Copyright

© 2018 ZIH Corp. and/or its affiliates. All rights reserved. ZEBRA and the stylized Zebra head are trademarks of ZIH Corp., registered in many jurisdictions worldwide. Google, Android, Google Play and other marks are trademarks of Google LLC; Oreo is a trademark of Mondelez International, Inc. group. All other trademarks are the property of their respective owners.

COPYRIGHTS & TRADEMARKS: For complete copyright and trademark information, go to www.zebra.com/copyright.

WARRANTY: For complete warranty information, go to www.zebra.com/warranty.

END USER LICENSE AGREEMENT: For complete EULA information, go to www.zebra.com/eula.

Terms of Use

- Proprietary Statement
  This manual contains proprietary information of Zebra Technologies Corporation and its subsidiaries (“Zebra Technologies”). It is intended solely for the information and use of parties operating and maintaining the equipment described herein. Such proprietary information may not be used, reproduced, or disclosed to any other parties for any other purpose without the express, written permission of Zebra Technologies.

- Product Improvements
  Continuous improvement of products is a policy of Zebra Technologies. All specifications and designs are subject to change without notice.

- Liability Disclaimer
  Zebra Technologies takes steps to ensure that its published Engineering specifications and manuals are correct; however, errors do occur. Zebra Technologies reserves the right to correct any such errors and disclaims liability resulting therefrom.

- Limitation of Liability
  In no event shall Zebra Technologies or anyone else involved in the creation, production, or delivery of the accompanying product (including hardware and software) be liable for any damages whatsoever (including, without limitation, consequential damages including loss of business profits, business interruption, or loss of business information) arising out of the use of, the results of use of, or inability to use such product, even if Zebra Technologies has been advised of the possibility of such damages. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Revision History

Changes to the original guide are listed below:

<table>
<thead>
<tr>
<th>Change</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Table of Contents

**About This Guide**
- Introduction .................................................................................................................. 5
- Product Support ........................................................................................................... 5
- Chapter Descriptions .................................................................................................. 5
- WFW Analyzer Use Cases .......................................................................................... 6
- Notational Conventions .............................................................................................. 7
- Provide Documentation Feedback .............................................................................. 7

**Using WFW Analyzer**
- Introduction .................................................................................................................. 8
- Opening WFW Analyzer .............................................................................................. 9
- Home Screen ................................................................................................................ 10
  - Status ........................................................................................................................ 10
  - Connected IP Network .............................................................................................. 11
  - Device Information .................................................................................................... 12
- Scan List ........................................................................................................................ 13
  - Scan Interval ............................................................................................................. 14
  - Filter Options ............................................................................................................ 15
  - Detailed Capabilities for BSSID ................................................................................ 16
    - Display Refresh Options ......................................................................................... 17
- Connection Analysis ..................................................................................................... 18
  - Module Selections ...................................................................................................... 19
  - Results ...................................................................................................................... 19
- Setting Network Parameters ....................................................................................... 21
- Roaming Analysis ......................................................................................................... 22
  - Roaming Analysis Settings ....................................................................................... 23
  - Save Data Options ................................................................................................... 24
    - Clear Sessions .......................................................................................................... 24
    - Export Saved Data ................................................................................................. 25
- Advance Reports .......................................................................................................... 25
  - Monitor and Reports ................................................................................................. 25
  - Ping Refresh Settings ............................................................................................... 30
Table of Contents

Voice Analysis ................................................................................................................................. 32
Voice Analysis Settings .......................................................................................................................... 33
Save Data Options ................................................................................................................................. 34
  Clear Sessions ............................................................................................................................. 34
  Export Saved Data ......................................................................................................................... 34
Advance Reports ................................................................................................................................. 35
  Monitor and Reports ..................................................................................................................... 35
Networking Tools ................................................................................................................................ 41
Ping ........................................................................................................................................... 41
  Ping Settings .............................................................................................................................. 42
Device’s Coverage View ....................................................................................................................... 43
  Auto Reachability Test .................................................................................................................. 44
Logging ............................................................................................................................................. 45
Fusion Advanced Configuration ............................................................................................................ 46
About ............................................................................................................................................... 47
Camera Preview ................................................................................................................................. 48

Report Logger Content
Introduction ..................................................................................................................................... 49
Content Structure ............................................................................................................................ 49
Header ............................................................................................................................................ 49
  Roaming and Voice Analysis Headers .......................................................................................... 49
    INFO Severity Class Headers .................................................................................................. 49
    WARNING or ERROR Severity Class Headers ......................................................................... 50
  Voice Analysis Only Headers ..................................................................................................... 50
    INFO or WARNING Severity Class Headers ............................................................................. 50
Parameters ..................................................................................................................................... 50
Reasons .......................................................................................................................................... 51
  Roaming and Voice Analysis Reasons ......................................................................................... 51
    Analyzed Reason Strings ........................................................................................................ 51
    Standard IEEE Codes for De-Authentication Packets ........................................................... 53
  Voice Analysis Only Reasons ..................................................................................................... 53
    WARNING Severity Class Headers ........................................................................................ 53
Introduction

This guide provides information for the WorryFree Wi-Fi Analyzer (WFW Analyzer) app (formerly SmartMU), which analyses WLAN network connectivity in real-time. View reports of performance and errors in real-time, off-line, or as log files.

NOTE: It is not recommended to set the Font size and Display size on the device to larger than the default.

