vWLAN

Configuring Dynamic Multicast Optimization

Basic Configuration Guide

To the Holder of this Document

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Revision History

Rev A   July 2018   Initial release

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1 Overview

This configuration guide describes the use of converting multicast transmissions to unicast transmissions in ADTRAN's Bluesocket virtual wireless local area network (vWLAN) and Bluesocket Access Points (BSAPs). Topics include an introduction to the new multicast optimization features, an overview of the multicast conversion feature, configuration considerations and procedures, and troubleshooting information.

1.1 Intended Audience

The intended audience for this information is the network administrator using and configuring the ADTRAN vWLAN instance. The instructions assume familiarity with the intended use of the equipment, basic required installation and configuration skills, and knowledge of local and accepted wireless networking practices.

1.2 Document Structure

Table 1 lists the topics contained in this document.

Table 1. Topic List

1.3 Hazard and Conventional Symbols

The following Hazard symbols are used throughout this guide:

⚠ **WARNING!**
Warning: Service affecting. Possible risk of system failure.

⚠ **CAUTION!**
Caution: Indicates that a failure to take or avoid a specific action could result in a loss of data.

❶ *NOTICE!*
Notice: Provides information that is essential to the completion of a task.

ℹ **NOTE**
Note: Information that emphasizes or supplements important points of the main text.

1.4 Related Online Documents and Resources

Refer to Table 2 for additional information for this product.

Documentation for vWLAN products is available for viewing and download directly from the ADTRAN Support Community website at https://supportforums.adtran.com/welcome.

Table 2. Related Online Documents and Resources

Title	Part Number	Description
vWLAN Documentation		
vWLAN Administrator's Guide	6ABSAG0001-31	Administrator's guide for the configuration of vWLAN instances and services. Provides complete configuration information for all vWLAN features and processes.

2 Introduction to Multicast Optimization

Multicast transmissions provide an efficient method for delivering common information from a single source to multiple recipients without unnecessary duplication and network resource waste. It is most often associated with the delivery of media content such as video and audio, but may also be used to deliver data such as news, stock tickers, and other one-to-many messages.

In vWLAN firmware release 3.2.0, enhanced multicast conversion features were introduced. These features, including dynamic multicast optimization, channel utilization monitoring, and multicast rate optimization, work together as a suite of multicast optimization tools that optimize multicast transmissions within the wireless network. Multicast optimization provides better performance for multicast traffic, alleviating high channel utilization and poor performance associated with multiple streams of data or video.

For example, multicast Dynamic Naming System (DNS) can be used by wireless clients in conjunction with other applications, such as Apple's Bonjour protocol and other android devices, as they search for printers, televisions, or other wireless devices. If your network is configured to use traditional multicast transmissions without unicast conversion, these transmissions are sent at the lowest data rate and transmitted by only one wireless station at a time. As individual clients wait for this information, the network can lag and drive down the performance of the entire vWLAN system. Wireless network configurations are recommended to use multicast conversion (as described in "Multicast Transmissions and Their Conversion to Unicast Transmissions" below) to send data at higher rates and relieve some of this network congestion. However, when using multicast applications in the network, such as video, these individual unicast wireless streams add up quickly and cause high channel utilization and poor network performance. The new vWLAN multicast optimization features work together to alleviate these wireless network congestion issues.

2.1 Multicast Transmissions and Their Conversion to Unicast Transmissions

In multicast communication, a single unit behaves as if it is communicating with a single endpoint, but that message is replicated to every member listening for that unit's stream. In a multicast-enabled network, specific content is sent in a single stream to a specific multicast address, much like a local broadcast TV station sends its content on a specific broadcast frequency. The network has multicast intelligence and is able to make copies of the stream as necessary to reach all active receivers.

The benefit of using multicast transmissions instead of a broadcast transmissions is that only devices running a process that uses a given multicast address need to listen for that address. Other devices are not interrupted when traffic is transmitted to a multicast address. With broadcast traffic, all attached devices are interrupted to listen to a broadcast packet.

