



# XR Solution Technical Certification Training

Session 2:

Training | Knowledge Check | Lab exercise

## This Workbook

Use this workbook to follow along with the technical training and take notes. This workbook only applies to session 2 of the XRSA certification.

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## Labels Deep Dive

### Router Label



6P1504500602A139;359414100159698;118n27Bu4U;1104786;8 12320 00615 6;3aBUaXxLbJqy



The XR80 label includes the integrated 4G/5G IMEI.



6P1504500602A139; 359414100159698; 8 12320 00615 6; 1104786; 350546850112507; 350546850112457;

When Sierra Wireless ships AirLink® products to distributors or direct purchase resellers, we send device information to a specific email address within that organization that is available to be imported into a CRM or similar database and can then be provided in a similar format for reseller partners or customers.

The information includes serial numbers, IMEI numbers, and AirLink Service registration information but not default passwords (due to security concerns).

If you do not currently receive or make use of this data, we recommend you contact the organization from which you purchase AirLink products to start making use of it.



## Basic XR and AirLink OS Use

### Basic Skills and Abilities

Things you should be able to do with an XR Series router:

- Physical setup (SIM card(s), default SWI antennas, connectors)
- Register your router for AirLink Services
- Save and load a configuration template
- Understand typical LED behavior
- Perform a factory reset
- Upgrade AirLink OS software
- Capture system information for a support ticket (logs, template, troubleshooting package)
- Understand WAN default priority
- Attach an XP cartridge

This list encompasses things that any user should be able to do with an XR Series router. Some information is contained in hardware guides and some is included in the online AirLink OS documentation, but these are general skills and require general knowledge in order to work with the devices.

Some of these areas have very advanced capabilities associated with them, but that is not the focus of this session. We will come back to this checklist in the self-assessment at the conclusion of the course.



To prepare for the quiz this week, you should download at least one of the XR80 or XR90 hardware guides from The Source at <https://source.sierrawireless.com> and locate the table that describes the LED behavior.

Also, in this session we are focused on how to work with the router with the device in front of you. Many of these items have corresponding capabilities available when using the ALMS cloud management platform. For instance, there are two ways to perform a factory reset on a local device, and one of them has additional options associated with it. You can also use ALMS to remotely factory reset a single device, a selected group of devices, or an entire fleet of devices with minimal effort. We will look at those aspects of fleet management next week.

The slides in this section cover several of these areas but not all, as some have already been covered and some will be covered next week.

## Find Information on The Source

Sierra Wireless Source provides access to downloads and documentation

- AirLink OS software for those who need to upgrade without using ALMS
- XR80 and XR90 Hardware guides
- LED behavior
- Physical setup
- Factory reset (button)



Find The Source at <https://source.sierrawireless.com>

We are not going to take the time during the training session to go through all these specific items, but you are encouraged to download the hardware guide and ensure that you can find all the areas listed here and understand what is required. You will have the opportunity next week to ask questions, or you can reach out to a Sierra Wireless resource (such as a Field Solution Engineer, your instructor, or the support organization) if you have any difficulty.

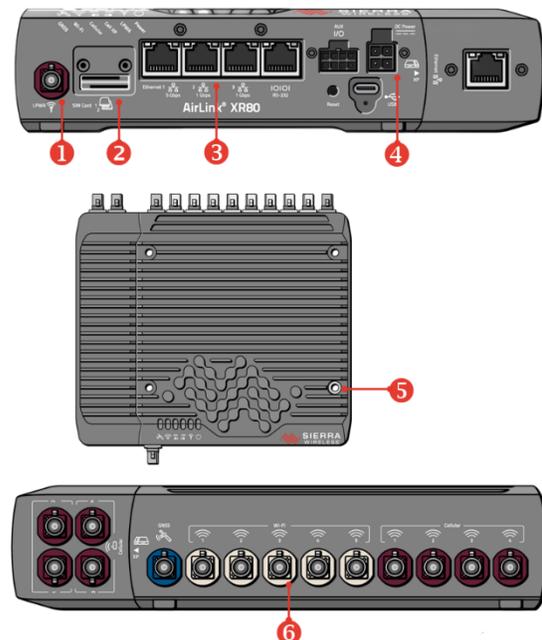
The following slides provide some detail on some of these areas but not all.

