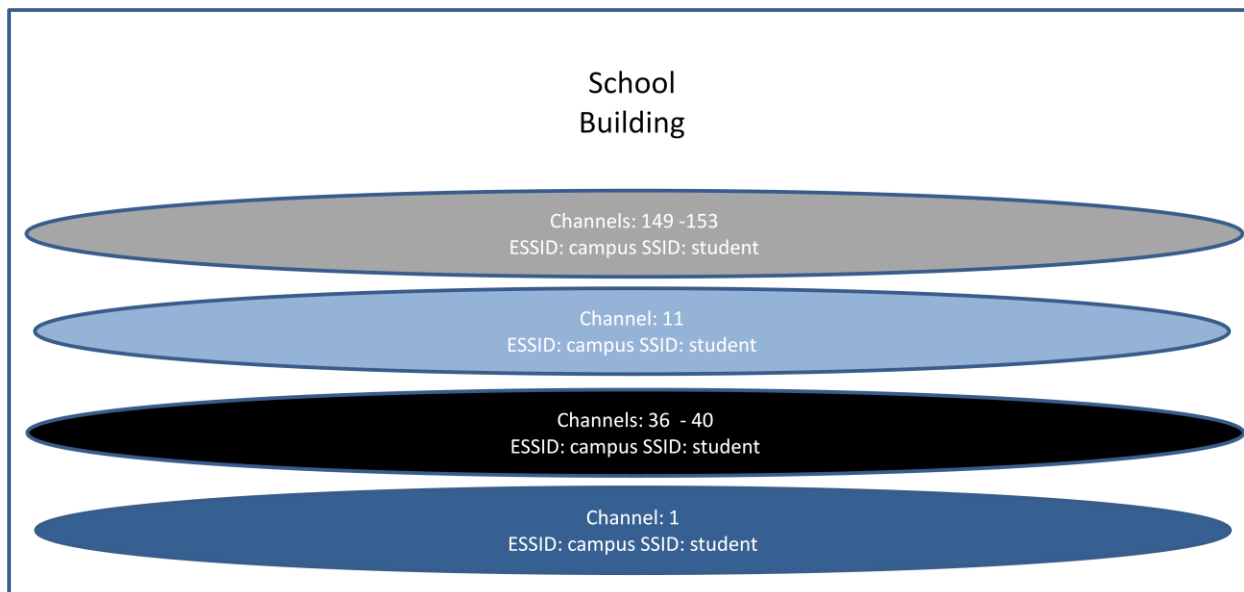
The following lists changes to this document:

- [Figure 1](#) and [Figure 2](#) (channel layer diagrams) have been updated.
- Sections of this document have been rewritten for improved clarity.

Channel Layering

Channel Layering is generally used to accommodate high-density and/or high-throughput areas but can also be used to provide RF-layer fault tolerance. Channel Layering can span an entire campus or be limited to particular areas, such as auditoriums, libraries, sports complexes, and so on. [Figure 1](#) illustrates Channel Layering configured pervasively throughout a school building.

Figure 1: Channel Layer Configured for a School



Because each channel layer is configured contiguously throughout the high-density or high-throughput area, the benefits of seamless roaming and infrastructure control are provided within each channel layer deployed. Clients roam throughout the area within the same channel layer.

Channel Width

WLAN network designers should consider the following recommendations when determining whether to deploy 20 MHz or 40 MHz channels.

- 20 MHz channels are recommended for high client density areas (500 clients or more per 5,000 square feet). Choosing 20 MHz channels allows for more channel layers to be provisioned, resulting in fewer clients per channel layer.
- 40 MHz channels are recommended if the client count is moderate to low and throughput demands are relatively high, such as they might be with many clients simultaneously streaming video. The other advantage of 40 MHz over 20 MHz channels is more throughput capacity can be provided at a lower cost, as fewer APs are needed to provide roughly the equivalent amount of throughput capacity.

Channel Layer Capacity

[Table 1](#) offers guidelines for determining the number of channel layers required to accommodate a given number of clients for a range of expected average per-client throughput. A maximum channel count of 24 is used, as this is the total number of channels currently available in the US when Dynamic Frequency Selection (DFS) channels are enabled in the 5 GHz band. Of the 24 channels, 3 are in the 2.4 GHz band and 21 are in the 5 GHz band.



Not all AP models support DFS. See the datasheet for the AP model that you are working with to determine whether that AP supports DFS.

Table 1: Estimated Number of Channel Layers Required for Various Client Densities and Throughput

Per Client Throughput	Number of Clients									
	100	200	300	400	500	600	700	800	900	1000
0 - .5 Mbps	1	2	3	4	5	6	7	8	9	10
.5 - 1 Mbps	2	4	6	8	10	11	12	13	14	15
1 - 2 Mbps	4	8	12	16	10	22	24			
2 - 4 Mbps	8	16	24							
4 - 8 Mbps	16	24								

The values listed in [Table 1](#) are based on the assumption of a mix of single-, dual-, and three-stream clients and that all clients are operating at reasonably high data rates.

For this mix of clients, we estimate a 20 MHz channel capacity of 50 Mbps. If the client population consists of mainly single spatial stream devices, we estimate a 20 MHz channel to provide approximately 20 Mbps. If the client population consists of mainly 3 spatial stream devices, we estimate that a 20 MHz channel would provide approximately 80 Mbps of aggregate throughput, assuming that the APs are capable of using 3 spatial streams as well. Knowing the client population is important when determining a channel layer plan.



[Table 1](#) does not consider sources of external co-channel interference Wi-Fi or non Wi-Fi, such as from neighboring 802.11 networks of interferers.

For information about design criteria and when to use Channel Layering, see the *Best Practices Guide for High Density Design and Deployment*, located at <http://salesportal.merunetworks.com>.

Channel Layering with Load Balancing

Channel Layering with load balancing is accomplished by provisioning two or more channel layers in the same band for a given ESSID and enabling load balancing. Channel Layering with load balancing is a technique that evenly distributes stations across channel layers for a given ESSID (also known as an ESS Profile). Channel Layering with load balancing can be used to accommodate high density and/or high throughput areas by evenly distributing across channels in the same band. If both bands are present for a given ESSID, load balancing occurs within each band independently.



Channel Layering with load balancing occurs within an ESSID and not an SSID. This distinction has profound implications in the system design. For more information, see the *AP332 Deployment Guide*, the *AP400 Deployment Guide*, and the *Best Practice Guide for High Density Design and Deployment*, which are available at <http://salesportal.merunetworks.com>.