Product Support

WFW Analyzer version 3.0.2 is available on the following devices running Android Nougat with LifeGuard update 12.

- MC33
- TC51
- TC51-HC
- TC56
- TC70x
- TC75x

Chapter Descriptions

Topics covered in this guide are:

- Using WFW Analyzer describes how to use the WFW Analyzer app.
- Report Logger Content provides a list of report headers and analyzed reasons.
### WFW Analyzer Use Cases

Analysis data provided by WFW Analyzer saves time and cost by allowing administrators to quickly improve or mitigate performance issues. Actions may include reconfiguring the RF or WLAN system, reconfiguring the device, or locating an issue that requires further investigation.

The following table describes some of the common WFW Analyzer use cases.

**Table 1  Use Cases**

<table>
<thead>
<tr>
<th>Summary</th>
<th>Detailed Description</th>
<th>WFW Analyzer Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic connectivity information.</td>
<td>View the status of the connected device, including the connected AP, RSSI, channel, and IP/DHCP/DNS.</td>
<td>Home screen</td>
</tr>
<tr>
<td>WiFi surveys and coverage from the mobile device view.</td>
<td>View multiple networks and access points (APs) from locations within radio frequency (RF) range of the device. View connectivity and roam events. Perform an auto reachability test from connected APs to the gateway. Verify the APs over-the-air advertised data, retrieved directly from the information elements of the AP packets.</td>
<td>Scan List Device Coverage View</td>
</tr>
<tr>
<td>Live Wi-Fi Roaming Analysis while using a mobile device in motion</td>
<td>While roaming, view real-time data about the performance and health of the WLAN, AP-handoffs, and network traffic. View real-time detection of issues, causes, and RF environmental parameters.</td>
<td>Roaming Analysis</td>
</tr>
<tr>
<td>Live voice quality analysis while using a mobile device in motion.</td>
<td>View real-time data about the performance of simulated voice traffic, combined with Roaming Analysis data. View real-time detection of voice traffic issues, reasons quality measures exceeded thresholds, and RF environmental parameters.</td>
<td>Voice Analysis</td>
</tr>
<tr>
<td>WiFi connection analysis.</td>
<td>On demand troubleshooting of initial and full associations to the SSID and IP network, including reasons and sub-protocols triggering a connection failure.</td>
<td>Connection Analysis</td>
</tr>
</tbody>
</table>
Table 1  Use Cases

<table>
<thead>
<tr>
<th>Summary</th>
<th>Detailed Description</th>
<th>WFW Analyzer Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troubleshoot and compare Fusion configuration parameters.</td>
<td>View the band preference or power save parameters to compare configurations.</td>
<td>Fusion Advanced Config</td>
</tr>
<tr>
<td>Network reachability and performance testing.</td>
<td>Run one or two independent pings at the same time, each with a separate</td>
<td>Network Tools &gt; Ping</td>
</tr>
<tr>
<td></td>
<td>configuration of the packets and destination.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Validate performance and simulate an app's required concurrency of network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>destinations.</td>
<td></td>
</tr>
</tbody>
</table>

Notational Conventions

This document uses the following conventions:

- **Bold** text is used to highlight the following:
  - Dialog box, window and screen names
  - Drop-down list and list box names
  - Check box and radio button names
  - Icons on a screen
  - Key names on a keypad
  - Button names on a screen.

- Bullets (•) indicate:
  - Action items
  - Lists of alternatives
  - Lists of required steps that are not necessarily sequential.
  - Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Provide Documentation Feedback

If you have comments, questions, or suggestions about this guide, send an email to EVM-Techdocs@zebra.com.
Using WFW Analyzer

Introduction

This chapter describes the following WFW Analyzer features:

- Opening WFW Analyzer on page 9
- Home Screen on page 10
- Scan List on page 13
- Connection Analysis on page 18
- Roaming Analysis on page 22
- Voice Analysis on page 32
- Networking Tools on page 41
- Device’s Coverage View on page 43
- Logging on page 45
- Fusion Advanced Configuration on page 46
- About on page 47
- Camera Preview on page 48.
Opening WFW Analyzer

Before using WFW Analyzer, ensure that Wi-Fi is enabled on the device. For information on how to enable Wi-Fi, refer to the user guide for your device.

To open the WFW Analyzer app on the device, swipe up from the bottom of the Home screen and touch 📲.

Figure 1  WFW Analyzer Screen
Home Screen

The **Home** screen displays:

- Status
- Connected IP Network
- Device Information.

**Figure 2** Home Screen

### Status

Displays the current device status.

- **Status** - Current connection status
- **SSID** - Name of the connected WLAN network
- **IP Address** - IP address of the device
- **AP/BSSID** - Basic Service Set ID (BSSID) of the connected access point
- **RSSI** - RSSI of the connected access point
- **Channel (Band)** - Displays the channel.
**Connected IP Network**

To view the following details of the connected IP network, touch the down arrow next to **Connected IP Network**.

**Figure 3  Connected IP Network**

- **Gateway** - IP address of the network gateway
- **DHCP Server** - IP address of the DHCP server
- **Lease Duration** - Amount of time the IP address of the device is leased. The device renews the lease before the lease duration expires.
- **Netmask** - Server subnet mask address
- **DNS1** - Domain Name System 1 (DNS1) address
- **DNS2** - DNS2 address.
Device Information

To view the following device information, touch the down arrow next to Device Info.

