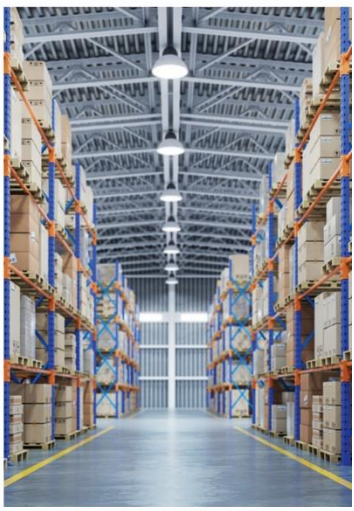


Antaira's New
RAPID ROAMING Technology

antaira®
making connectivity simple...

Antaira's New Rapid Roaming Technology

Modern factories heavily rely on Artificial Intelligence (AI) driven processes in order to optimize every step of production and precise data that is collected by numerous sensors. Historically, they were using slow cable-driven serial protocols. Often, we would see cables for RS-232 cables or twisted pairs for RS-422/485. With the development of new technologies, we see a transition to Ethernet-based communication. Two main factors play a key role in this process: the price of Ethernet nodes went down with the advent of cheap microcontrollers that included fully integrated Ethernet communication hardware in one chipset, and sophisticated sensors providing the flow of data not compatible with old serial buses.

WIFI communications (wireless Ethernet) is a key technology to deliver all the necessary metrics from sensors. It provides freedom from cables that allows unrestricted 3D movements. Typical 802.11ac wireless communication extends to a distance of 100 meters. Commonly, this distance is not sufficient and multiple access points (AP) are installed to cover a large area of operation. In this scenario of moving wireless, the client (vehicle or robot), needs to switch over communication to the next strong signal access point. The best solution is the implementation of 802.11r across the infrastructure. It manages the switch-over mechanism with below 50ms

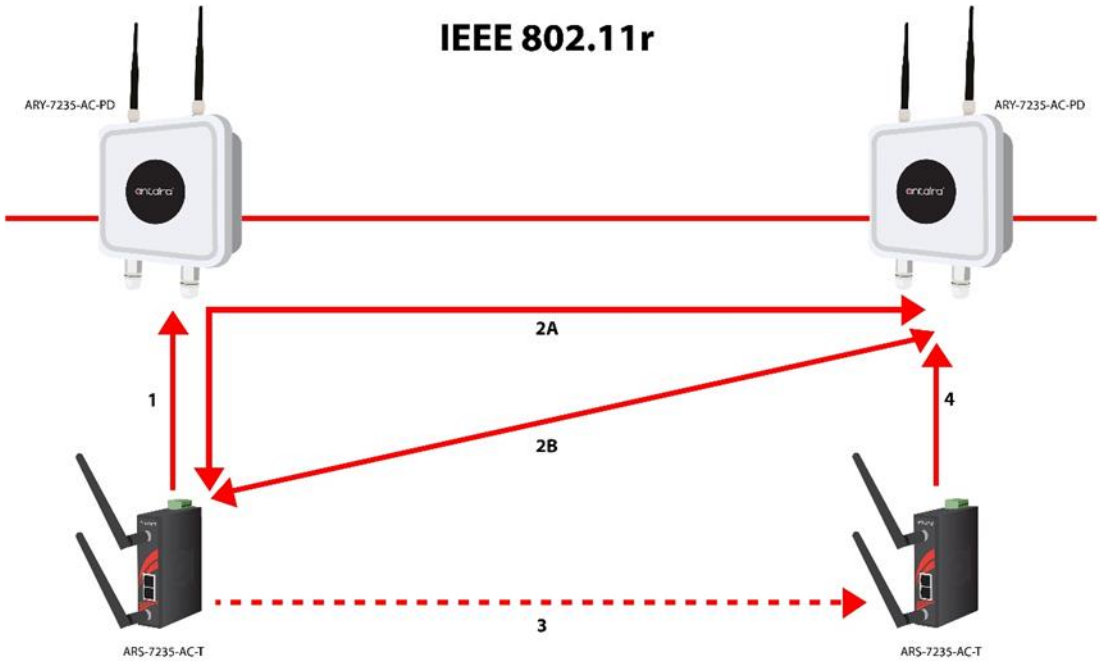
transition. In some places existing WIFI infrastructure does not support 802.11r, but the need for moving installation demands fast transition times.