When multicast transmissions are converted to unicast transmissions, rather than sending messages from one source to several destinations, or to all destinations, on the network, messages are sent to a single destination. In the wireless environment, when multicast and broadcast transmissions are sent wirelessly, they use the lowest data rate available, often resulting in lower performance than unicast transmissions. If traffic is converted from multicast to unicast, it is sent using a higher data rate (thus improving performance) and uses less air time. They are also sent to a single client at a time, therefore using the data speed of each client rather than that of the slowest client. In addition, converting multicast transmissions to unicast transmissions adds fidelity to network transmissions.

2.2   Multicast Optimization Functionality in vWLAN

When using multicast optimization in vWLAN, the channel utilization feature allows the AP to dynamically switch back to traditional multicast usage when paired with the dynamic multicast optimization feature, thus reducing overhead and improving transmission speeds. The multicast rate optimization feature, alternatively, is used in conjunction with traffic steering to keep data transmission rates higher and improves the overall wireless experience because traffic is sent at the highest common data rate of connected clients. Multicast rate optimization is used only when dynamic multicast optimization is disabled either manually or dynamically and when traffic is sent natively as multicast.

When both dynamic multicast optimization and multicast rate optimization are enabled, once a wireless client joins an IGMP group and multicast-to-unicast transmission conversion is used, these transmissions are sent to the client at their data rate until the configurable threshold is reached. This configuration provides a distinct advantage over the traditional multicast-to-unicast conversion configuration because once the threshold is reached, dynamic multicast optimization disables multicast-to-unicast conversion and proceeds sending multicast traffic natively while utilizing multicast rate optimization. Multicast rate optimization uses the highest common transmit rate of multicast clients using the SSID when traffic is being sent as multicast (rather than unicast) at a much higher rate than the maximum 1 Mbps provided with traditional multicast.

3   Hardware and Software Requirements and Limitations

Multicast conversion is supported on vWLAN instances running firmware revisions 2.3.0.9 or later. In addition, BSAP firmware 6.7.0-23 is recommended for use with this version of vWLAN. These products support the conversion of multicast transmissions to unicast transmissions.

In vWLAN firmware release 3.2.0, additional enhancements for multicast conversion are supported. These enhancements include dynamic multicast optimization, channel utilization monitoring, and multicast rate optimization.

3.1   Multicast Conversion Configuration and Deployment Considerations

By default, each Service Set Identifier (SSID) in vWLAN is enabled to convert broadcast and multicast transmissions to unicast transmissions. From a security standpoint, it is difficult to configure the firewall properly for multicast transmissions between different client types because the transmission is not client-specific, but rather based on a multicast address. When multicast transmissions are converted to unicast transmissions, traffic can be more closely policed because the traffic is split into individual streams on a per-client basis. In addition, when multicast and broadcast transmissions are sent wirelessly, they use the lowest data rate available, resulting in lower performance than with unicast transmissions. Converted traffic is sent using a higher data rate, thus improving performance and using less air time. Unicast traffic is sent to a single client, and is therefore transported at the speed of the client (rather than at the slowest client speed).

In addition, any time that multicast traffic is converted to unicast traffic, additional overhead is generated in the transmission, stemming from the use of unicast acknowledgment messages. These messages add an extra frame to the transmission, which if missed, can cause message retransmissions. The retransmissions cause additional message overhead, even while providing extra fidelity through an acknowledgment process. Multicast does not provide this same level of fidelity because acknowledgment messages are not used, and clients must converse with the AP in order to receive multicast buffered frames. In order to provide the client with the buffered frames, the client must be woken by the AP. The amount of time

required to wake the client can be lengthy, but it can also be managed by configuring the beacon intervals and delivery traffic indication message (DTIM) values within the SSID.

> **i** **NOTE**
>
> Changing the beacon interval can cause the client to check in with the AP more frequently, and can result in increased battery usage.

ADTRAN does not recommend converting multicast transmissions to unicast transmissions if there are more than ten clients associated to each radio. If you choose not to convert multicast network traffic to unicast traffic, you must allow multicast traffic in the vWLAN role associated with the SSID. If multicast traffic is not allowed in the SSID's role, and conversion of multicast traffic to unicast traffic is not enabled in the SSID, then multicast traffic from a wired host or wireless client on another AP will not be received.