Channel Layering with load balancing is configured by setting the Maximum Stations Per BSSID parameter, in the QoS Settings, to a value other than 0. By default, the Maximum Stations Per BSSID parameter is set to 0 (0 = disabled).

A BSSID is unique to a channel layer for a given ESSID when using Virtual Port or Virtual Cell, or for a single pod load balanced area when Native Cell is used. The maximum number of clients per channel layer is a configurable parameter.

The load balancing algorithm distributes clients evenly across all channel layers configured for an ESSID in a given band (2.4 GHz or 5 GHz). When all channel layers for a given ESSID/band have reached the maximum count configured, no additional stations can join the network using that ESSID/band unless Load Balance Overflow has been enabled. (Load Balance Overflow is off by default.)



We recommend enabling Load Balance Overflow when using load balancing, unless the precise number of clients for the load-balanced area is known.

When Load Balance Overflow is enabled and the maximum station count is reached on all channel layers for an ESSID/band, the maximum station count is incremented by three. As all channel layers reach the new maximum station count (the original maximum station count + 3), the max station count per BSSID is again incremented by three. This process of incrementing the maximum station count by three continues once all channel layers reach the new maximum station count, for an ESSID/band.

Channel Layering with load balancing can be configured to work across multiple radios in the same band on a single AP on some AP models, such as the AP332 and the AP433, or across multiple APs that are positioned near each other.

A group of APs that are positioned near each other for the purpose of load balancing is referred to as a pod. APs that make up a pod should be placed approximately 7-10 feet apart from one another. For example, if there are three APs in a pod, they can be arranged in a delta configuration. This placement recommendation allows for similar coverage patterns for each channel layer but avoids side band interference that might result by placing the APs too close together.



It is important to maintain similar coverage patterns for all channels in a pod, but as mentioned previously, APs are likely to interfere with each other if they are too close together. Therefore, AP spacing of 7-10 feet apart should be followed to ensure proper load balancing functionality.

Load balancing works with the following RF virtualization models:

- Virtual Cell (virtualization with Shared BSSID): With Virtual Cell, each channel layer is represented by a single (virtual) BSSID for a given ESSID. Virtual Cell is not supported on the AP320, AP332, and AP433 models.
- Virtual Port: Virtualization where each station has a personal BSSID that roams with them, but with a parent BSSID that is shared for a given ESSID.
- Native Cell (no virtualization): Used when there is only one pod (therefore, only one radio per channel layer for a given ESSID). This choice is best suited for load-balanced areas that are approximately 7,000 square feet or less.

As mentioned above, with Virtual Port, there is a parent BSSID that is shared by all radios on the same channel within the same ESSID. It is the parent BSSID that is used when determining the maximum station count of the load balancing feature.

When designing systems that require load balancing, consider the following:

- Load balancing is a global configuration. When load balancing is enabled, it is applicable for all ESSIDs configured on a controller.
- Load balancing works within only one band. What occurs in the 2.4 GHz band has no impact on the 5 GHz band.
- Load balancing works within an ESSID. What occurs in one ESSID has no impact on other ESSIDs.
- Load balancing works when Virtual Cell and/or Virtual Port are disabled if there is only one radio per channel layer within a particular ESSID. This option works well for load-balanced areas that are small enough such that a single radio per channel layer provides good signal strength coverage throughout the area (for example, -70 dBm for data-only networks or -65 dBm for networks that need to support voice or video).

Channel Layering with Load Balancing Example

Consider a campus deployment example with an auditorium, which is considered a high-density area, for which load balancing is configured. The campus uses one global SSID (student) and two ESSIDs, one for auditorium (auditorium) and one for the rest of the campus (campus).

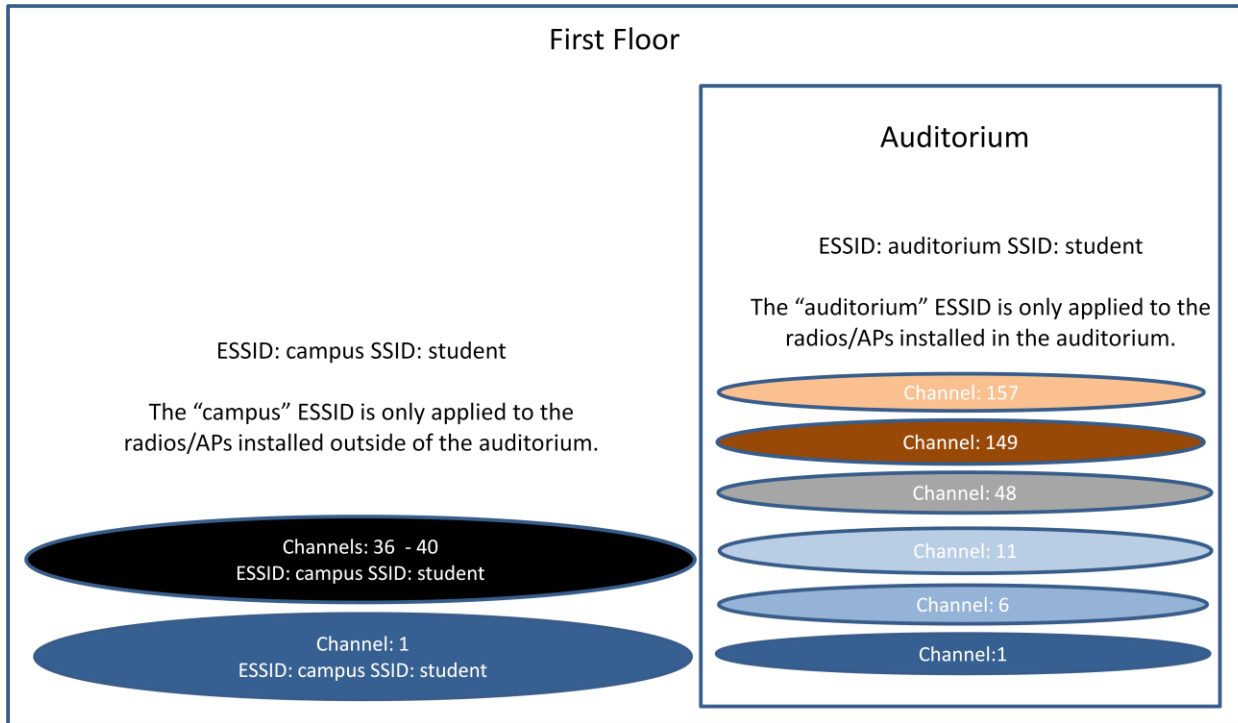


In this example, there is a single high-density area. If the network design required another high-density area elsewhere on the campus, another ESSID would need to be created and applied to the APs in that area. For each discrete high-density area, a unique ESSID must be used, as each area is an independent load-balancing domain.