In this situation, Antaira Rapid Roaming is a great solution. We have developed an enhanced WIFI client ability to actively monitor surroundings and prepare new possible access points (APs) connection opportunities before classic die-down and drop-off connection processes take place, causing a drop in communication for a minute or longer. With Rapid Roaming, we take an active approach and seek a new AP when communication is still healthy. It assures good throughput and fast transition with below 150ms switch time.

IEEE 802.11r Wireless Roaming

Roaming has been a desired feature in a wireless device for decades. In 2002, the IEEE 802.11r standard was introduced and is still under heavy development with major fundamentals published in IEEE 802.11r-2008. The main goal of 802.11r was to hand over wireless connections between numerous APs along a client travel path without significant delay. It has been particularly important for Voice over Internet Protocol (VoIP) applications where human conversation requires 50ms or better of transmission time to avoid undesired noticeable interruptions. This new 802.11r standard allowed for speed with secure and seamless handoffs where authentication and Quality of Service (QoS) configurations were preconfigured ahead of switching to the next AP. It made for a stable throughput of data without delays caused by the

regular authentication process.



Steps of Fast Roaming

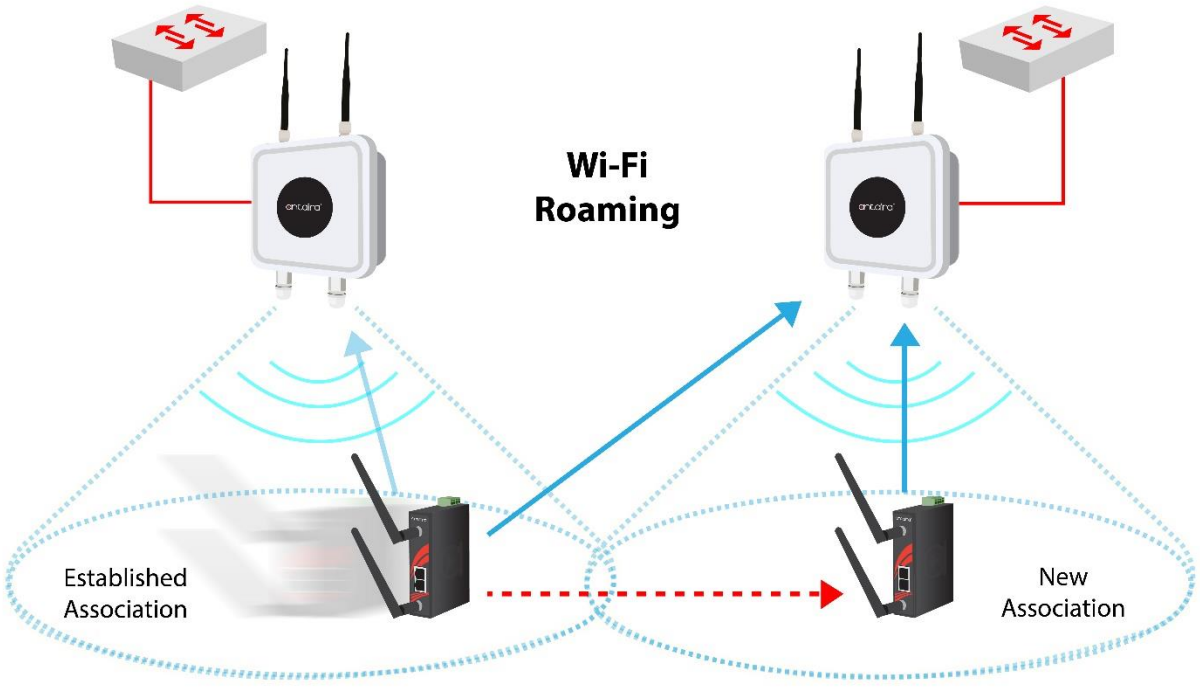
1) Authentication and QoS
    a. In this step, two technologies are properly transitioning. Not just units are connected to one AP, but it has the same privileges in respect to communication priority. It is important in voice-over IP scenarios when delays could affect the human-to-human conversation.
2) Exchange 802.11r (2a - cable, 2b - radio)
    a. This special protocol allows to exchange all necessary information ahead of travel path of a client. Making the transition smooth and fast.
3) Travel path
    a. This is the way Client travels along the available APs