Multicast conversion use in vWLAN is recommended only with a small number of clients per radio (ten or fewer), due to the large overhead multicast transmissions create.

4 Configuring Multicast Conversion in vWLAN

To configure multicast conversion in vWLAN, you must complete the following tasks:

- "Configure the SSID for Multicast Conversion Support" on page 13
- "Configure the SSID's Role to Support Multicast" on page 18
- "Apply the Configuration to the AP" on page 22

4.1 Configure the SSID for Multicast Conversion Support

By default, broadcast and multicast transmissions are converted to unicast transmissions on the AP's SSID. You can choose to configure the system to convert broadcast, multicast, or both broadcast and multicast transmissions to unicast transmissions on a per-SSID basis. In addition, you can configure the multicast optimization features for the SSID.

To configure the SSID's multicast conversion setting, connect to the vWLAN GUI, navigate to the **Configuration** tab, and select **Wireless > SSIDs**, as shown in Figure 1.
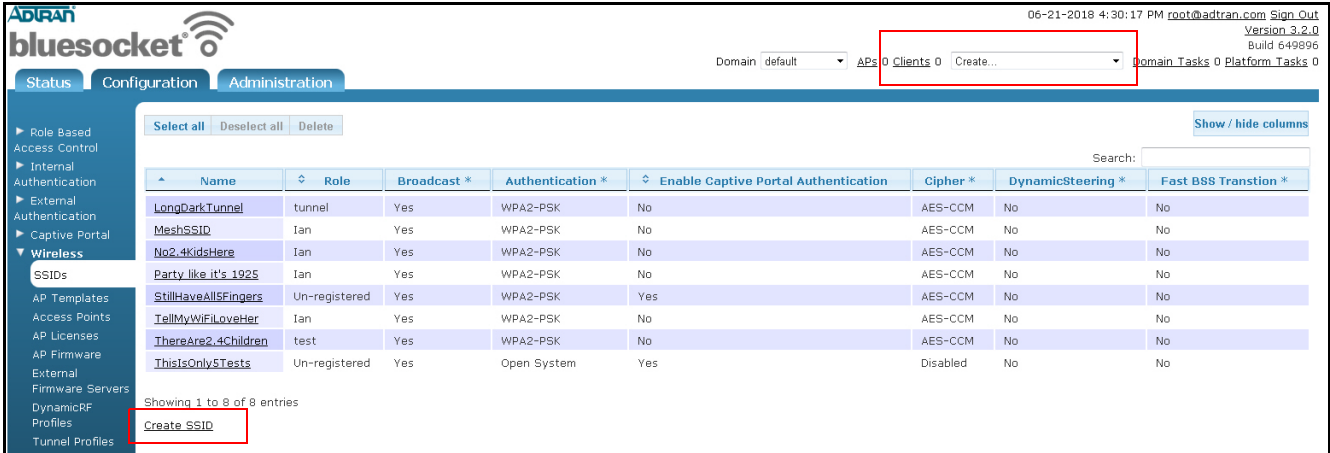

Figure 1. SSID Configuration Menu

Any previously configured SSIDs are listed here, and their name, role broadcast SSID, authentication method, accounting server, and cipher type are also displayed. You can choose

to edit a previously created SSID by selecting the SSID from the list, or choose to create a new SSID by selecting **Create SSID** at the bottom of the menu or select **Domain SSID** from the **Create** drop-down menu at the top right of the page.

4.1.1 Select the Conversion Type to Use

Once you have selected the SSID to configure, use the **Convert** drop-down menu in the SSID's configuration menu to select the conversion type used by the SSID. Menu options include:

- **Convert broadcast and multicast to unicast** This is the default setting for all SSIDs in vWLAN instances using firmware 3.2.0 and later. This selection enables the conversion of both broadcast and multicast transmissions to unicast transmissions, and provides further configuration for multicast optimization features (refer to "Configure Multicast Optimization Features" on page 15).