In [Figure 2](#), the ESSID named campus is configured for radios on channel 1 everywhere except the auditorium. The auditorium ESSID is applied to all radios in the auditorium. One SSID student is applied to the two ESSIDs. In this situation, load balancing occurs only within the auditorium ESSID.

[Figure 2](#) shows how SSIDs and ESSIDs are applied to APs throughout the school.

Figure 2: Channel Layer with Load Balancing Example for a School Campus



Configuration Tasks

You need to perform the following tasks to configure Channel Layering with load balancing:

- [Creating an ESSID](#)
- [Configuring Channel Layering](#)
- [Applying an ESSID to APs/Radios](#)
- [Configuring Load Balancing](#)

Creating an ESSID

This topic describes how to create the ESSID for the APs that are installed in the auditorium. We assume that the campus ESSID has been created and applied to the APs installed throughout the campus except for the APs that are installed in the auditorium.



It is important to remember that the auditorium ESSID is applied only to APs that are installed in the auditorium, and the campus ESSID is applied only to APs that are installed throughout the rest of the campus. The campus ESSID is not applied to the APs in the auditorium.

CLI

To create an ESSID:

1. Enter global configuration mode.

```
controller# configuration terminal
```

2. Enter the ESSID (ESSID) creation mode

```
controller(config)# ssid auditorium
```

3. Configure the SSID for the auditorium ESSID as student.

```
controller(config-ssid)# ssid student
```

4. Enable broadcast of the student SSID on the 5 GHz band only. This feature enables the announcement of the student SSID, for the auditorium ESSID, on the 5 GHz band only. Clients that are only capable of 2.4 GHz can still join the auditorium ESS, assuming that there are 2.4 GHz channels configured for the ESS.

```
controller(config-ssid)# publish-ssid 5GHz
```

5. Disable Virtual Port for APs that support Virtual Cell, such as the AP1010, AP1014i, and AP332. For the AP320 and AP433 this command is not needed.

```
controller(config-ssid)# no virtual-port
```



We recommend that Virtual Port be disabled for AP1000 or AP332 models, as Virtual Cell is the preferred method of RF virtualization for these APs. For the AP320 or AP433 models, Virtual Port needs to be enabled, unless the high-density area is small enough (7,000 square feet or less) such that a single pod of APs can provide good coverage throughout the area.

Virtual Port is not necessary for small high-density areas, which require only a single pod of APs, because there is only a single radio per channel for a high-density area; therefore, there is no reason to enable RF virtualization.

6. Enable band-steering to 11a (5 GHz) mode. This command causes most of the dual-band capable clients to associate with channels in the 5 GHz band, where channels are typically cleaner and more abundant.

```
controller(config-ssid)# band-steering-mode a-steering
```


7. Disable automatic AP join to the ESSID.

This command prevents existing and new APs from automatically joining the auditorium ESSID. The ESSIDs needs to be manually applied to the APs installed in the auditorium, which is described in [Applying an ESSID to APs/Radios](#).

```
controller(config-ssid) # no ap-discovery join-ess
```

8. Exit ESSID mode to enable the commands just entered.

```
controller(config-ssid) # exit
controller(config) #
```

Web UI

To create an ESSID:

1. In the Web UI, select **Configuration>Wireless>ESS>Add**. The ESS Profile – Add page appears, as shown in [Figure 3](#) and [Figure 4](#).
2. In the ESS Profile Name field, enter `auditorium`.
3. In the SSID field, enter `student`.
4. In the SSID Broadcast list, select **5GHz band Only**.
5. In the New APs Join ESS list, select **Off**.
6. Do one of the following:
 - If you are using APs that support Virtual Cell, such as the AP1010, AP1014i, and AP332, go to step [7](#).
 - If you are using the AP320 or AP443 models, go to step 8.
7. In the Virtual Port list, select **Off**.
8. Enable band-steering to 11a (5 GHz) mode. This command will result in most of the dual-band capable clients to associate to channels in the 5 GHz band, where channels are typically cleaner and more abundant.
9. In the Band Steering Mode list, select **Band Steering to A Band**.
10. Click **OK**.