4) Confirmation with new AP
   Client finalizes its connection with the current AP. It switches communication with the new node and closes communication with the previous not; however, rapid reconnection with the previous node is available if the path is reversed.

RAPID ROAMING in Legacy Non-802.11r Access Point

Compatible Environments

Antaira's ARS-7235-AC-T can offer client-based rapid roaming. This is particularly useful in older installations when existing infrastructure does not support 802.11r. However, it is not as efficient as having 802.11r, it is attempting to close the gap with systems not having the roaming technology where conventional disconnecting and reconnecting with new APs. This process may take a long time - sometimes even longer than a minute. It is frustrating when slow moving clients operate with extremely weak AP signals while another AP with a strong signal level is readily available in range. To address these scenarios, Antaira has implemented a new and special Rapid Roaming protocol.



Below are some of the requirements for the infrastructure for Rapid Roaming

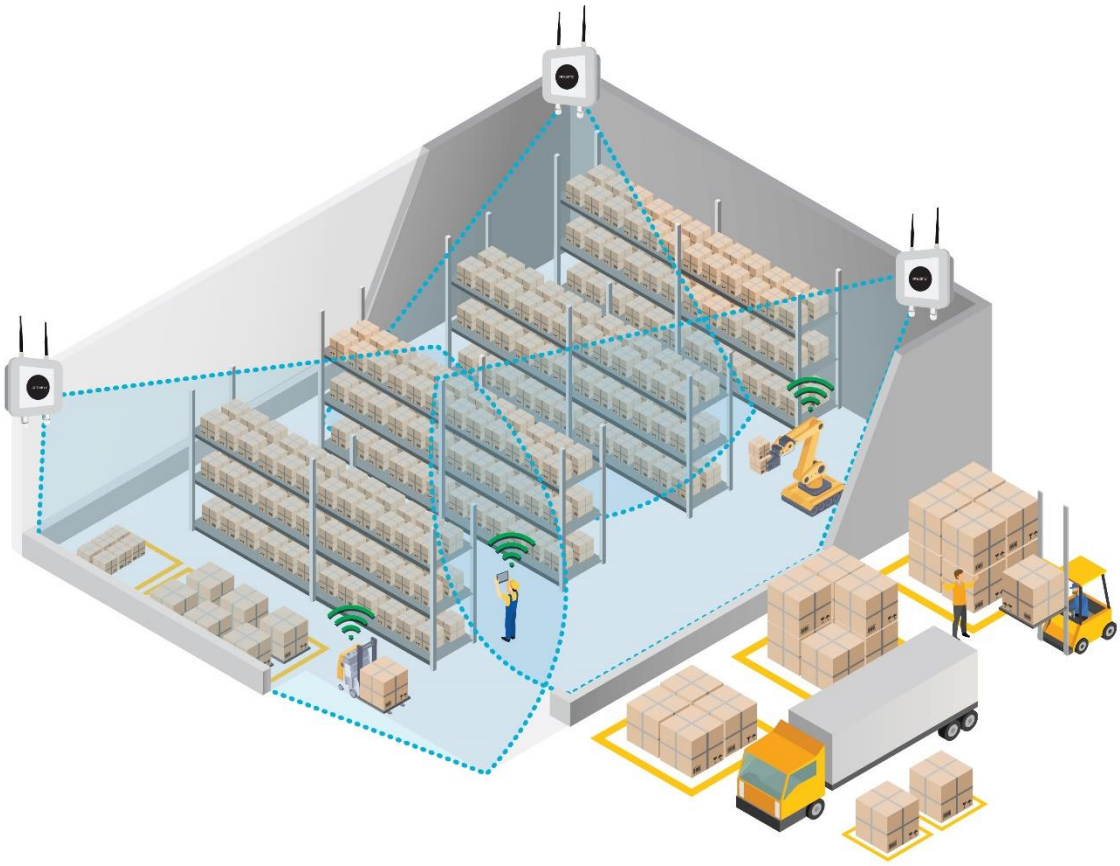
1) Same Service Set Identifier (SSID)
2) Same Password
3) Same Security Mode
4) Same Band
5) Same Channel Width (20Mhz/40Mhz)