- **Convert multicast to unicast** With this setting, multicast transmissions are converted to unicast transmissions, thus optimizing performance on the network by using higher data rates and the speed of individual clients. In vWLAN firmware 3.2.0 and later, this setting also provides further configuration for multicast optimization features (refer to "Configure Multicast Optimization Features" on page 15).

- **Convert broadcast to unicast** This selection enables the conversion of broadcast transmissions to unicast transmissions. Using this setting converts messages sent to all clients simultaneously (broadcast) to unicast messages sent to a single client, thus improving network performance and sending the transmission at the speed of each client. This setting does not include multicast transmission conversion.

- **Disable** This selection disables multicast/broadcast conversion to unicast. If conversion is disabled, multicast transmissions are delivered at the lowest rate (1 Mbps) and can result in slow data rates on the network. If the multicast conversion is set to **Disable**, you must configure the role associated with the SSID to support multicast (refer to "Configure the SSID's Role to Support Multicast" on page 18).

Select the appropriate setting from the **Convert** drop-down menu in the SSID's configuration menu as shown in Figure 2:
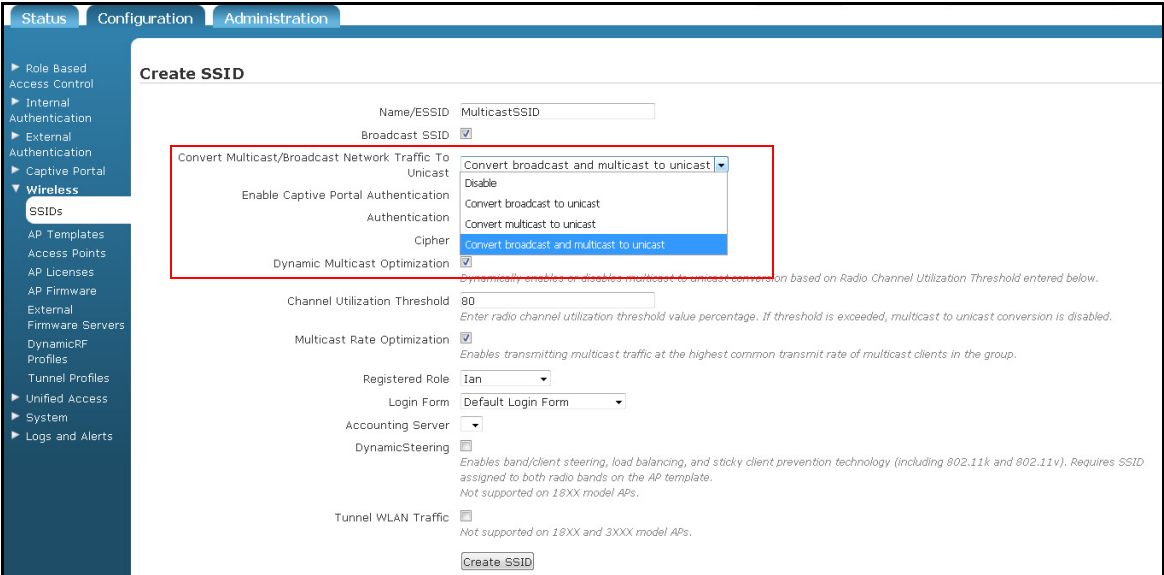

Figure 2. SSID **Convert** Drop-down Menu

If you have selected **Disable** or **Convert broadcast to unicast**, select **Update/Create SSID** at the bottom of the menu to complete the SSID transmission conversion configuration. If you selected **Disable** or **Convert broadcast to unicast**, you must now configure the SSID role (refer to "Configure the SSID's Role to Support Multicast" on page 18).

If you have selected **Convert multicast to unicast** or **Convert broadcast and multicast to unicast**, you can choose to configure the multicast optimization features as described in the following sections.

4.1.2   Configure Multicast Optimization Features

If you selected **Convert multicast to unicast** or **Convert broadcast and multicast to unicast** in the SSID configuration page, you can optionally choose to configure the various multicast optimization features, including enabling dynamic multicast optimization, specifying a channel utilization threshold, and enabling multicast rate optimization.