## Set Up the XR Series Router

The complete setup includes:

1. Attach LPWA antenna
2. Insert SIM card(s)
3. Connect required Ethernet cables
4. Connect power (AC or DC)
5. Secure the router
6. Connect required antennas

Some items are dependent on the installation type: fixed or mobile, cabling required, and the specific wiring of the power harness.



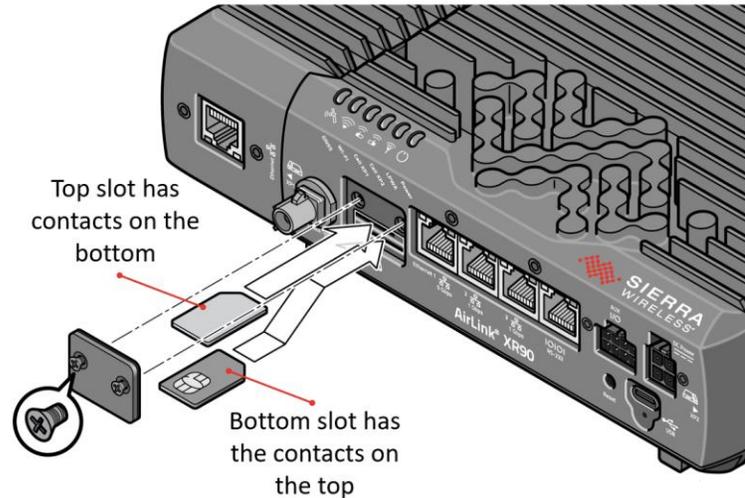
Depending on how and when the router is configured and installed, these steps may not occur in this sequence.

In some cases, it is useful to prepare a detailed drawing for installation personnel to ensure the right cables are connected in the right places. An example of this is when specific network configurations are made or not all antenna connections are being used.

## Insert the SIM cards

Primary SIM and secondary SIM installation:

- Primary in the top slot
- Secondary in the bottom slot.



Configuration is not needed if using default behavior, but slots are configurable.

If you are using two SIM cards and there is a specific primary SIM and secondary SIM:

- Primary goes in the top slot
- Secondary goes in the bottom slot

This could be for a dual-radio scenario, or for a secondary carrier failover scenario.

This is configurable, but if you understand the default behavior you can insert the SIMs without needing to be concerned with changing the configuration.

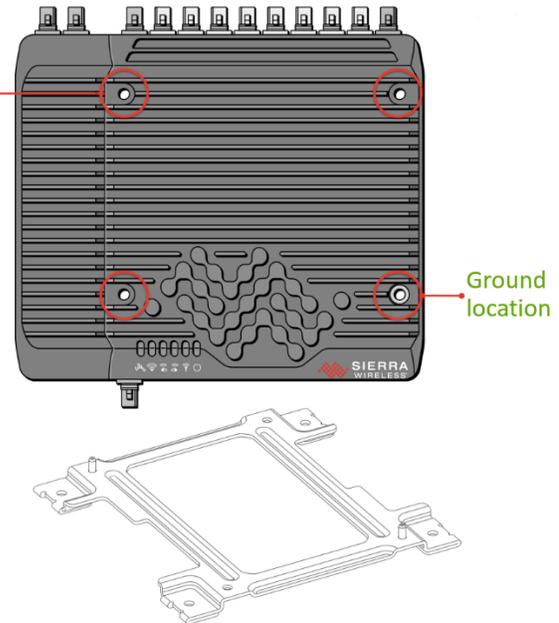
The SIM card in the top slot has contacts on the bottom, and the bottom slot has the contacts on the top.

## Secure the Router

The router has 4 bolt holes  
*All XR Series models have same layout and spacing*

Plan for:

- Access to antenna connectors and Ethernet ports
- Bend radius of antenna cabling
- Visibility of LEDs for troubleshooting
- Possible addition of an XP cartridge in the future
- Ground connection
- Protection of cable connectors
- Physical security



A quick-disconnect bracket is available.

The emphasis in the slide is on securing the device from movement and ensuring a good ground, which is more important in some situations than others. There is a ground connection on the power harness, but it is sometimes beneficial to ensure the device is physically grounded as well.