In order for the rapid roaming technology to work correctly, it is necessary to use an AP with the same SSID and security key. When rapid roaming is enabled, the client device will be configured to scan for the surrounding APs. It is necessary to set slow scan time intervals to specify relatively slow scans when Received Signal Strength Indication (RSSI) signal levels are relatively high and the client device can comfortably concentrate on delivering the maximum data throughput. Then, it is necessary to specify the RSSI threshold level that will indicate an imminent need for a new connection. When this level is reached, the client device will be performing fast scans looking for a new AP and when it is detected it will authenticate and auto-connect to the new AP while simultaneously dropping the current connection. This active process eliminates weak signals deprived of links and prepares a new connection ahead when needed. Additionally, there are two modes of channels for scanning. One mode is “standard” and it works when all the channels are scanned. The other mode is “intelligent” and it works when a client device for example goes back and forth along the same APs. In this scenario, it is smart and can learn those APs channels and look for them automatically. This can further speed up the reconnection process.

In order to implement 802.11r, the wireless infrastructure needs to support this standard. This typically will require significant additional investment as most systems that support 802.11r

must have a Wireless LAN Controller in addition to the APs that are then controlled by the Wireless LAN Controller. Applications where necessary infrastructure does not exist and there are cost restrictions, then Antaira Rapid Roaming technology can provide many of the same advantages at a much lower cost.

One example of where we have seen this scenario play out is in a warehouse application with autonomous robots that move about the warehouse stocking shelves and fulfilling orders. Here, a legacy WIFI network was already in place to support employees connecting their PCs, tablets and phones, but the network did not have the necessary equipment to support 802.11r. Antaira was able to provide the solution by fitting each of the robots with an ARS-7235-AC wireless router that could implement our Rapid Roaming technology at a fraction of the cost of installing an entirely new wireless network.




Wi-Fi
Roaming
Established
Association
New
Association

Products with Antaira's New RAPID ROAMING Technology

ARS-7235-AC Series

Industrial IEEE 802.11 a/b/g/n/ac Wireless Access Point/ Client/ Bridge/ Repeater with Router Capabilities

- Industrial 2x2 MIMO
- 2*10/100/1000 Base-TX WAN/LAN Ports
- Tx Power 25dB for 2.4GHz
- Tx Power 24dB for 5GHz
- Standard Operating Temperature: -10° to 60°C
- Extended Operating Temperature: -35° to 70°C

ARX-7235-AC-PD-T

Industrial IP67 Metal Housing 802.11 a/b/g/n/ac Dual-Radio WiFi AP/Client/ Bridge/Repeater/Router with PoE PD

- High-speed WLAN Supports up to 867Mbps
- Dual Radios; 2.4GHz/5GHz concurrent
- Industrial MIMO Wireless Solution (Dual 2Tx/2Rx)
- Operating Temperature: -40° to 70°C

ARY-7235-AC-PD

Industrial IP67 Plastic Housing 802.11 a/b/g/n/ac Wireless Access Point/Client/ Bridge/Repeater/Router with PoE PD

- High-speed WLAN Supports up to 867Mbps
- Dual Radios; 2.4GHz/5GHz concurrent
- Industrial MIMO Wireless Solution (Dual 2Tx/2Rx)
- Operating Temperature: -40° to 50°C