Figure 3: Creating an ESSID Profile

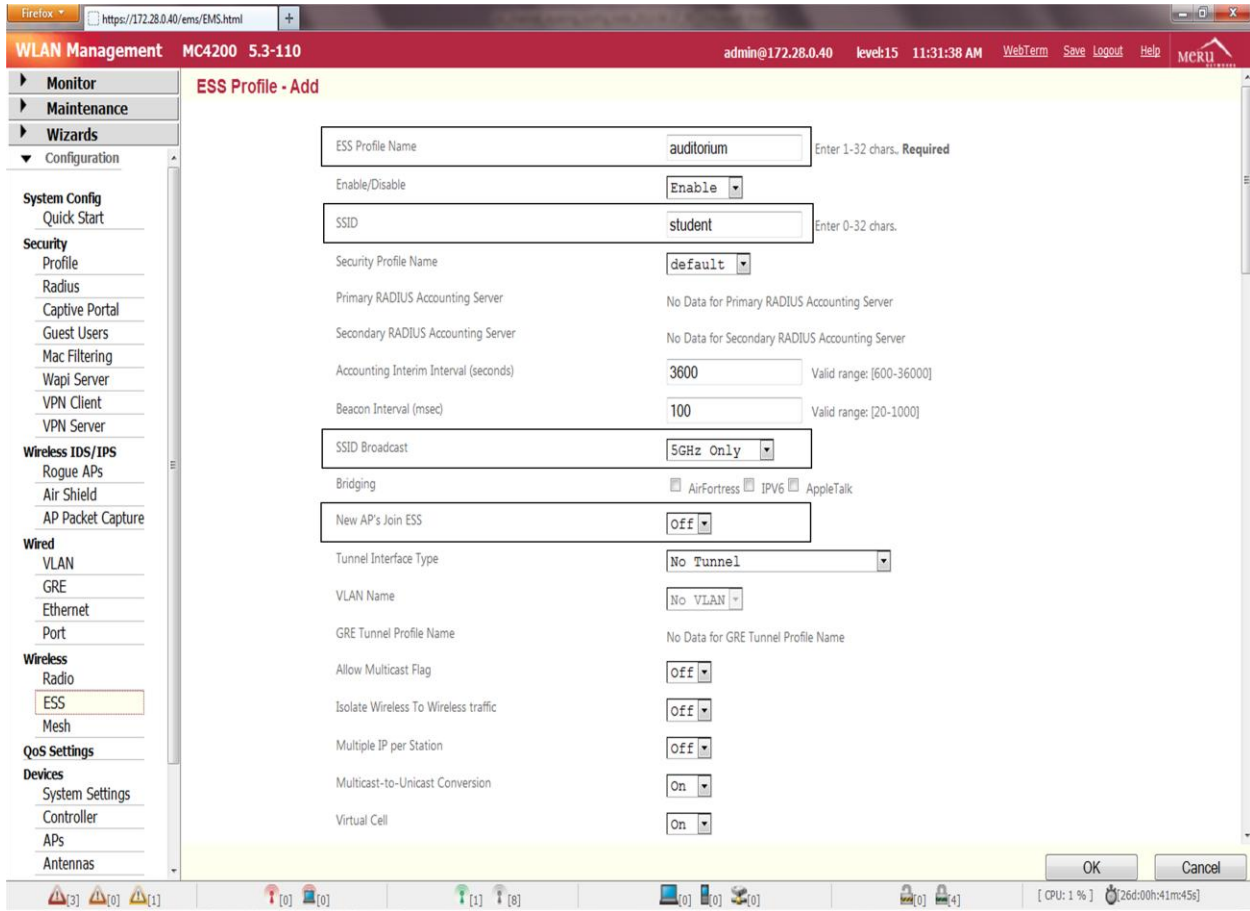
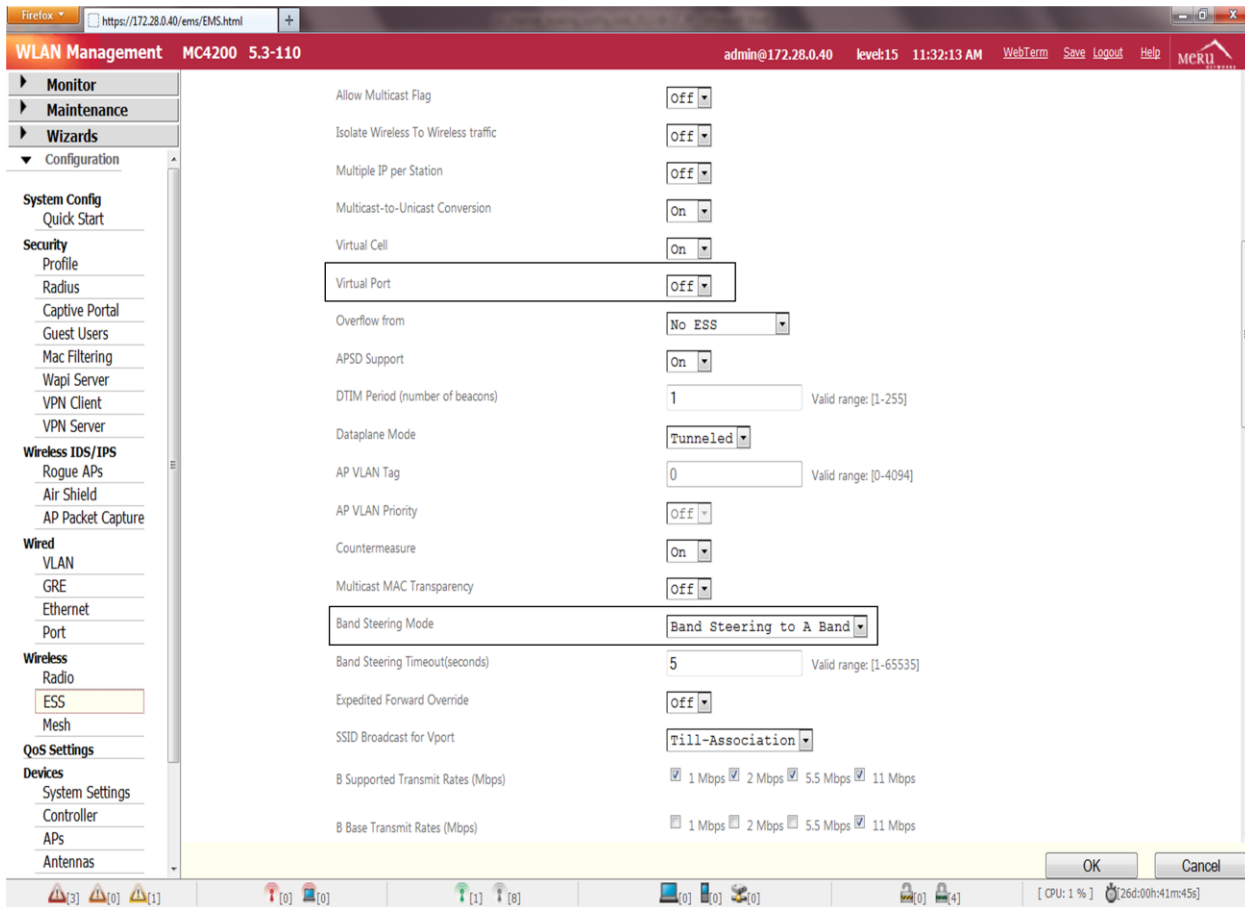


Figure 4: Creating an ESSID Profile (Continued)



Configuring Channel Layering

To configure Channel Layering, you specify the channels for radios in each channel. You can use the CLI or Web UI to configure radios. If you use the Web UI, you can use the Bulk Update feature to specify the channel for a group of radios.



When configuring Channel Layering, each pod of APs must have identical channel configurations for an ESSID.

CLI

To specify an AP's radio channel:

1. Enter global configuration mode.

```
controller# configuration terminal
```

2. Enter radio interface configuration mode.

```
controller(config)# interface Dot11Radio ap-id interface-id
```

- Use the `channel` command to specify the channel number.

```
controller(config-if_802)# channel channel_number
```

- Repeat steps 2 and 3 for each radio's new channel assignment.

Web UI

To change the channels for a group of radios:

- In the Web UI, click **Configuration > Wireless > Radios**. The Wireless Interface Configuration page appears, as shown in [Figure 5](#).
- Select the APs whose channels you want to change by selecting the check boxes for them in the first column.