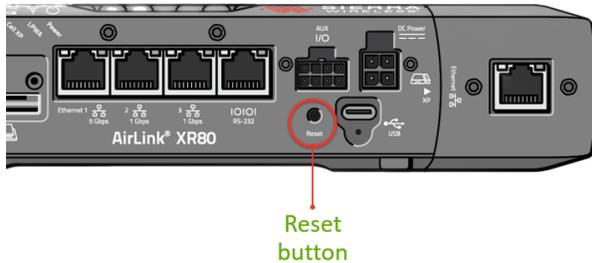
Other aspects of securing the router include securing access and installing it in a manner or location that ensures its physical safety from damage or theft.

The LEDs on the XR Series are best viewed from above and in front of the router, and they can provide valuable insight into the operation but only if the intended user can see them. Often, the person being asked to provide the LED status is someone not experienced with troubleshooting the solution, but they are being called on for information because they are available where the router is located.

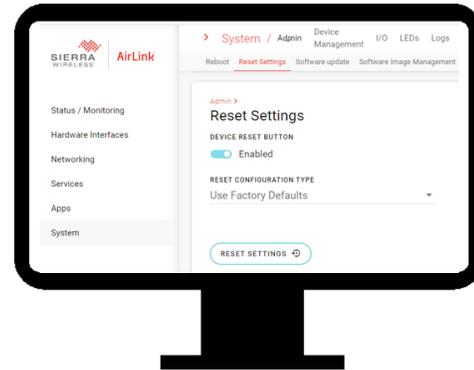
## Factory Reset

Apply a Factory Reset in two ways:

- 1 Hardware:**  
 Press and hold the Reset button for between 20-40 seconds. Release while Power LED is blinking Yellow



- 2 AirLink OS:**  
 Go to **System > Admin > Reset Settings**



On the hardware, pressing and holding the factory reset will always set all values including the default password. For a customer that has an active Services agreement and the router will continue to communicate with ALMS, this does not present much of an issue. It is best practice to ensure that default passwords have been captured before the routers are installed.

If a user presses and holds the Reset button but decides they do not want to perform a factory reset after all, they can continue to hold the button until the power LED starts alternating yellow-red and then safely release the button.

Using AirLink OS, a user can choose whether to factory reset to default settings or to replace the current configuration with a new configuration entirely, or a base configuration that provides the most required settings but that can then be adjusted as needed.

It will be stated in the discussion about templates, but note that passwords, such as Wi-Fi STA profile, access point SSID profiles, and VPN credentials, are never stored in a local (JSON) template and need to be entered at template creation for inclusion in an ALMS account template. This same mechanism would allow you to include the passwords in a local template but it will cause the passwords to be saved in the JSON file in clear text, which most customers are strongly against doing.

## Default Priority for Multi-WAN

Interface	Order, if present
Ethernet	<ul style="list-style-type: none"> <li>Eth 1</li> <li>Eth 2</li> <li>Eth 3</li> <li>Eth XP/XP1</li> <li>Eth XP2</li> </ul>
Wi-Fi WAN	<ul style="list-style-type: none"> <li>Wi-Fi 5GHz</li> <li>Wi-Fi 2.4GHz</li> </ul>
Cellular	<ul style="list-style-type: none"> <li>Cell INT/XP1</li> <li>Cell XP/XP2</li> </ul>

The XR Series routers are designed to support custom routing over different WAN links and managing that level of detail is beyond basic use.

From a basic use perspective, you should understand what the default behavior is when you have multiple WAN links available.

This may impact where you insert SIM cards or require additional configuration internally.

MGOS users will be familiar with the concept of Default Priority; it is simply the priority of interface use for WAN links if no other routing policy has been used to change some or all traffic from that interface.

The more advanced courses will delve into policy-based routing and Cognitive Wireless, where specific rules are used to change or enable/disable routing based on the state of the router. Later in this session we will look at how to determine which interface is being used, but you should remember that since the XR Series has very advanced networking capabilities and is fully compliant with both IPv4 and IPv6, the current WAN route may be dependent on the type of traffic being sent even without advanced policies in place.



You can adjust the default priority by creating a custom WAN-like zone and overriding system policies with that new definition, but that will not be covered explicitly in this training course.



This list is comprehensive, but some interfaces will not show up in the default WAN zone if they are not currently in use as WAN links. For instance, if Ethernet 2 is used as a LAN interface, it will not be listed when you look at the WAN zone definition; it will appear in the specified sequence if it is put into use, which is dynamic.