Figure 4  Device Info

- Device Product Name
- Device MAC
- Operating System.
Scan List

The Scan List main screen displays a list of BSSIDs and their corresponding SSIDs, RSSI, and channels. The first row displays the currently connected BSSID, unless the connected SSID is filtered out using Select Filter Options, or the device is not connected at all. All other rows are sorted and filtered according to the filter options. See Filter Options on page 15.

The Scan List includes all BSSIDs with the same country, band, configuration, and WLAN protocols as the current channel. Wi-Fi Direct SSIDs are not supported.

To view the Scan List, touch ⌁ > Scan List.

Figure 5  Scan List

For each BSSID, the following displays:

- **BSSID** - MAC address of the access point BSSID
- **RSSI** - Received signal strength in dBm. The closer the dBm number is to zero, the stronger the signal.
- **SSID** - Name of an 802.11 wireless local area network (WLAN)
- **Channel/Band** - Channel and frequency band.
Scan Interval

Use Scan Interval to change the time interval between scans (range: 5 - 15 seconds, default: 5 seconds).

Figure 6  Monitor and Reports

![Select Scan Interval](image)

To change the time interval between scans:

1. Touch \( \equiv \) > Scan List > \( \equiv \) > Scan Interval.
2. Use the slider to set the interval.
3. Touch OK.
Filter Options

From the Scan List screen, touch Select Filter Options to filter networks.

Figure 7  Filter Options

- **Modify Filtering Options** - Select to filter the Scan List using one of the following options:
  - **All SSID** - Display BSSIDs of all SSIDs (default)
  - **Connected SSID** - Display BSSIDs of only the connected SSID
  - **Filter by SSIDs** - Touch to display a list of SSIDs. Select an SSID to enable or disable view of its corresponding BSSIDs in the Scan List.
- **Sort By** - Select to sort the Scan List by **Received Signal Strength (RSSI)** (default), or **Channel**.
- **Group by SSID** - Select to group SSIDs with the same name together. SSIDs are listed in alphabetical order.
Detailed Capabilities for BSSID

From the Scan List screen, touch a BSSID to display detailed capabilities.

**Figure 8** Detailed Capabilities for BSSID

- **AP/BSSID** - Displays the MAC address of the access point BSSID.
- **SSID** - Displays the WLAN network name corresponding to the BSSID.
- **AP MAC OUI** - Displays the Organizationally Unique Identifier (OUI). When an organization was not assigned an identifier, or an identifier was recently assigned by the IEEE Registration Authority, this value is empty.
- **Supported Bands** - Displays the notation of the supported 802.11 standard for the associated 2.4 GHz or 5 GHz band.
  A physical AP is typically dual-band, where each band of the AP has a unique BSSID identifier, so each BSSID of the AP is listed as a unique item on the Scan List main screen.
- **Beacon Params** - Touch the down arrow next to Beacon Params to view the beacon interval.
- **11d Country, Power, Channels** - Touch the down arrow to view details.
- **QoS and Power Save** - Touch the down arrow next to QoS and Power Save to view QoS and Power Save information.
  Some APs do not support QoS and Power Save.
- **Security** - Touch the down arrow next to Security to view security WLAN information.
Using WFW Analyzer

**Display Refresh Options**

Use **Display Refresh Options** to enable or disable the automatic refresh of the detailed capabilities information.

Touch **Display Refresh Options** and use the toggle switch, then select **OK**.

**Figure 9  Display Refresh Options**

<table>
<thead>
<tr>
<th>Refresh Option for 'Detail Capabilities for BSSID'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refresh Enable/Disable</td>
</tr>
</tbody>
</table>

When Enabled, the Data refreshes automatically upon any new scan Results. If new Scan Results does not contain this BSSID while page is in the foreground, the Data becomes empty.

When Disabled, as long as page is in foreground the Data for this BSSID does not refresh.

| CANCEL | OK |

**IMPORTANT**  When **Roaming Analysis** is running with default settings, the **Scan List** displays only **ROAM** events. To change the type of scans displayed, see **Roaming Analysis Settings on page 23**.
Connection Analysis

Use Connection Analysis to perform a one-time connection analysis on the selected SSID network. Selecting a network layer in the Module Selections tab automatically selects all of the dependent layers below it. The order that the connection analysis runs is based on standard WLAN networking dependency, from the bottom (MAC) to the top (Connectivity). If any of the dependent layers fail, all layers above it also fail.

By default, the analysis is run on the connected WLAN network, unless configured in settings. See Setting Network Parameters on page 21.

Figure 10  Connection Analysis

- **Connectivity** - This test is initiated by the WFW Analyzer app, and analyzes the ICMP (ping) reachability test using the selected SSID network.
  
  To run a full connection analysis on all layers, select the Connectivity layer.

- **Address Resolution Protocol (ARP)** - This test is initiated by the WFW Analyzer app, and analyzes the ARP process using resolved parameters from the DHCP layer.

- **Dynamic Host Configuration Protocol (DHCP)** - The DHCP is initiated automatically by Android, and analyzes the native Android DHCP process.

- **Extensible Authentication Protocol over LAN (EAPOL)** - This analyzes the EAPOL process of the WLAN network stack. If the EAPOL is not required, for example, with an open network, the analysis is skipped.

- **Media Access Control (MAC)** - This analyzes the MAC-based communications used for 802.11 authentication and association with an access point.
Module Selections

Use the Module Selections tab to choose a network layer to analyze.