To access these features in the SSID's configuration menu, follow these steps:

1. In the **Create SSID** configuration menu, enable or disable **Dynamic Multicast Optimization** by selecting the **Dynamic Multicast Optimization** checkbox as shown in Figure 3. This feature is enabled by default, and dynamically enables or disables multicast to uni-

cast conversion based on a configurable radio channel utilization threshold. If this check box is selected, you can optionally configure the channel utilization threshold.

Create SSID

Name/ESSID	MulticastSSID
Broadcast SSID	☑
Convert Multicast/Broadcast Network Traffic To Unicast	Convert broadcast and multicast to unicast ▼
Enable Captive Portal Authentication	☐
Authentication	Open System ▼
Cipher	Disabled ▼
Dynamic Multicast Optimization	☑
	Dynamically enables or disables multicast to unicast conversion based on Radio Channel Utilization Threshold entered below.
Channel Utilization Threshold	80
	Enter radio channel utilization threshold value percentage. If threshold is exceeded, multicast to unicast conversion is disabled.
Multicast Rate Optimization	☑
	Enables transmitting multicast traffic at the highest common transmit rate of multicast clients in the group.
Registered Role	Ian ▼
Accounting Server	▼
DynamicSteering	☐
	Enables band/client steering, load balancing, and sticky client prevention technology (including 802.11k and 802.11v). Requires SSID assigned to both radio bands on the AP template.
	Not supported on 18XX model APs.
Tunnel WLAN Traffic	☐
	Not supported on 18XX and 3XXX model APs.
	Create SSID

Figure 3. Dynamic Multicast Optimization Configuration Options

2. If you have enabled **Dynamic Multicast Optimization**, you can enter a value for the channel utilization threshold as shown in Figure 4. This threshold value is used to enable or disable multicast conversion. If the channel utilization value of the radio is more than the configured threshold value, multicast to unicast conversion is dynamically disabled. Alternatively, multicast to unicast conversion is dynamically enabled when the channel utilization value of the radio is less than the configured threshold value. By default, the

threshold value is set to **80** percent. To specify a different channel utilization threshold, enter the appropriate percentage value in the **Channel Utilization Threshold** field.

Figure 4. Channel Utilization Threshold Configuration

3. Additionally, you can optionally enable or disable **Multicast Rate Optimization** by selecting the appropriate checkbox as shown in Figure 5 on page 18. Enabled by default, this setting specifies that multicast transmissions are sent at the highest common transmit rate for either radio of multicast clients using the SSID when traffic is being sent as multicast (rather than unicast). This setting does not dynamically change multicast

conversion functionality, nor does it use the values configured in the channel utilization threshold.

Figure 5. Multicast Rate Optimization Configuration

ℹ NOTE
When both dynamic multicast optimization and multicast rate optimization are used, dynamic multicast optimization takes precedence until it dynamically turns off the conversion, thus enabling multicast rate optimization.

Once you have configured the multicast optimization settings for the SSID, select **Update/ Create SSID** and the bottom of the menu. If you selected **Disable** or **Convert broadcast to unicast** as the conversion type, continue multicast configuration by configuring the SSID role as described in the next section.

4.2   Configure the SSID's Role to Support Multicast

If the multicast conversion is set to **Convert multicast to unicast** or **Convert broadcast and multicast to unicast**, continue multicast conversion configuration by applying the changes to the AP (refer to "Apply the Configuration to the AP" on page 22). If the multicast conversion is set to **Disable** or **Convert broadcast to unicast**, you must configure the role associated with that SSID to also support multicast transmissions. To configure the SSID's role for multicast support, you must configure a destination network and then assign that destination network to the role associated with the SSID.

ℹ NOTE
The steps documented below relate to destination and role configuration for use with multicast transmission and SSIDs. For more information about configuring destinations and user roles in general, refer to the *vWLAN Administrator's Guide*, available online at https://support-forums.adtran.com.