Figure 5: Wireless Interface Configuration Page

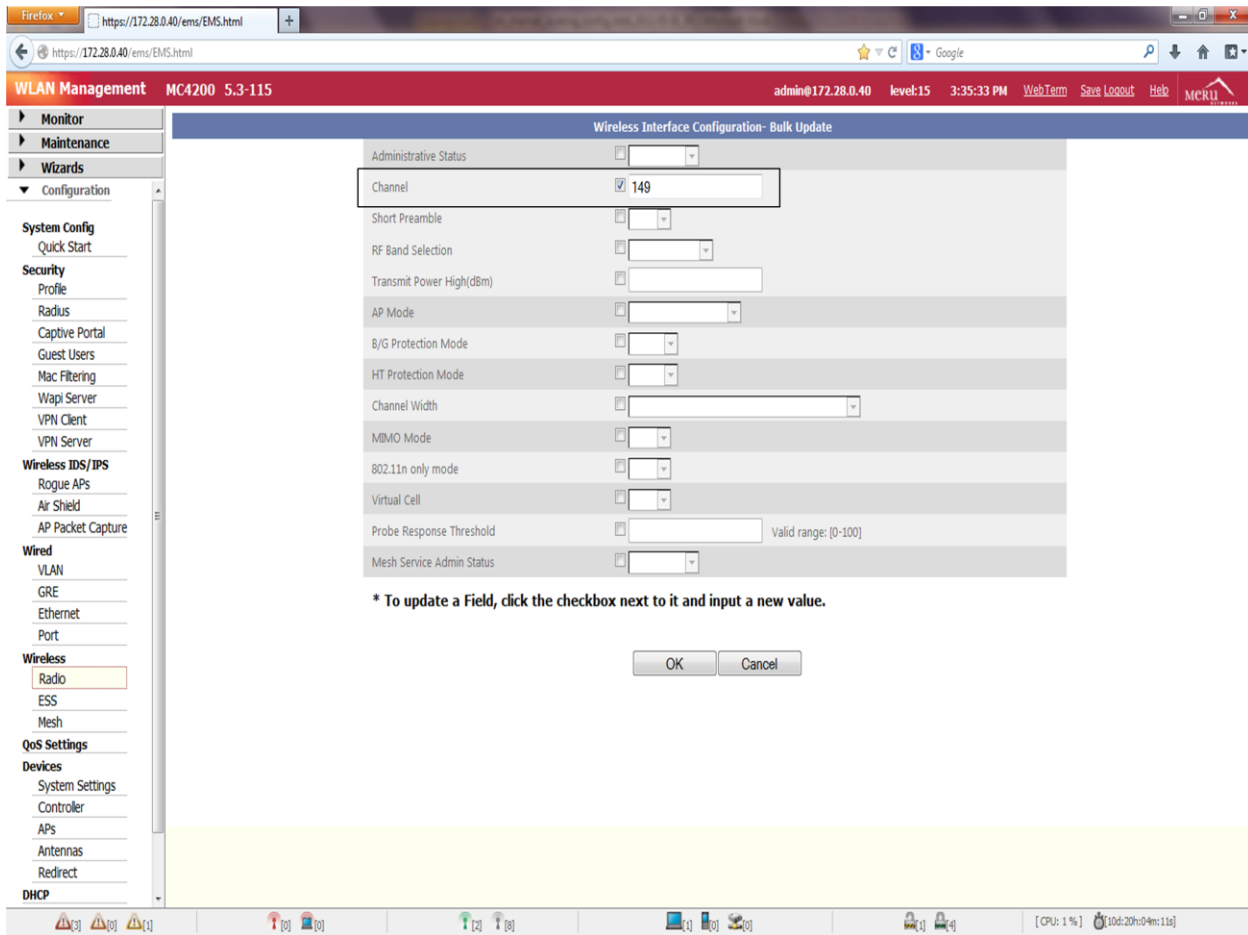
AP ID	AP Name	Radio ID	Model	Status	Mode	Channel	Channel	Channel	Mode	Mode	Mode	
<input type="checkbox"/>	25	AP-25	2	AP332e	Up	Enabled	157	157	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	25	AP-25	1	AP332e	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input type="checkbox"/>	26	AP-26	3	AP433i	Down	Disabled	149	149	802.11an	Scanning Mode	Disable	Downlink
<input type="checkbox"/>	26	AP-26	2	AP433i	Down	Disabled	36	36	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	26	AP-26	1	AP433i	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input checked="" type="checkbox"/>	27	AP-27	3	AP433e	Down	Disabled	165	165	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	27	AP-27	2	AP433e	Down	Disabled	36	36	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	27	AP-27	1	AP433e	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input type="checkbox"/>	29	AP-29	3	AP433is	Up	Enabled	149	149	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	29	AP-29	2	AP433is	Down	Disabled	36	36	802.11an	Scanning Mode	Disable	Downlink
<input type="checkbox"/>	29	AP-29	1	AP433is	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input checked="" type="checkbox"/>	31	AP-31	2	AP332i	Down	Disabled	165	165	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	31	AP-31	1	AP332i	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input type="checkbox"/>	32	AP-32	2	AP320	Down	Disabled	36	36	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	32	AP-32	1	AP320	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input checked="" type="checkbox"/>	33	AP-33	3	AP433e	Up	Disabled	165	165	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	33	AP-33	2	AP433e	Down	Disabled	36	36	802.11an	Normal Mode	Disable	Downlink
<input type="checkbox"/>	33	AP-33	1	AP433e	Down	Disabled	6	6	802.11bgn	Normal Mode	Disable	Downlink
<input type="checkbox"/>	35	AP-35	2	AP1020	Down	Disabled	165	165	802.11an	Normal Mode	Enable	Downlink

- Click **Bulk Update**.
- Select the check box for the Channel field.
- In the Channel field, type the new channel number.

6. Click **OK**.

The channel number is changed for the APs.

Figure 6: Wireless Interface Configuration Bulk Update Page



Applying an ESSID to APs/Radios

You need to apply the auditorium ESSID, which you created in [Creating an ESSID](#) to the APs installed in the auditorium.

CLI

Although more APs are likely needed in the auditorium to provide the channel layers shown in [Figure 1](#), for simplicity, this example shows how to apply the auditorium ESSID to one radio on AP26.