1. Touch ➔ > Connection Analysis > Module Selections.
2. Touch a network layer to select it. The box next to the selected layer is checked and turns blue.
   The network layers below it are automatically checked and turn gray. To clear all selections, touch the blue
   check box.
3. Select Run Selections. The Results tab displays.

Results

When an analysis is complete, the results display in the Results tab.

NOTE: Results only display for the first connection attempt to the SSID. If the first connection attempt fails,
subsequent attempts are not analyzed. This may cause the Connection Analysis screen to show a connection
failure even if the device is connected.

Figure 11  Connection Analysis Results

Select 🔄 to rerun the previous connection analysis for a selected layer, or all layers. To select a new network
layer to analyze, use the Module Selections tab.
Touch **Show Result Details** to display detailed analysis reports for each network layer.

**Figure 12** Connection Analysis Results

The **Results Details** screen displays the network layers in the same order as they appear on the **Results** tab.
Setting Network Parameters

By default, the analysis is run on the connected WLAN network.

Figure 13 Set Network Parameters

To select a different network:

1. Touch \( \equiv \) > Connection Analysis > Module Selections > Set Network Params for Analysis.
2. Touch : . A list of previously saved networks displays.
3. Touch a network to select it.
4. Select OK.
5. Select \( \leftarrow \).

To set the server IP, URL or Fully Qualified Domain Name (FQDN) for the connectivity reachability test:

1. Touch \( \equiv \) > Connection Analysis > Module Selections > Set Network Params for Analysis > : .
2. Touch the switch next to Use Gateway IP of SSID Network.
3. Enter the server IP, URL, or FQDN.
4. Select \( \leftarrow \).
Roaming Analysis

Use Roaming Analysis to troubleshoot or monitor real-time WLAN performance, and get analysis reasons in real-time for WLAN connectivity and link quality issues. The analysis data includes reports, packets, traffic statistics, and performance indicators. Analysis is available for open, PSK, and 11r/FT networks.

Roaming Analysis runs continuously during a live session and continues to collect data when the WFW Analyzer app is running in the background and when the app is closed. When the device is restarted, the session does not automatically resume.

When actively using a voice app while running Roaming Analysis with Settings > Advance Methods > Generate Constant Ping-Data, all traffic is run in parallel. However, the load of any combined parallel traffic does not impact the device processing itself. In cases where isolating the voice app stream is critical, use Roaming Analysis and select ☐ > Roaming Analysis > Settings > Advance Methods > Do not generate ping traffic.

Use these best practices when running Roaming Analysis:

- It is not recommended to run a live session for more than a several hours. If a session of more then a few hours is required, stop the live session after a few hours, and start a new session.
- It is not recommended to view Scan List or Device's Coverage View, or run Ping, while Roaming Analysis is running.
- It is not recommended to run high throughput traffic or video applications while Roaming Analysis is running.

To start a Roaming Analysis session, touch ☐ > Roaming Analysis > ☑. To stop a Roaming Analysis session, touch ☐.

Figure 14  Roaming Analysis
Roaming Analysis Settings

The main screen displays the current settings:

- **SSID** - Connected WLAN network
- **Analysis Traffic generator** - Method used to generate traffic (default: Ping-Data)
- **Packet Capture Status** - Packet capture status (default: Disabled).

To change the Roaming Analysis settings, touch 🔄 > Roaming Analysis > ☰ > Settings.

**Figure 15**  Roam Analysis Settings

- **Profile Settings**
  - **Current Status** - Displays the current SSID status.
  - **Current Selection** - Touch ☰ to select from a list of available SSIDs. When not connected to a WLAN network, this selection is required.
  - **Session Name** - Touch to enter a session name. For information on how to clear or save sessions, see Save Data Options on page 24.

- **Advance Settings**
  - **Advance Methods** - Select whether or not to generate traffic (default: Generate Constant Ping-Data traffic). To manually set the IP, URL, or FQDN for the remote server, slide the switch for **Use Gateway IP of SSID Network** to the OFF position.
  - **Packets Viewer** - Select a packet category (default: WLAN Mgmt + Selective Data Packets).
  - **Analysis Report Level** - Not supported.
  - **Enable/Disable pcap capture** - Not supported.
• **Low Storage Options** - Select an option for managing data when available storage is less than 15%.

• **Scan data for ‘Scan List’ and ‘Coverage View’ features, based on** - Select the scan data type to use for Scan List and Device’s Coverage View features while Roaming Analysis is running (default: Only Roam Scans).

  • **All type scans** - While Roaming Analysis is running, Scan List and Device’s Coverage View display data at normal intervals. This setting may cause events from Scan List or Device’s Coverage View to affect Roaming Analysis results.

  • **Only Roam Scans** - While Roaming Analysis is running, Scan List and Device’s Coverage View only display data collected during roaming events. This setting may cause long delays between events in Scan List and Device’s Coverage View.

**Save Data Options**

Use **Save Data Options** to clear or export Roaming Analysis data.

**Figure 16**  Saved Data Options

**Clear Sessions**

Use Clear Sessions to clear all Roaming Analysis session data. Previously collected sessions are removed from the device and become unavailable for off-line viewing. To save session data, see Export Saved Data on page 25.

To clear all Roaming Analysis session data:

1. Touch **≡ > Roaming Analysis > ➤ > Save Data Options**.
2. Select individual sessions to clear, or touch **Select All** to clear all sessions.
3. Touch **OK**.
Export Saved Data

Export session data to text files containing JSON objects. The WFW Analyzer app saves the files to the smu folder.