## Specific Status Information

### Using the Dashboard

The screenshot shows a dashboard with the following sections and annotations:

- Device Info:** XR80, 6Q1065006502AC24, OS Version 3.0. Annotation: "Device model, serial number, AOS version".
- ALMS COMM. STATUS:** LAST 5 minutes ago, NEXT 00:09:57 (ETA). Annotation: "ALMS communication status and check".
- SYSTEM TEMPERATURE:** 60° C | 140° F.
- Location:** LATITUDE 49.19647, LONGITUDE -122.55718, ALTITUDE 23 m, SATELLITES 17. Annotation: "Location details (implies working status)".
- WAN:** Radio Module (Fido, XP Cellular, LPWA - Out-of-Band Management), Data Usage (Cellular, Ethernet, Wi-Fi). Annotation: "Cell network status (hover over the 'i')".
- Ethernet WAN:** Ethernet Port(s) (Ethernet 3, XP Ethernet). Annotation: "Ethernet WAN status".
- Ethernet LAN:** Ethernet Port(s) (Ethernet 1 (5G), Ethernet 2). Annotation: "Ethernet LAN status including segment".
- LAN:** Wi-Fi AP status (2.4GHz, 5GHz), Data Usage (USB, Ethernet, Wi-Fi). Annotation: "Wi-Fi AP status including SSID, client count, segment (Bridge)".
- Last Login:** ON February 28, 2022 11:51:42 PM, IP 172.25.0.100, FAILURES 0.

### Things you will find on the Dashboard

1. Device model, serial number, AOS version
2. ALMS communication status and check
3. Location details (implies working status)
4. Cell network status, with more info if you hover over the grey "i" circle
5. WAN Wi-Fi (STA) status
6. Ethernet WAN status
7. Wi-Fi AP status including SSID, client count, segment (Bridge)
8. Ethernet LAN status including segment

## Using Other Parts of Status/Monitoring

Question	Where to look
Is my Cell link connected?	Status* > System > Radio Module > Cellular : Adapter Status
Which cell link is being used?	Status* > Networking > Multi-WAN : Current WAN Device
Is my Station Wi-Fi connected?	Status* > System > Wi-Fi : Clients : States
Is my GPS/Location working?	Status* > Services > Location
Is my VPN connected?	Networking > VPN > IPsec Tunnels : Status
Am I reporting to ALMS?	System > Device Management > LWM2M
Is my Wi-Fi broadcasting?	Status* > System > Wi-Fi : Wi-Fi AP
How many clients are connected?	Status* > Networking > Neighbor

Question	Where to look
Will this link support IPv4, IPv6 or both?	WAN table (Status* > System > WAN)
What is my current IP address on a specific link?	WAN table (Status* > System > WAN)
What DNS servers are being used on a specific link?	WAN table (Status* > System > WAN)
What link is currently used for traffic?	Multi-WAN table (Status* > Networking > Multi-WAN)
What phone number is associated with a given cellular link?	Radio Module status (Status* > System > Radio Module)
Am I connected on 5G?	Radio Module status (Status* > System > Radio Module)
What channel is my Wi-Fi using?	Wi-Fi status (Status* > System > Wi-Fi)

Status\* is used as a short form for Status / Monitoring

## Basic Configuration Settings

### Definition of Basic Settings

Things you should be able to do on in AirLink OS:

- Change a Cellular APN
- Change LAN addressing
- Set up Wi-Fi Station (client) profile
- Set up Wi-Fi Access Point (SSID, security, band)
- Set router shutdown (time, voltage)
- Set up location reporting to CAD

This list of basic settings represents a core that is common to many simple configurations, and the total of all configuration settings for some deployments.

You set all these settings during the lab, and the slides included are provided to reinforce the learning from the lab. Some of these settings handled differently in the operating system than in previous AirLink routers and have different options available based on anticipated next-generation needs.

### Change a Cellular APN

“Auto” APN mode determines the Primary Operator and uses a look-up table to provide the most common APN.

To provide a different APN:

1. Go to **Hardware Interfaces > Cellular Interfaces > Configuration**
2. Change **APN Mode** to Manual
3. Do one of the following:
  - a. Enter the **Manual APN** that has been provided
  - b. Leave the **Manual APN** blank to query the network to provide a suitable APN

Private network and APN offerings are far more common than in the past, and so AirLink OS behavior has been designed to support the current and anticipated future environment.