4.2.1 Create a Destination Network for the Role

To create a destination network for the user role associated with the previously configured SSID, follow these steps:

1. In the vWLAN GUI, navigate to the **Configuration** tab, and select **Role Based Access Control > Destinations**. Create a new destination by either selecting **Create Destination Network** at the bottom of the menu as shown in Figure 6, or selecting **Destination Network** from the **Create** drop-down menu at the top right of the page.
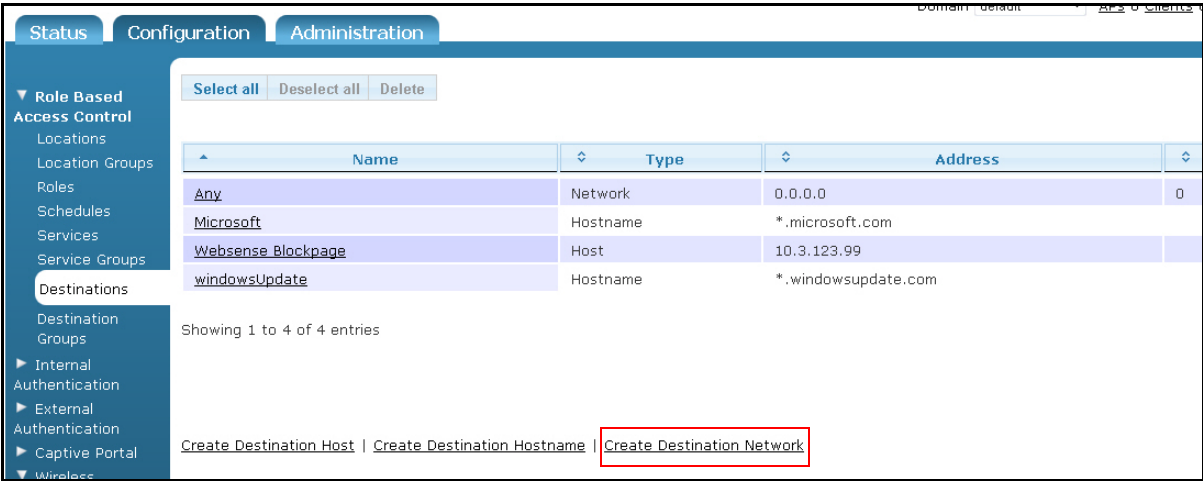

Figure 6. Create Destination Network

2. Define the parameters of the new destination network by completing the appropriate fields in the **Create Destination Network** menu as shown in Figure 7.
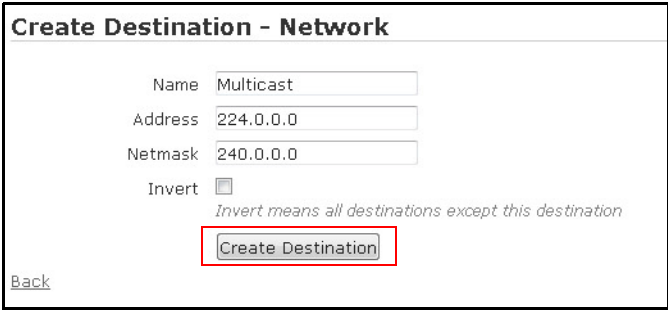
Figure 7. Define Destination Network Parameters

3. Select **Create Destination** to add the destination network to the destination table in vWLAN. Next, you must configure the client or user role to use the newly created destination in its firewall rules.

4.2.2 Configure the Role to Use the Multicast Destination Network

After configuring a destination network, you must apply the destination network to the user role's firewall rules. This user role is the role used by the previously configured SSID for multicast conversion. To configure or update the user role associated with the SSID, follow these steps:

ℹ️ NOTE

By default, when a user connects to vWLAN for the first time and has not been authenticated, the user role assigned is **Unregistered**. If web authentication is used, the following multicast destination and firewall rules must be applied to the **Unregistered** role.