To export all saved Roaming Analysis session data:

1. Touch **≡ > Roaming Analysis > ⌁ > Save Data Options**.
2. Select individual sessions to export, or touch **Select All** to export all sessions.
3. Touch **OK**. Text files containing JSON objects are created for each tab in **Roaming Analysis > Monitor & Reports**.

To view exported files, ensure Roaming Analysis and logging are not running, connect the device to a host computer using a USB cable, and copy the files from the device to the host computer.

Advance Reports

While Roaming Analysis is running, session data displays in real-time. When Roaming Analysis is not running, the most recent report displays. To load a previous session while the live session runs in the background or when Roaming Analysis is not running. See View Options on page 30.

Monitor and Reports

To view Roaming Analysis reports, touch **≡ > Roaming Analysis > Monitor & Reports**.

**NOTE:** Each time Roaming Analysis starts, WFW Analyzer intentionally causes the device to disconnect and then reconnect to the network. For this reason, the first **Disconnected** error in the Report Logger tab can be ignored.
Figure 17  Monitor and Reports

- **Ping Accumulated Stats** - Displays ping data indicators, accumulated in real-time during a live session, or a final summary of a loaded session.

- **Report Logger** - Displays connectivity and Roaming Analysis results. Touch a row to display detailed parameters and reasons of performance thresholds and issues. For more information, see Report Logger Content on page 49.
• **Packet Viewer** - Displays the time, direction, and type of select packets in a session. Touch a packet to view certain fields from its header content. Packet details include 802.11 authentication and association, DHCP, and ARP.

The Packet Viewer does not display all of the packets that are actively analyzed by WFW Analyzer. Analyzed packets are available after an analysis session, with packet capture enabled, ends. See Roaming Analysis Settings on page 23.

**Figure 18   Packet Viewer**
• **Ping Monitor** - Displays detailed ping statistics. To change the ping refresh interval, see *Ping Refresh Settings on page 30*.

When specific ping errors are detected, such as 100 percent packet loss, or when three or more consecutive packets are lost during ping, touch the information row to view the error report.

**Figure 19**  Ping Monitor
- **Key Indicators** - Displays a summary of handoffs, disconnects, and the number of scans accumulated during a live session. When a live session is not running, a final summary displays.

**Figure 20**  Key Indicators
View Options

If Roaming Analysis is running, touch \[\text{\paperclip} \] to pause live monitoring. Touch \[\text{\checkmark} \] to display view options.

Figure 21  View Options

- **Resume Live Events** - Touch to resume live monitoring.
- **Load session** - Touch to load a previous session.
- **Goto position** - Use slider and buttons to quickly navigate through long lists of data. Not available in the Key Indicators tab.

Ping Refresh Settings

Use **Ping Refresh Settings** to change the time interval between pings (range: 2 - 20 seconds, default: 5 seconds).

Figure 22  Ping Refresh Settings
To change the time interval between pings:

1. Touch ➞ Roaming Analysis ➞ Monitor & Reports ➞ Ping Refresh Settings.
2. Use the slider to set the interval.
3. Touch OK.
**Voice Analysis**

Use **Voice Analysis** to troubleshoot or monitor simulated voice traffic performance, and get analysis reasons in real-time for connectivity and link quality issues. The analysis data includes reports, packets, traffic statistics, and performance indicators. Analysis is available for open, PSK, and 11r/FT networks.

**Voice Analysis** runs continuously during a live session and continues to collect data when the WFW Analyzer app is running in the background and when the app is closed. When the device is restarted, the session does not automatically resume.

When actively using a voice app while running **Voice Analysis** with **Settings > Advance Methods > Generate Constant Ping-Data**, all traffic is run in parallel. However, the load of any combined parallel traffic does not impact the device processing itself. In cases where isolating the voice app stream is critical, use **Voice Analysis** and select **≡ > Voice Analysis > Settings > Advance Methods > Do not generate ping traffic**.

Use these best practices when running Voice Analysis:

- It is not recommended to run a live session for more than a several hours. If a session of more then a few hours is required, stop the live session after a few hours, and start a new session.
- It is not recommended to view Scan List or Device's Coverage View, or run Ping, while Voice Analysis is running.
- It is not recommended to run high throughput traffic or video applications while Voice Analysis is running.

To start a Voice Analysis session, touch **≡ > Voice Analysis >]**. To stop a Voice Analysis sessions, touch **≡**.

**Figure 23** Voice Analysis
Voice Analysis Settings

The main screen displays the current settings:

- **SSID** - VoIP network the device is connected to
- **Packet Capture Status** - Packet capture status (default - Disabled).

To change the Voice Analysis settings, touch ☰ > Voice Analysis > ☰ > Settings.

To ensure that the changes to the Voice Analysis settings take effect, touch 📞.

**Figure 24** Voice Analysis Settings

- **Profile Settings**
  - **Current Status** - Displays the current SSID status.
  - **Current Selection** - Touch ☰ to select from a list of available SSIDs. When not connected to a VoIP network, this selection is required.

- **Session Name** - Touch to enter a session name. For information on how to clear or save sessions, see Save Data Options on page 34.