To apply an ESSID to an AP/radio:

1. Enter global configuration mode.

```
controller# configuration terminal
```

2. Select the newly created auditorium ESSID for configuration.

```
controller(config) # essid auditorium
```

3. Apply the auditorium ESS to the APs in the auditorium.

```
controller(config-essid) # ess-ap 26 2  
controller(config-essid-essap) # exit  
controller(config-essid) # exit  
controller(config) # exit
```

Use the previous procedure to apply the auditorium ESSID to other APs/radios installed in the auditorium.

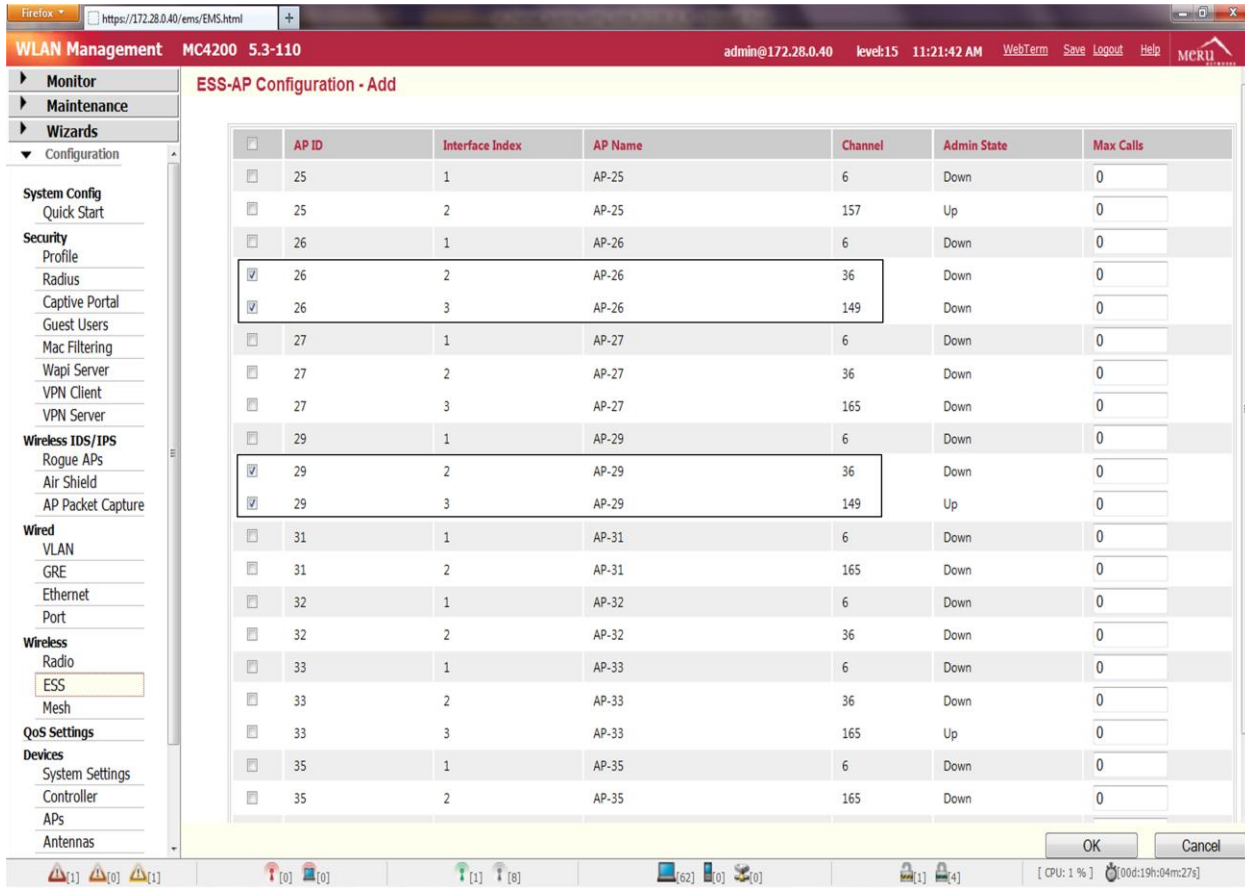
Web UI

In this example, AP26 and AP29 are installed in the auditorium, so the auditorium ESSID is applied to all radios on those APs.

To apply an ESSID to APs/radios:

1. In the Web UI, click **Configuration > Wireless > ESS**.
2. Select the check box for the ESSID, and click **Settings**.
3. Select the **ESS-AP Table** tab.
4. Click **Add**. The ESS-AP Configuration - Add page appears, as shown in [Figure 7](#).
5. Select the check box(es) for the APs to which the ESSID is applied.
In this example, AP26 and AP29 are selected.
6. Click **OK**.

Figure 7: ESS-AP Configuration Page



Configuring Load Balancing

You configure load balancing by performing the following tasks:

- Configure the maximum number of stations per BSSID.

You need to set the maximum number of clients that are allowed to associate to a channel layer (or BSSID) for a specific ESSID. The maximum number of stations allowed is 0 through 1023. The default value is 0.

- Enable load balance overflow.

When load balance overflow is enabled, as all channels reach the maximum station count, the count is automatically incremented by three.

- Change the station assignment age time value.

When configuring load balancing, set the station assignment aging time to 5 seconds. Limiting the aging time to 5 seconds, which is the minimum value allowed, speeds up the load-balancing process and frees up system resources associated with maintaining station assignments. The default aging time is 30 seconds.

- Create, upload, and apply boot scripts.

As part of configuring Channel Layering with load balancing, you need to create, upload, and apply a boot script. The boot script is a text file that contains AP CLI commands that specify that APs respond only to clients to which they are assigned. These APs will not respond to every client broadcast. For more information, see [Creating, Uploading, and Applying Boot Scripts](#).