1. In the vWLAN GUI, navigate to the **Configuration** tab and select **Role Based Access Control > Roles** as shown in Figure 8. Any previously configured domain roles are listed in the menu. To edit a previously created role, select the role from the list.
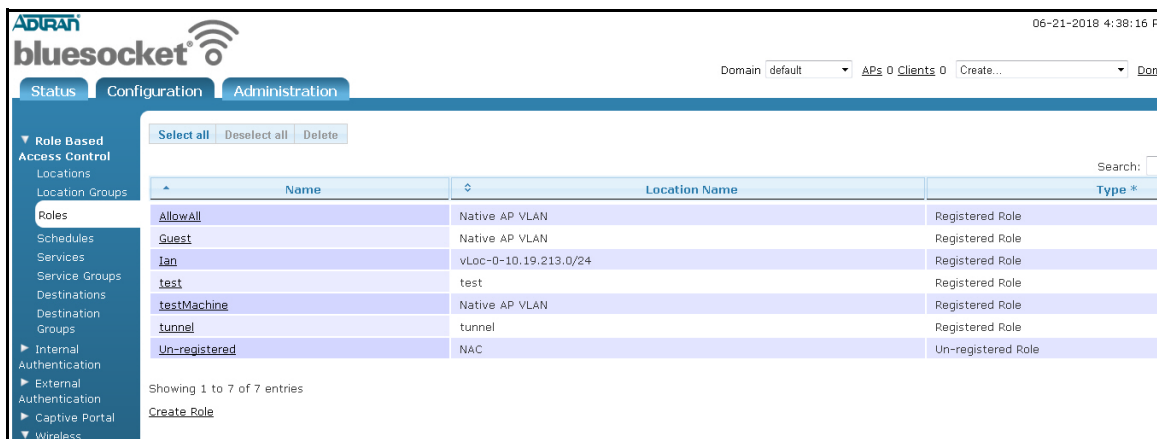
Figure 8. Role Based Access Control Menu

2. In the role's configuration menu, specify whether client-to-client traffic is allowed on the AP by selecting the **Allow Client To Client** checkbox as shown in Figure 9. This box must be selected if the multicast sender and receiver are associated on the same access point.
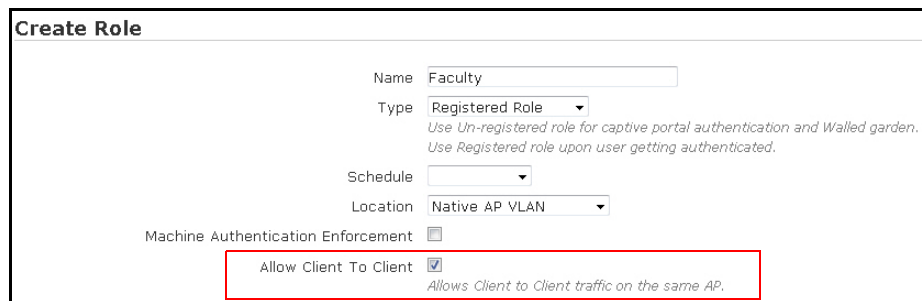