- **Advance Settings**
  - **Set Remote Server** - To manually set the IP, URL, or FQDN for the remote server, slide the switch for Use Gateway IP of SSID Network to the OFF position.
  - **Packets Viewer** - Select a packet category (default: WLAN Mgmt + Selective Data Packets).
  - **Analysis Report Level** - Not supported.
  - **Enable/Disable pcap capture** - Not supported.
  - **Low Storage Options** - Select an option for managing data when available storage is less than 15%.
Using WFW Analyzer

- **Scan data for ‘Scan List’ and ‘Coverage View’ features, based on** - Select the scan data type to use for Scan List and Coverage View features while Roaming Analysis is running (default: Only Roam Scans).

**Save Data Options**

Use **Save Data Options** to clear or export Voice Analysis data.

**Figure 25**  Saved Data Options

![Saved Data Options](image)

**Clear Sessions**

Use Clear Sessions to clear all Voice Analysis session data. Previously collected sessions are removed from the device and become unavailable for off-line viewing. To save session data, see **Export Saved Data on page 34**.

To clear all Voice Analysis session data:

1. Touch ☐ > Voice Analysis > ☘ > Save Data Options.
2. Select individual sessions to clear, or touch Select All to clear all sessions.
3. Touch OK.

**Export Saved Data**

Export session data to text files containing JSON objects. The WFW Analyzer app saves the files to the smu folder.

To export all saved Voice Analysis session data:

1. Touch ☐ > Voice Analysis > ☘ > Save Data Options.
2. Select individual sessions to export, or touch Select All to export all sessions.
3. Touch OK. Text files containing JSON objects are created for each tab in Voice Analysis > Monitor & Reports.

To view exported files, ensure Voice Analysis and logging are not running, connect the device to a host computer using a USB cable, and copy the files from the device to the host computer.

**Advance Reports**

While Voice Analysis is running, session data displays in real time. When Voice Analysis is not running, the most recent report displays. To load a previous session while the live session runs in the background or when Voice Analysis is not running. See View Options on page 40.

**Monitor and Reports**

To view Voice Analysis reports, touch > Voice Analysis > Monitor & Reports.

**NOTE:** Each time Voice Analysis starts, WFW Analyzer intentionally causes the device to disconnect and then reconnect to the network. For this reason, the first Disconnected error in the Report Logger tab can be ignored.

**Figure 26 Monitor and Reports**

- **Ping Accumulated Stats** - Displays ping data indicators, accumulated in real-time during a live session, or a final summary of a loaded session.
• **Report Logger** - Displays connectivity and Voice Analysis results. Touch a row to display detailed parameters and reasons of performance thresholds and issues. See Report Logger Content on page 49. Rows containing a warning message display the **Warning Details** button. Touch **Warning Details** to display one or more sub-reports.

**Figure 27**  Sub-Reports

```
<table>
<thead>
<tr>
<th>Sub-Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB REPORT : PACKET LOSS EXCEEDED</td>
</tr>
<tr>
<td>TimeStamp</td>
</tr>
<tr>
<td>RSSI</td>
</tr>
<tr>
<td>SNR</td>
</tr>
<tr>
<td>Tx Rate of Max Packets</td>
</tr>
<tr>
<td>Packet Loss (%)</td>
</tr>
<tr>
<td>Voice Latency</td>
</tr>
<tr>
<td>Reason</td>
</tr>
<tr>
<td>OK</td>
</tr>
</tbody>
</table>
```
• **Packet Viewer** - Displays the time, direction, and type of select packets in a session. Touch a packet to view certain fields from its header content. Packet details include 802.11 authentication and association, DHCP, and ARP.

Raw analyzed packets are available after an analysis session, with packet capture enabled, ends. See Voice Analysis Settings on page 33.

**Figure 28**  Packet Viewer
- **Ping Monitor** - Displays detailed ping statistics.

  When specific ping errors are detected, such as 100 percent packet loss, or when three or more consecutive packets are lost during ping, touch the information row to view an error report.

**Figure 29**  Ping Monitor
Using WFW Analyzer

- **Key Indicators** - Displays a summary of handoffs, disconnects, the number of scans, and additional voice traffic events accumulated during a live session. When a live session is not running, a final summary displays.

**Figure 30**  Key Indicators
View Options

If Voice Analysis is running, touch \( \square \) to pause live monitoring. Touch \( + \) to display view options.

**Figure 31** View Options

- **Resume Live Events** - Touch to resume live monitoring.
- **Load session** - Touch to load a previous session.
- **Goto position** - Use slider and buttons to quickly navigate through long lists of data. Not available in the Key Indicators tab.
Networking Tools

To view available networking tools, touch ➞ Networking Tools.

Ping

Ping is a self-contained utility that sends an ICMP ping with configurable input settings. Configure and run up to two separate pings at the same time, each with a different IP, URL, or FQDN address.

Use Ping to determine reachability and to perform a self-contained test of end to end traffic performance.

It is not recommended to use Ping while Voice Analysis is running. To use Ping while Roaming Analysis is running, select ➞ Roaming Analysis ➞ Settings ➞ Advance Settings ➞ Advance Methods ➞ Do not generate ping traffic.

To use Ping, touch ➞ Networking Tools ➞ Ping.

To start the ping test:

1. Touch ➞ Networking Tools ➞ Ping.
2. If connected to a Virtual Private Network (VPN), check the Use Default Gateway check box.
3. To use a custom IP, URL, or FQDN, uncheck the Use Default Gateway check box and enter the IP, URL, or FQDN.
4. Touch ⊗.

Figure 32 Ping Screen
Ping Settings

Ping Settings provides options for configuring ping input settings. To configure ping input settings, touch 🛠.