In addition to the traditional Auto and Manual options, the XR Series supports multi-APN, where up to 5 different APNs are supported and presented as virtual radios/interfaces to support custom routing needs.

## Change LAN Address

Set by default to:

- 192.168.1.1 (Default Gateway)
- 192.168.1.0/24 (Network)

To change the addressing of the Default LAN:

1. Go to **Networking > Zones settings > Bridges**
2. In the **Bridge Configuration Table** click the three dots
3. Provide the new intended IPv4 address and prefix
4. Provide the new DHCP starting and ending addresses
5. Click **Update** to save and take effect immediately

**NOTE** There are other settings that you can change including DHCP lease time and all IPv6 properties but nothing further is required to just change the addressing of the existing IPv4 Default LAN.

In previous generations, LAN changes required a reboot or at least a recaching of network addresses by client systems attached to the router. With AirLink OS, changes take place and are communicated to the client to support a very quick restoration of network access.

**NOTE** If you connect to a lab or deployment network as an Ethernet or Wi-Fi WAN link that is addressed the same as the default LAN, it may appear that WAN auto-detect is not working or the router is not functioning. This is a result of the address range duplication and the resulting issues with network routing. If that occurs, disconnect from the WAN network, and change the addressing of one or the other network before proceeding.

## Set Up WAN/STA Wi-Fi

Recommended workflow:

1. Go to **Hardware Interfaces > Wi-Fi Interfaces**
2. Enable the 2.4 and/or 5GHz clients
3. Look for desired SSIDs in the **Scanned SSIDs** table
4. Click the **Select** button for all desired SSIDs  
*NOTE: Those SSIDs will be written to the Client SSID Database*
5. Click on the three dots for each SSID and provide the required password

**NOTE** Any available STA network will automatically be joined.



If there are multiple profiles for a single band, the first found will be connected. You can use the Priority to rank multiple networks in the desired order.



5GHz STA will be preferred over 2.4 GHz STA for traffic.

You can manually create a profile to use with infrastructure/depot networks if you know all the required settings, but be aware of the outdoor router channel restrictions, as some depot networks are configured on channels that are restricted on the XR Series, at least at the current time.

The XR80 Wi-Fi radios (2.4 and 5GHz) will operate in repeater mode, which switches operation to whatever channel and bandwidth are being used by the depot network. In this way, the XR80 will support session-based communication such as secured video offload, but at a reduced capacity since the radio is supporting both LAN and WAN operations.

The XR90 has dual 5GHz radios so supports full 4x4 client and host operations without performance degradation or limitation. The 2.4GHz radio on the XR90 operates in a time-slicing mode if configured for dual operation, so will not support session-based communication.

As of AirLink OS 3.0, there is an option to disable specific access point operation when the router connects as a client to a depot/infrastructure network which lets the user effectively dedicate full 4x4 MU-MIMO throughput to access point operation when not in the depot and automatically switch to 4x4 MIMO client operation when connected as a client.

### Set Up Wi-Fi Access Point

Recommended workflow:

1. Go to **Hardware Interfaces > Wi-Fi Interfaces**
2. Click on the pencil for the 2.4 and/or 5GHz Access Points.  
(The **Edit Wi-Fi Interface** screen appears.)
3. Click **Enable**
4. Enter your preferred **SSID**
5. Select the desired **Security Mode**
6. Enter the passphrase
7. Click **Update** to save and enable



This enables an AP with basic settings on the selected bands. Many settings can be modified, but they are not required.

The XR Series supports up to three access points per radio, each with complete control over security and network assignment. Physical connection attributes are all shared, such as channel and bandwidth being used. The presentation of the radio configuration is different in 3.0 than in previous AirLink OS versions.

### Set Up Router Shut Down

1. Go to **System > MCU > Voltage Threshold**
2. In the **Standby Voltage** field, enter the voltage at which to shut down
3. In the **Resume Voltage** field, enter the voltage at which the router should start up again
4. Under **Power Management**, in the **Power Sources** table, click on the three dots on the Ignition line
5. In the **Update Edit Source Delay** dialog box, type the number of seconds the router should maintain operation after ignition off

 By default, the router starts based on ignition sense (white wire) and shuts down 3 seconds after ignition off or when voltage drops below 9 VDC and resume operation at 10.5 VDC.