Figure 9. Select the **Allow Client To Client** Checkbox

3. Define the remaining parameters of the role in the role's configuration menu.

4. Define the firewall rules for the role. For multicast conversion, a specific firewall rule must be created in the role In the **Firewall Rules** configuration, enter the action, the service group to which to apply the policy, the traffic direction, and the traffic's destination network (this is the network previously created in "Create a Destination Network for the Role" on page 19) in the appropriate fields using the drop-down menus as shown in Figure 10.
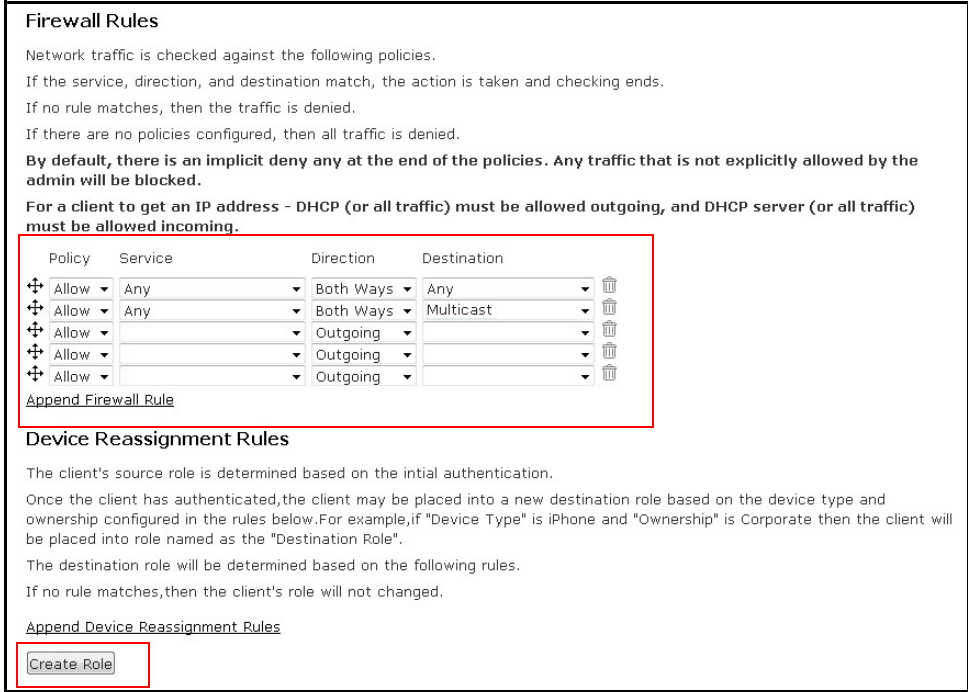

Figure 10. Defining the Role's Firewall Rules

NOTE
By default, if a role is configured to allow all traffic (**Firewall Rule** configured with a **Policy** of **Allow**, a **Service** of **Any**, a **Direction** of **Both Ways**, and a **Destination** of **Any**), it will not allow multicast traffic.

NOTE
The **Firewall Rules** operate by checking network traffic against the configured policies. If the service, direction, and destination of the traffic match the policy, then the action is taken and traffic checking ends. If no policy matches, then traffic is denied. If there are no policies configured, then all traffic is denied. Policy matches are attempted in order, so arrange each policy as needed for your network. Policies can be repositioned using the drag option to the left of the policy, or deleted by using the trash icon to the right of the policy.

5. Once the role is configured for multicast support, and a firewall rule is configured using the newly created multicast destination network, select **Update/Create Role** from the bottom of the menu to update or create the role, as shown in Figure 10. You must apply the new configuration to the AP as described in the following section for the changes to take effect.

4.3   Apply the Configuration to the AP

To apply the SSID, destination network, and role configurations to the AP, you must run a **Domain Task**. To do so, navigate to **Administration > Admin Tasks> Domain**, and select the play button next to **Must apply configuration to APs**, as shown in Figure 11.
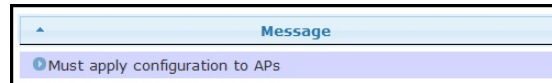

Figure 11. Apply Configuration Message

You can verify the changes have been applied by checking the AP status. To do this, in the vWLAN GUI, navigate to the **Status** tab, select **Access Points**, and verify that the recently configured APs have the **UpToDate** status. Multicast conversion is now configured and supported on the vWLAN instance.

5   Troubleshooting

To troubleshoot multicast conversion functionality in vWLAN, you can optionally choose to take an AP packet capture to confirm that multicast traffic is transversing the AP properly. For more information about creating an AP packet capture, refer to the *vWLAN Administrator's Guide*, available online at https://supportforums.adtran.com.

In addition, you can verify the multicast optimization and channel utilization threshold configurations using the vWLAN logs. In the vWLAN GUI, navigate to the **Status** tab and select **Logs**. The multicast functionality is logged by vWLAN, and is displayed in this menu as an informational level log entry with an **Operation** description as either **disabled** or **enabled**, as shown in Figure 12.

Figure 12. Multicast Functionality Log

NOTE

These messages are available through the Debug Alert template. By default, this template does not send logs to the vWLAN GUI. You must enable Syslog in the Debug Alert template to see these messages.

6   Warranty and Contact Information

6.1   Warranty

Warranty information can be found at:

www.adtran.com/warranty.

6.2   Contact Information

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