Figure 33  Ping Settings

- **Continuous ping** - Enable or disable continuous ping (default: disabled)
- **Count** - Number of ping requests to send (default: 10). This option is not available when using continuous ping.
- **Interval (ms)** - Amount of time in ms between ping requests (default: 1000)
- **Timeout (ms)** - Amount of time in ms before a ping times out (default: 500)
- **Max TTL** - Maximum time to live for a packet (default: 64)
- **Packet Size** - Size of each ping packet in bytes (default: 64)
- **TOS (Hex Value)** - Type of service as a hexadecimal value from 00 to FF. Recommended values are B8 Voice, A0 Video, 20 Background, and 00 Best Effort (default).
Device’s Coverage View

**NOTE:** Changes to channel (band) preference do not take effect while in Device’s Coverage View. When Android split-screen mode is enabled or disabled, the device automatically exits Device’s Coverage View.

**Device’s Coverage View** displays the live RSSI values of BSSIDs of the connected SSID versus relative time (in seconds), with connectivity events. If the device connects to a different SSID, or another WFW Analyzer feature is accessed, **Device’s Coverage View** resets.

To display the **Device’s Coverage View**, touch > **Device’s Coverage View**.

**Figure 34**  Device’s Coverage View

Each line is a connected BSSID with dots marking the RSSI values from scan samples.

The legend at the bottom of the screen matches each BSSID to a color and specifies the currently connected BSSID. The BSSID colors also display as vertical bars on the **Scan List** screen.

Vertical dotted lines designate events which can happen outside of regular scan intervals:

- **VIEW (RE)STARTED** – View started without a Connectivity or Roam event involved
- **ROAMED** – AP hand-off event
- **DISCONN** – Disconnection from SSID
- **NEW CONN** – Connection to SSID.
Using WFW Analyzer

**Figure 35** Device’s Coverage View Events

To zoom in and out, place two fingers on the screen and pinch them together (to zoom out) or spread them apart (to zoom in), or touch the  and  icons. Pan in any direction inside the graph by moving a finger on the screen. Using Zoom or Pan pauses auto-scroll. Touch the  icon to enable auto-scroll. Values continue to update even if not in viewing area.

**Auto Reachability Test**

Use the **Auto Reachability Test** to automatically send a batch of four ICMP packets to the Gateway IP address a couple of seconds after each **CONN** or **ROAMED** event. The result displays on the **Device’s Coverage View** screen next to the **CONN** or **ROAMED** event.

Touch  > **Auto Reachability Test** and use the toggle button to enable or disable this test.
Using WFW Analyzer

Logging

NOTE: Not Supported.
Fusion Advanced Configuration

Use the Fusion Advanced Configuration screen to view the parameters for power save mode or band preference.

Figure 36  Fusion Advanced Config Screen
About

Use **About** to view the version number for the WFW Analyzer app.

When contacting Zebra support, please have App, Service, and Middleware version numbers available.

**Figure 37** About Screen
Camera Preview

When Camera Preview is enabled, a live camera view appears on the screen and remains active while WFW Analyzer is open.

Figure 38  Camera Preview

To enable the Camera Preview feature from any screen in WFW Analyzer, touch \( \text{探究} \) > Camera Preview. To disable, touch \( \text{探究} \) > Camera Preview or touch the X on the top right of the camera view. To move the camera view box, touch and drag anywhere on the screen.

Use Camera Preview to document the location of APs or diagnose issues, such as physical obstructions with low RSSI or poor coverage, by capturing a screenshot. To capture a screenshot, simultaneously press and hold the power key and the volume down key. This saves the entire screen, including the WFW Analyzer app and camera preview to the device storage as a PNG file.
Introduction

This chapter provides detailed information about the Report Logger tab of the Roaming Analysis and Voice Analysis features.

To view Roaming Analysis reports, touch ☐️ > Roaming Analysis > Monitor & Reports > Report Logger.

To view Voice Analysis reports, touch ☐️ > Voice Analysis > Monitor & Reports > Report Logger.

Content Structure

Events found in the Report Logger tab are structured in the following order:

- Header
- Parameters
- Reasons

Header

The header contains the severity class (INFO, WARNING, ERROR), the time the event occurred, and a short description. In the default view, only the header is visible. Touch a header for an expanded view that lists parameters and reasons, when applicable.

Roaming and Voice Analysis Headers

INFO Severity Class Headers

- Roam Analysis Started
- Roam Analysis Stopped
- AUTH Started (802.11 Auth)
- AUTH Completed (802.11 Auth)
- ASSOC Started (802.11 Assoc)
- ASSOC Completed (802.11 Assoc)
- EAPOL STARTED
• EAPOL Completed
  • DHCP Started
  • DHCP Completed
• ARP Started
• ARP Completed
• Connection Completed (Full connection attempt completed)
• Roam Started
• Reassoc Completed (802.11 Reassoc)
• Roam Completed
• Scan Started
• Scan Completed
• Device storage space reached 60%
• Disconnect Suppression Triggered
• Disconnect Suppression Completed.

WARNING or ERROR Severity Class Headers
• Connection Failed (Full connection attempt failed)
• Roam Failed (Roam attempt failed)
• Authentication Failed (802.11 Auth attempt failed)
• Association Failed (802.11 Assoc attempt failed)
• EAPOL Failed (EAPOL handshake attempt failed)
• DHCP Failed (DHCP attempt failed)
• ARP Failed (ARP attempt failed)
• Disconnected (Fully Disconnected from Wifi)
• Device storage space reached 70%
• Device storage space reached 80%
• Device storage space reached 90%
• Roam Retry
• Frequent Roams Seen.