CLI

To configure load balancing:

1. Enter global configuration mode.

```
controller# configuration terminal
```

2. Specify the maximum number of clients that can associate with a BSSID. In the following example, the maximum number of clients that can associate with a BSSID is 10.

```
controller(config)# qosvars max-stations-per-bssid 10
```

3. Enable load balance overflow.

```
controller(config)# qosvars load-balance-overflow on
```

4. Specify the station assignment aging time to 5 seconds.

```
controller(config)# qosvars station-assign-age 5
```

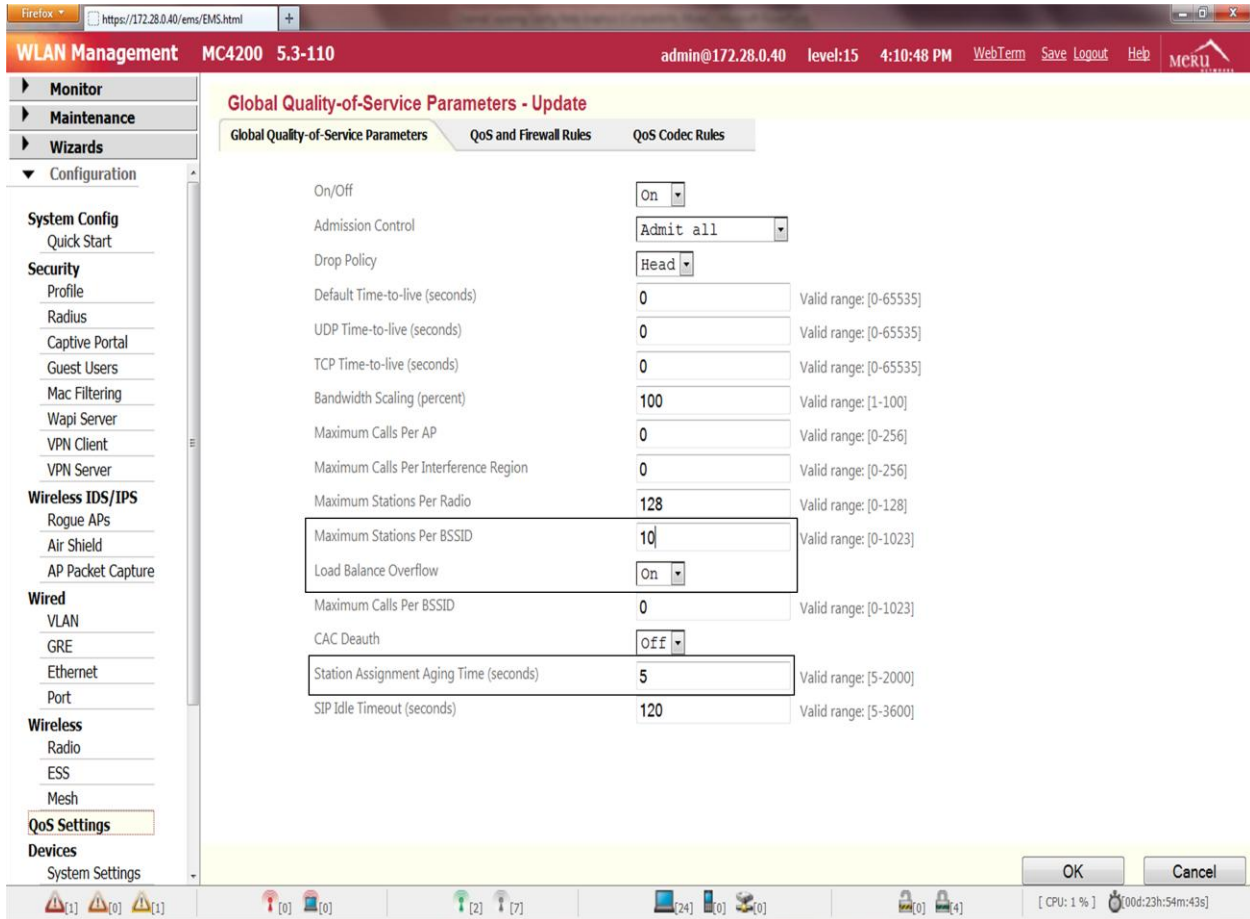
5. You now need to create, upload, and apply a boot script. For more information, see [Creating, Uploading, and Applying Boot Scripts](#).

Web UI

To configure load balancing:

1. In the Web UI, click **Configuration > QOS > System Settings**. The Global Quality-of-Service Parameters page appears, as shown in [Figure 8](#).
2. In the Maximum Stations Per BSSID field, type the maximum number of clients allowed to associate to a BSSID (for example, type 10).
3. In the Load Balance Overflow list, select **On**.
4. In the Station Assignment Age Time field, type **5**.
5. Click **OK**.
6. You now need to create, upload, and apply a boot script. For more information, see [Creating, Uploading, and Applying Boot Scripts](#).

Figure 8: Global Quality-of-Service Parameters Web UI Page



Creating, Uploading, and Applying Boot Scripts

When configuring load balancing, you need to create, upload, and apply a boot script. The boot script required for load balancing prevents radios from responding to probe requests unless an assignment can be made for the client probing.

Creating and Uploading Boot Scripts

For all Meru AP models, you need to create a boot script, as described in the following procedure.

To create and upload a boot script to the controller:

1. Using a text editor that supports line breaks, or end-of-line (EOL) characters that are compatible with UNIX, create a text file named `proa.scr`. If you are using a system other than UNIX or Linux, you need to use a third-party text editor that supports UNIX-compatible EOL characters (for example, `gvim`).

Add the following AP CLI commands to the boot script file:

```
radio prt radio0 assigned 0
radio prt radio1 assigned 0
radio prt radio2 assigned 0 (for AP433s only)
```

The `radio prt radio` commands prevent radios from responding to probe requests if the radios are unable to accommodate any more assignments because the channel layer/BSSID has reached the max station per the BSSID limit.

2. Copy the `proa.scr` file to the `ATS/scripts` directory on the controller.

- a. Change the directory to `ATS/scripts`:

```
controller# cd ATS/scripts
```

- b. Use the `copy` command to transfer the `proa.scr` file to the controller:

```
controller# copy protocol://username:password@server/filename .
```

You can use FTP, SCP, SFTP, or TFTP to transfer files to the controller. Use a valid username and password on the remote server.

Applying the Boot Script

After uploading the boot script to the controller, you need to specify that the boot script is run when an AP is booted.

CLI

To specify that the boot script is run when an AP is booted, type the following commands:

```
controller# configuration terminal
controller(config)# boot-script proa.scr
```

Manually reboot an AP by using the `reload ap` command.

