Using Wi-Fi SoftAP for Network Setup and Gateway Provisioning

The Challenge

Wi-Fi is one of the most popular wireless technologies for connected products due to its reliability, high bandwidth, and ubiquity in the Internet of Things (IoT). But initial configuration for connecting to Wi-Fi networks can be challenging when products lack graphical user interfaces (GUI) or peripheral devices, such as a keyboard and mouse.

What is SoftAP?

SoftAP is an abbreviation for a software-enabled access point, which provides another wireless interface for connected products and is often used by manufacturers to let their customers set up and configure headless products through a smartphone or web browser. A SoftAP is created using the embedded Wi-Fi radio to establish a separate network name and password for direct communication with the connected product. The user then can provide the security credentials, which are sent to the product in order to connect to Wi-Fi network infrastructure.

Concurrent SoftAP and Station Mode

There are many Wi-Fi modules on the market today for building connected devices, but not all modules are created equal. To narrow the search, manufacturers must decide what Wi-Fi connections are necessary for their product once deployed in the field as well as envision an optimal user experience for different stakeholders throughout its lifecycle. There are three main Wi-Fi connectivity options available to manufacturers depending on the module they use:

- **Station (Client) mode:** When a product is connected to a wireless access point (AP) and can access the network created by that access point.
- **Station or SoftAP mode:** The product can be connected to a Station, like in the first option, or the product can operate as an access point itself, where other devices (like a smartphone, tablet, or PC) can connect to the product as a Client. Modules that enable this feature usually require a reboot in order to switch from Station to AP or vice-versa.
- **Concurrent SoftAP and Station mode:** In this mode, the product can be connected to a wireless network as a Client, while also simultaneously creating a separate network as an AP for other devices to connect to it.

Wi-Fi Network Provisioning

Device installation typically requires the end user, system integrator or another party to enter the service set identifier (SSID) and Wi-Fi network credentials to connect to the network. However, many IoT devices with embedded Wi-Fi modules lack a user interface or keyboard to input this information quickly.

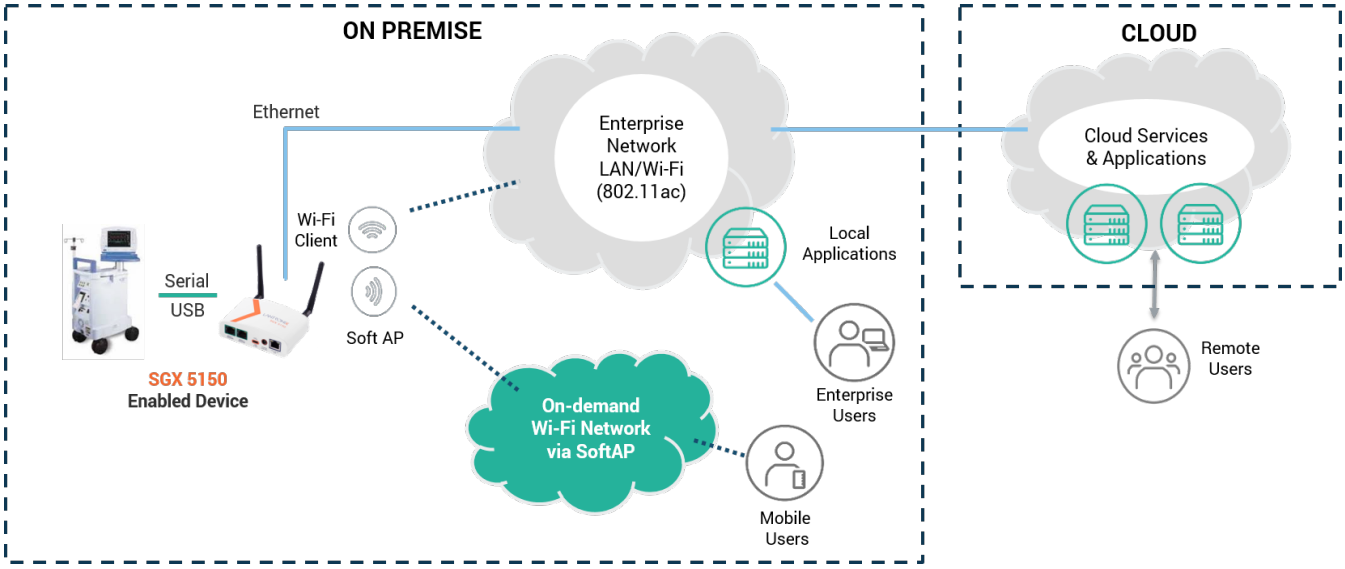
Supplying an integrated user interface is often overlooked by OEMs because of the added size, cost, and overall footprint of the device. Despite these limitations, devices can be provisioned by the user with the help of the SoftAP interface. Users can conveniently enter network credentials within a web browser on a PC or via a smartphone application provided by the device OEM.