Voice Analysis Only Headers

INFO or WARNING Severity Class Headers
• Voice Analysis Started
• Voice Analysis Stopped
• Voice Consolidated Report.

______________________________

Parameters

Standard Wi-Fi parameters are located directly under the header when applicable.
Reasons

Analyzed reasons are provided for the WARNING and ERROR severity classes when applicable.

Roaming and Voice Analysis Reasons

Analyzed Reason Strings

- Timeout happened between substate machines
  For example: Auth response came, but Assoc request was not sent
- Packet State machine Succeeded but Framework did not notify the state change
- Packet State machine Success but Framework notified wrong state change
- Analysis could not start due to MAC Analysis Failed
- Analysis could not start due to EAPOL Analysis Failed
- Analysis could not start due to DHCP Analysis Failed
- Analysis could not start due to ARP Analysis Failed
- Keynonce of eapol1 and eapol3 not equal
- ReplayCounter of eapol1 not equal to eapol2 or eapol3 is not equal to (eapol1 + 1)
- DHCP_INVALID
- DHCPDECLINE
- DHCP_NAK
- DHCP_RELEASE
- NO DHCP server(s) found
- DHCP server didn't respond to the request
- Device failed to start discover after NAK
- AP of selected SSID to analyse is not in vicinity
- EAPOL four way handshake timeout
- Analysis is been done on an Open/WEP Profile Hence EAPOL is not applicable
- Authentication has Timedout
- Association has Timedout
- WiFi is turn off
- Unable to reach the destination address
- Destination address was reachable But Reachability is poor
- Destination address was reachable But Reachability is only 50%
- Destination address was reachable But Reachability is 75%
- Destination address was reachable Reachability is 100%
- Success
- Unable to reach gateway through arp
- Gateway IP is not available to test arp reachability
- Association not started
- EAPOL Key 1 not started
• DHCP not started
• ARP not started
• EAPOL Key 2 not sent
• EAPOL Key 3 not received
• EAPOL Key 4 not sent
• DHCP Request not started
• Ping test not started
• Undefined Error
• Device Roamed from Non Preferred Band to Preferred Band AP
• Device Roamed to Non Preferred Band
• Device failed to Roam to Good Signal Strength Access Points are seen in Preferred Band
• Device failed to Roam to Preferred Band after Roam Scan
• Roam Candidate AP's RSSI is greater than Previous AP's RSSI
• Delta RSSI of Candidate AP's and Previous AP is not greater than 5 dbms
• Candidate AP is not the Best AP in the Scan List
• Candidate AP is also not the Second Best AP in the Scan List
• Gradual Roam. Current and previous RSSI average difference is 0-5 dbm
• Sporadic Roam. Current and previous RSSI average difference is greater than 5 dbm
• Roam due to connected SSID packet not found in scan cache
• Extreme Roam. Instant RSSI and current RSSI average difference is greater than 6 dbm
• Roam due to Very Weak AP Signal. Less than -85 dbm
• No Access Points are seen in Preferred Band
• Low Signal Strength Access Points are seen in Preferred Band
• Unknown Scenario
• Disconnect Reason Unknown
• Disconnect Reason - Screen OFF
• Disconnect Reason - WiFi Disabling
• Disconnect Reason - WiFi Disabled
• Disconnect Reason - New Profile Added in UI
• Disconnect Reason - Profile Updated in UI
• Disconnect Reason - Profile Deleted in UI
• Disconnect Reason - Deauth Packet from AP
• Disconnect Reason - Profile Roam from UI
• Disconnect Reason - Deauth packet from Driver
• Low Signal Strength.(condition: formula made of RSSI, TX Loss , RX Loss)
• High Interference.(condition: formula made of SNR, TX Loss , RX Loss)
• High Channel Load.(condition: formula made of AP's IE load, TX Loss , RX Loss)
• Poor Coverage Area.(condition: scan yields weaker than -65 dBm 'best' coverage)
• Tx Power and Data Rate Mismatch.
Standard IEEE Codes for De-Authentication Packets

When the device receives a de-authentication packet from the AP, the analyzed reason strings may include an IEEE 802.11 standard reason code. The reason code is retrieved directly from the 802.11 packet. The reason code value, located in the expanded view, is prefixed with DEAUTH CODE.

To view the meanings of de-authentication code values, refer to the reason codes table, found in the IEEE 802.11 standard.

Voice Analysis Only Reasons

WARNING Severity Class Headers

Rows containing a warning message display the Warning Details button. Touch Warning Details to display one or more sub-reports.

Each sub-report contains one of the following parameters:

- CONSECUTIVE PACKET LOSS type - More than 3 packets lost consecutively within a sub-window
- PACKET LOSS EXCEEDED type - More than 20% packets lost within a sub-window
- LATENCY EXCEEDED type - Latency yielded value larger than 200ms
- JITTER EXCEEDED type - Jitter yielded value larger than 100ms.

The CONSECUTIVE PACKET LOSS and PACKET LOSS EXCEEDED parameters may also provide one of the follow analyzed reasons:

- Packet Loss during Power Save
- Packet Loss during Roam Scan
- Packet Loss during Low Signal Strength
- Packet Loss during High Interference
- Packet Loss during High Channel Load
- Packet Loss in Poor Coverage Area
- Packet Loss - Loss condition happened with none of the above situations.