Depending on the cable harness length, you may have a 0.3-0.5Vdc difference between the voltage sense on the XR Series router and the voltage being reported to the engine computer unit, with the XR Series being the lower of the two. For instance, if the cable is full length, the resistance will cause the router to sense only 10.5V when the vehicle is still at 11V. As a result, you will want to set the shutdown voltage to about 0.5V higher than where you actually want it to shut down based on its own voltage sense. The thing to remember is that you never want router operation to be the reason for not being able to start the engine next time the vehicle is needed.

 As with previous AirLink routers, if you have the option of connecting to either a 12VDC or 24/28VDC power source, the higher voltage is generally recommended. However, if you set the shutdown voltage to some value that is higher than a standard AC adapter can deliver, you will need to power the router with a custom or variable output DC power supply for bench use.

In vehicle use, the battery power will typically be sensed as dropping to 12VDC quite quickly after ignition off and will usually be sensed at approximately 14.4VDC when the vehicle engine is running, as long as both battery and alternator are in good condition.

## Set Up Location Reporting



Location services are enabled by default, but you need to be able to specify certain details to set up CAD/AVL reporting for an end user.

To set up location reporting, you need to know:

- A. TAIP ID (optional, if using TAIP)
- B. Reporting target (local or remote address, including network ports)
- C. Protocol and sentences



The XR Series support TAIP and NMEA reporting to network locations, remote or local.

To set up CAD/AVL reporting:

1. Go to **Services > Location > Reporting**
2. Provide the details according to the information available



Future releases or AirLink OS will include additional options.

Some legacy location reporting options have been supported in previous generations of AirLink routers but are not supported in the XR Series with AirLink OS. For instance, network/IP-based local reporting is now quite standard so serial-based local reporting is no longer supported. Also, the Sierra Wireless RAP protocol is no longer supported for security reasons, but the XR Series can send both vehicle and router telemetry information to both local and remote network/IP-based clients via TCP, UDP or both.

## Working with Templates: On the Router and In ALMS

### What You Can Do with Templates, and From Where

What you can do	Locally	From ALMS Configuration view	From ALMS Develop > Templates
Create a complete template from router	Yes	Yes	Yes
Create a partial template	Yes	Yes	Yes
Save a template to local file	Yes	Yes	No
Save a template to ALMS account	No	Yes	Yes
Modify a template	Yes	Yes	Yes
Load a template from local file	Yes	Yes	No
Apply an ALMS account template	No	No	Yes
When we will cover	This week	Next week	

AirLink OS not only presents a clean, modern local user interface when connected locally to a router, but also provides a virtually identical user interface when carrying out remote configurations via AirLink Management Service (ALMS).

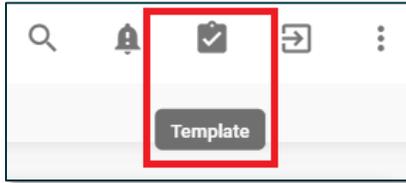
This week in your lab, you will carry out the same set of configuration settings you set in Lab #1 but this time you will save them locally as a template. This template is a JSON (XML-format) single file that is saved on your computer, and then can be loaded onto another XR Series router and loaded as a starting point to make further configuration changes.

While the user interface is identical for creating a configuration, some features like seeing scanned depot networks provide feedback more rapidly in a local setting than when carried out remotely. Local configuration may still be preferable for some initial prototyping of the configuration settings



As mentioned previously, passwords are never saved within a template file, whether locally or on ALMS. As a result, when configuring routers using saved templates, passwords must be explicitly set on routers. This can be done on a device-at-a-time basis either locally or remotely working from ALMS, or it can be done in a secure mass upload mode using a spreadsheet upload to ALMS. This restriction and mass deployment option are not new with the XR Series or AirLink OS.

## About AirLink OS Templates: Working Locally



Just as previous operating systems could save and load templates locally, so can AirLink OS. The file format is different from either ALEOS or MGOS (JSON, and XML-based format.) The template creation process has evolved: both the look and feel, and the capability.

Local template creation is fine for prototyping and testing. There is a workflow available to take your local prototype and make it deployable to a fleet.