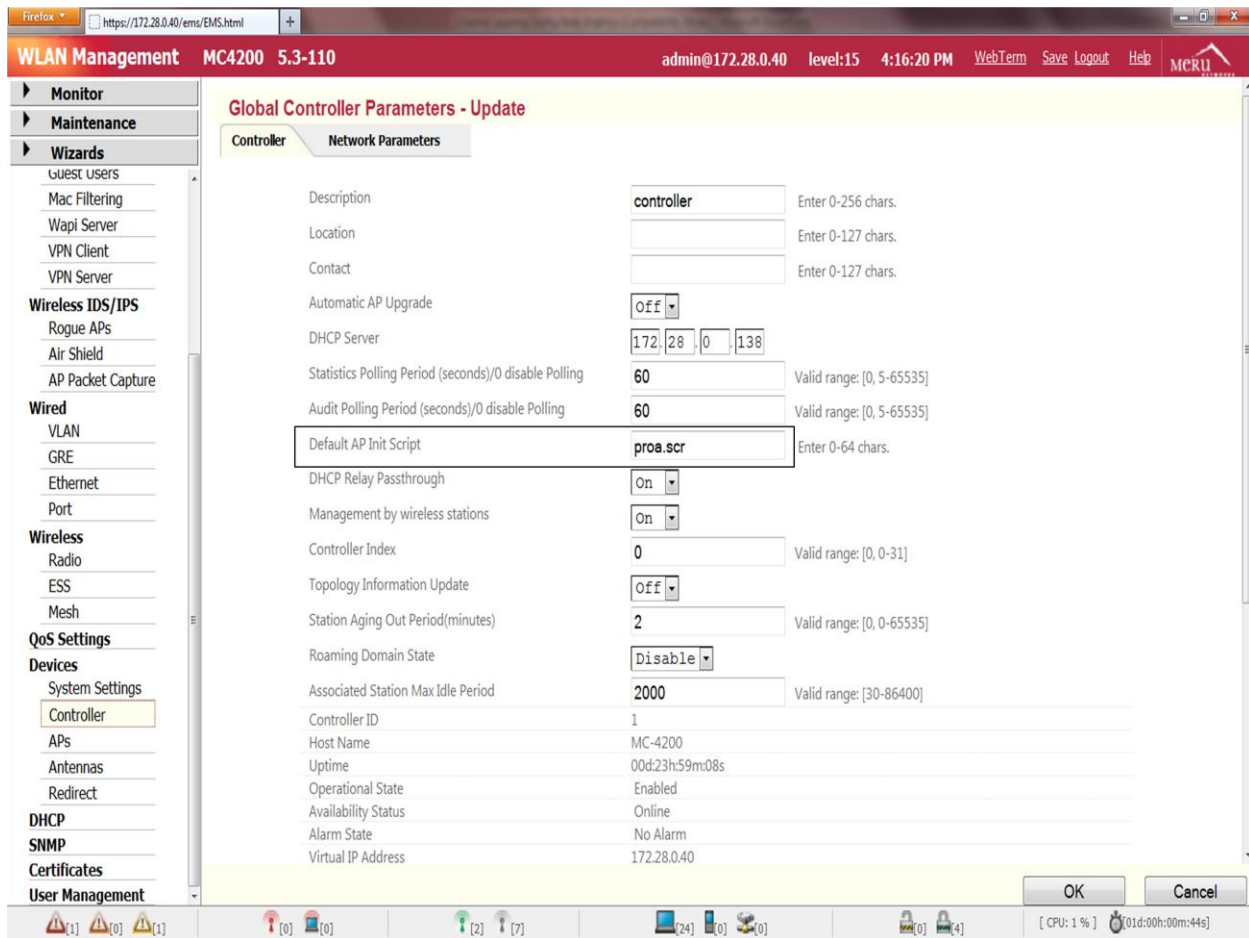
Web UI

To specify that the boot script is run when the AP is booted:

1. In the Web UI, click **Configuration > Devices > Controller**. The Global Controller Parameters page appears, as shown in [Figure 9](#).
2. In the Default AP Init Script field, type `proa.scr`.

3. Click **OK**.

Figure 9: Global Controller Parameters Page



4. Manually reboot one or more APs:

- a. Select **Maintenance > Reboot > Controller/APs**. The Select APs for Reboot page appears, as shown in [Figure 10](#).
- b. Select the check box for one or more APs that you want to reboot.
- c. Click **Reboot**.

Figure 10: Select APs for Reboot Page

WLAN Management MC4200 5.3-110 admin@172.28.0.40 level:15 4:18:02 PM WebTerm Save Logout Help

Monitor Reboot All Reboot Controller

Configuration

Wizards

Maintenance

Reboot System

Captive Portal

Import File

Customization

Custom CP

AP Replacement

SysLog Files

Password

Licensing

Licenses

Import License

View License

Diagnostics

Max Page Size

Technical Support

Select APs for Reboot (9 entries)

<input type="checkbox"/>	AP ID	AP Name	Serial Number	Uptime	Operational State	Availability Status	Runtime Image Version	Connectivity Layer	AP Model
Search:						Online			
<input checked="" type="checkbox"/>	25	AP-25	00:0ce6:0df1:91	00d:01h:45m:00s	Enabled	Online	5.3-dev-1.0	L3	AP332e
<input checked="" type="checkbox"/>	29	AP-29	00:0ce6:0da5:9f	00d:03h:51m:20s	Enabled	Online	5.3-115	L3	AP433is
<input type="checkbox"/>	26	AP-26	00:0ce6:0a:60:35	00d:00h:00m:00s	Disabled	Offline		None	AP433i
<input type="checkbox"/>	27	AP-27	00:0ce6:0a:59:a8	00d:00h:00m:00s	Disabled	Offline		None	AP433e
<input type="checkbox"/>	31	AP-31	00:0ce6:10:fb:10	00d:00h:00m:00s	Disabled	Offline		None	AP332i
<input type="checkbox"/>	32	AP-32	00:0ce6:0a:ef:2a	00d:00h:00m:00s	Disabled	Offline		None	AP320
<input type="checkbox"/>	33	AP-33	00:0ce6:0a:68:f8	00d:00h:00m:00s	Disabled	Offline		None	AP433e
<input type="checkbox"/>	35	AP-35	00:0ce6:09:a0:c0	00d:00h:00m:00s	Disabled	Offline		None	AP1020
<input type="checkbox"/>	36	AP-36	00:0ce6:09:a4:94	00d:00h:00m:00s	Disabled	Offline		None	AP1020

Refresh Reboot

[1] [0] [1] [0] [0] [2] [7] [24] [0] [0] [0] [0] [4] [CPU: 1 %] [01d:00h:00m:44s]

Where to Find More Information

For more information about designing networks that require Channel Layering with load balancing, see the *AP332 Deployment Guide*, the *AP400 Deployment Guide*, and the *Best Practice Guide for High Density Design and Deployment*, which are available at <http://salesportal.merunetworks.com>.