Once the network details are supplied to the device's Wi-Fi module via the SoftAP, the Wi-Fi module will connect to the infrastructure access point and provide appropriate feedback in case the user has entered an incorrect password.

Wi-Fi modules that do not support Concurrent SoftAP and Station mode of operation must be rebooted entirely to connect to the network infrastructure, and immediate feedback is not possible. These types of devices typically have LED indicators that inform users if the connection with the network infrastructure access point is unsuccessful. When this happens, a user must start all over again, raising technical support costs and contributing to a poor user experience.

Headless Human Machine Interface (HMI)

A fitting example of devices without a user interface is an IoT gateway, which provides network connectivity to legacy industrial devices via a serial connection. IoT gateways are typically headless and lack extra ports for a wired connection to a local PC for setting up and provisioning. Conversely, gateways built with Wi-Fi modules that support concurrent SoftAP and Station mode of operation allows the use of a Wi-Fi connection from a PC or a mobile application to provision the gateway in a matter of seconds.



More Benefits of SoftAP

The concurrent SoftAP and Station mode interface also enables direct access to set up and provision the connected product's embedded controller. With the use of a mobile application, OEMs can provide their customers and service personnel with an engaging user interface on their mobile devices without the added cost and complexity of developing a GUI display from scratch. In addition, the concurrent SoftAP and Station mode simplify embedded application firmware development by eliminating the need for switching between these two Wi-Fi interfaces.

Service Mode Access or Wireless Diagnostic Port

Another excellent use for the SoftAP feature on a Wi-Fi module is to provide field technicians and support staff with direct access to deployed devices in the field without the need to go through the network infrastructure. This use case is pervasive since most end users do not want to divulge sensitive information such as SSIDs and passwords to third-party support organizations. By using a Wi-Fi module with Concurrent Station and SoftAP, the device remains connected to network infrastructure and is fully operational while a technician performs maintenance checks or retrieves diagnostic information.

Imagine integrating a Wi-Fi module with doors or elevator access control units to provide physical access and security. A Wi-Fi module with Concurrent Station and SoftAP capability can allow the field technician to service the access control units without interrupting the operation of the connected device.

Lantronix Products Supporting SoftAP

Lantronix portfolio of Wi-Fi modules and IoT gateways including the Lantronix SGX 5150, xPico® Wi-Fi, xPico® 240, xPico® 250, and PremiereWave® 2050 all support Concurrent SoftAP and Station mode, providing OEMs with a solution to design and manufacture products that deliver superior user experiences and lower field support costs.

SGX 5150
- High-performance 802.11ac Wi-Fi.
- Industrial-grade ruggedized design.
- Integrated device management capability.

PremierWave® 2050
- Industrial-grade 802.11ac Wi-Fi.
- Integrated enterprise security.
- Yocto Linux SDK with Python support.

xPico® 200 Series
- Dual-band Wi-Fi, Ethernet and Bluetooth.
- Pre-integration with the MACH10™ IoT Platform.
- Industrial operating temperature (-40 C to + 85 C).

xPico® Wi-Fi
- Concurrent SoftAP and client mode.
- 256-bit AES Encryption.
- Complete device server application with full IP stack and web server.

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