There are new tools for creating and working with templates, both locally and within ALMS. This session will look at local use and build on it next week.

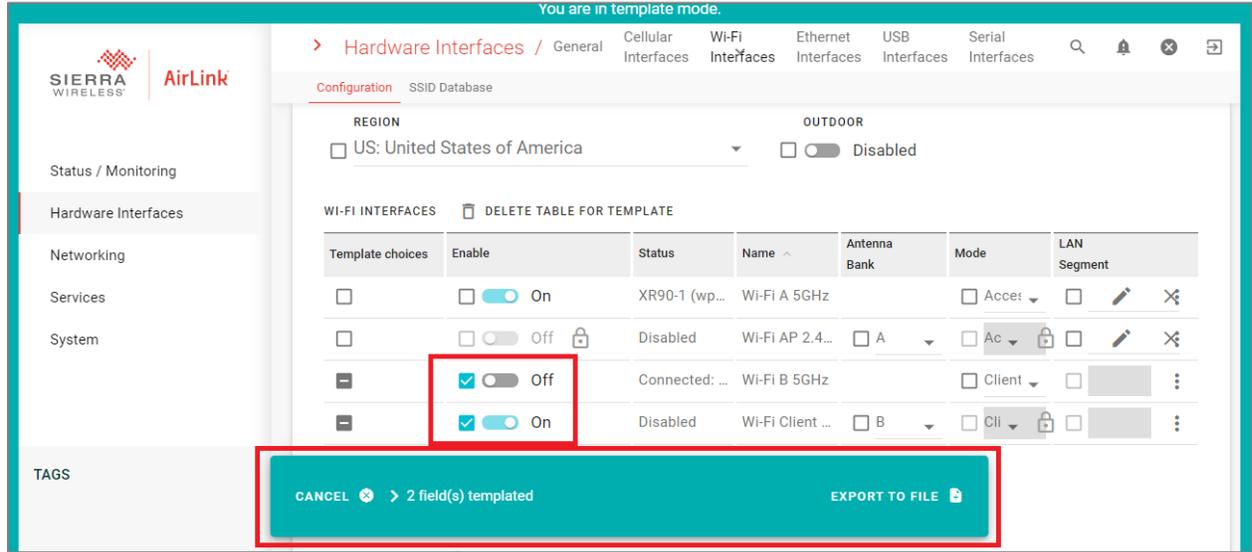


Click on the clipboard/checkmark icon at the top of the AirLink OS interface to switch the router into Template mode. AirLink OS will present four different template options, which are explained in detail in the following slides.



When in Template mode, changes made are saved within the working template but not applied to the current configuration on the router. You can also select settings that have already been configured on the router for inclusion in the new template.

## Template Mode



Template mode in AirLink OS is clearly indicated by bright blue frame and bar.

Changes are not applied to the system while you are creating the template. Working locally on the router, templates can only be saved to a local file.

Locally saved template can be:

- Reloaded locally and modified to add additional settings
- Loaded in ALMS Configuration view and saved to ALMS account for deployment

### Mode 1: Create a Template from Scratch

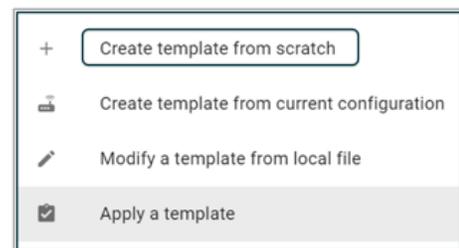
Switches to Template mode and lets you specify and capture configuration changes.

You can capture settings two ways:

- Choose settings already present on router
- Make changes from the current configuration

Changes are not applied to current system. Save changes when all template elements are captured.

*This is like creating a partial or incremental template, traditionally only available on ALMS but now available locally as well*

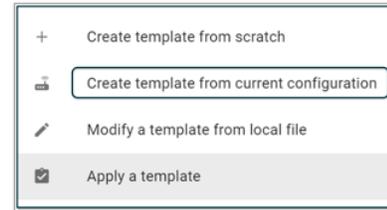


## Mode 2: Create a Template from Current Configuration

Used for a full device configuration

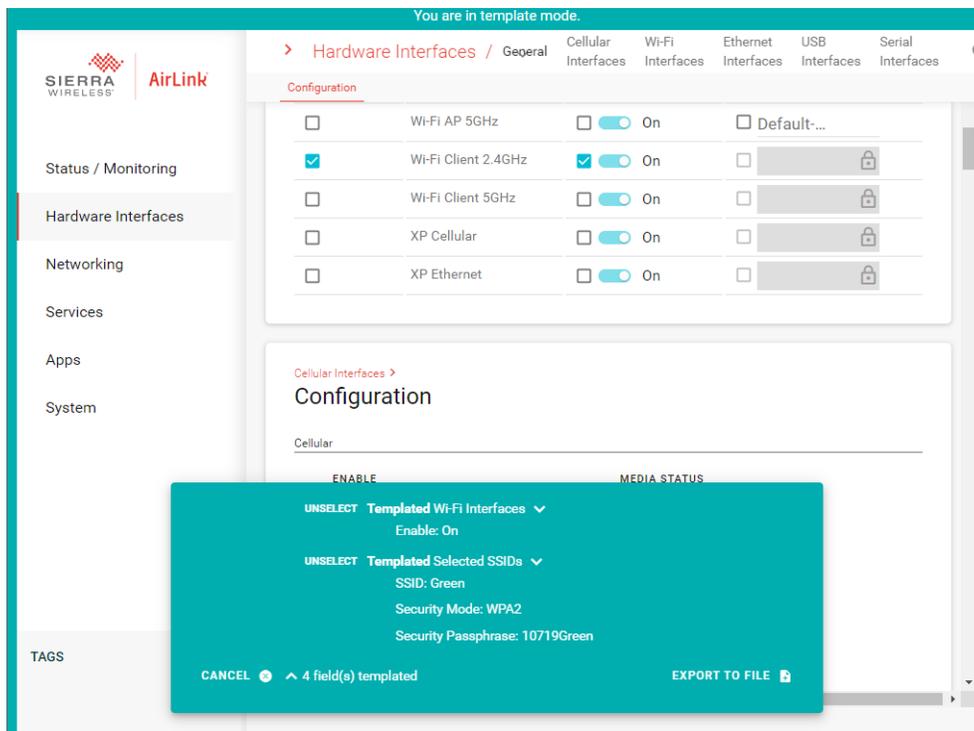
*This is similar to creating and saving a complete template in ALEOS or MGOS but with one significant difference: it only captures the **non-default** settings.*

**NOTE** This feature cannot be used with engineering builds of AirLink OS.



This is a very powerful new configuration option, in that AirLink OS will scan the current settings to determine exactly which ones have been changed from default settings and save only those settings and values in the new template. This option may not work when using engineering releases of AirLink OS, as it relies on testing and verification processes that may not have been completed for unpublished builds.

## Mode 3: Modify a Template from a Local File



This mode is very similar to creating template from scratch. It lets you choose a starting point and modify it by adding, removing, or revising changes.

Existing elements of the template are clearly identified so you can get to them easily. It also lets you take a locally saved configuration template and make it available for mass deployment via ALMS.

## What's Next

As part of the certification program, you are required to demonstrate that you have mastered the knowledge requirements of working with the XR Series of routers. This assessment must be passed with at least 80% prior to the start of the next session.

**NOTE** You do not need to complete the lab exercise prior to taking the quiz, as it is based on the presentation content.

Log in to the Training Portal and you will find the Week 2 quiz posted in the XR Solution Administrator course.

**NOTE** You will need to download an XR80 or XR90 hardware guide in preparation for the quiz this week. Specifically, you will need to locate the information on LED status.

Here's what you should know:

- Know how to register XR Series routers for your customers
- Know the benefits of registering XR Series routers
- Know where to find specific status information in AirLink OS
  - Link and interface states
  - Network states (LAN and WAN)
  - Current routing status
  - Router systems states: location, CPU, temperature
- Know how to perform basic configuration settings on the XR Series routers
- Know how to create, save, and load templates locally on an XR series router
- Know how to do basic operations with an XR Series router



In this lab exercise you will:

- Create and save a configuration template locally
- Perform a factory reset locally on the XR Series router
- Deploy a configuration template locally
- Perform a software upgrade locally (downloaded from the Source)
- Back out of a software upgrade
- Capture log files locally
- Use the network troubleshooting tools in AirLink OS
  - Ping
  - IP Capture in basic mode