TB-00014-01

WR900 Wireless Repeater: Mesh Dual Band Network Architecture Technical Brief

With over 13 years of leadership in mesh wireless and commercial climate control technology, Pelican Wireless Systems continues to set industry standards. Renowned for deploying some of the largest commercial wireless mesh networks, Pelican consistently innovates to optimize network strength, quality, reliability, and customer confidence.

Pelican's wireless network features an automated and isolated communication backbone, enabling Pelican devices to collaborate in message routing across facilities of all sizes. This collaborative approach not only optimizes and simplifies indoor climate control but also bridges device data to Pelican Connect, a cloud application for virtual climate management and troubleshooting.

Operating on a private 802.15.4 / 2.4 GHz wireless mesh, Pelican's in-house architecture automatically routes and repeats device messages on its private network. With hundreds of thousands of installations, Pelican has demonstrated extreme reliability and robust networking leveraging this backbone. However, recognizing the need for additional tools and acknowledging that some applications still pose challenges in bridging a network across large distances, Pelican has introduced its next generation of innovation.

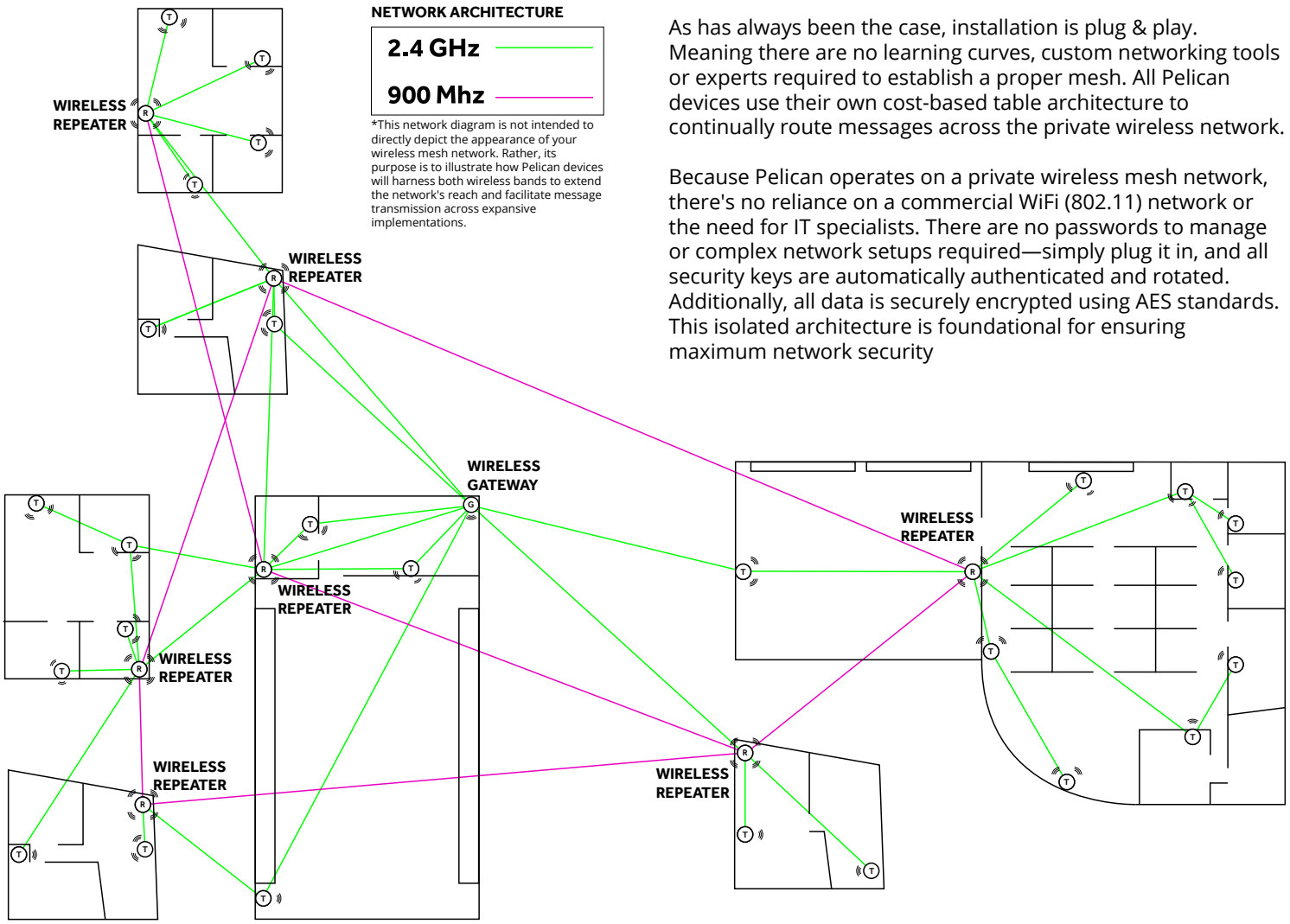
Introducing the third-generation Pelican repeater: the WR900. This long-range dual-band repeater utilizes both the 2.4 GHz and 900 MHz bands, simplifying long-distance bridging. While the 2.4 GHz band connects with the primary Pelican wireless network and other Pelican devices, the 900 MHz band communicates with other WR900 repeaters to enhance message transfer in installations with extensive distances or significant 2.4 GHz interference, such as multi-building campuses. This dual-band functionality optimizes network performance and reliability even in challenging environments.

The WR900 automatically routes network messages using an in-house algorithm, which intelligently leverages both wireless bands for efficient message delivery. With both antennas always active, the WR900 can simultaneously communicate on both the 2.4 GHz and 900 MHz bands.

Built upon Pelican's proven automated and self-healing 802.15.4 architecture, the WR900 dual band mesh offers the most advanced tools for reliable message transmission, expanding reach and reducing hop counts for messages to reach their destinations and, ultimately, the cloud.

As has always been the case, installation is plug & play. Meaning there are no learning curves, custom networking tools or experts required to establish a proper mesh. All Pelican devices use their own cost-based table architecture to continually route messages across the private wireless network.

Because Pelican operates on a private wireless mesh network, there's no reliance on a commercial WiFi (802.11) network or the need for IT specialists. There are no passwords to manage or complex network setups required—simply plug it in, and all security keys are automatically authenticated and rotated. Additionally, all data is securely encrypted using AES standards. This isolated architecture is foundational for ensuring maximum network security

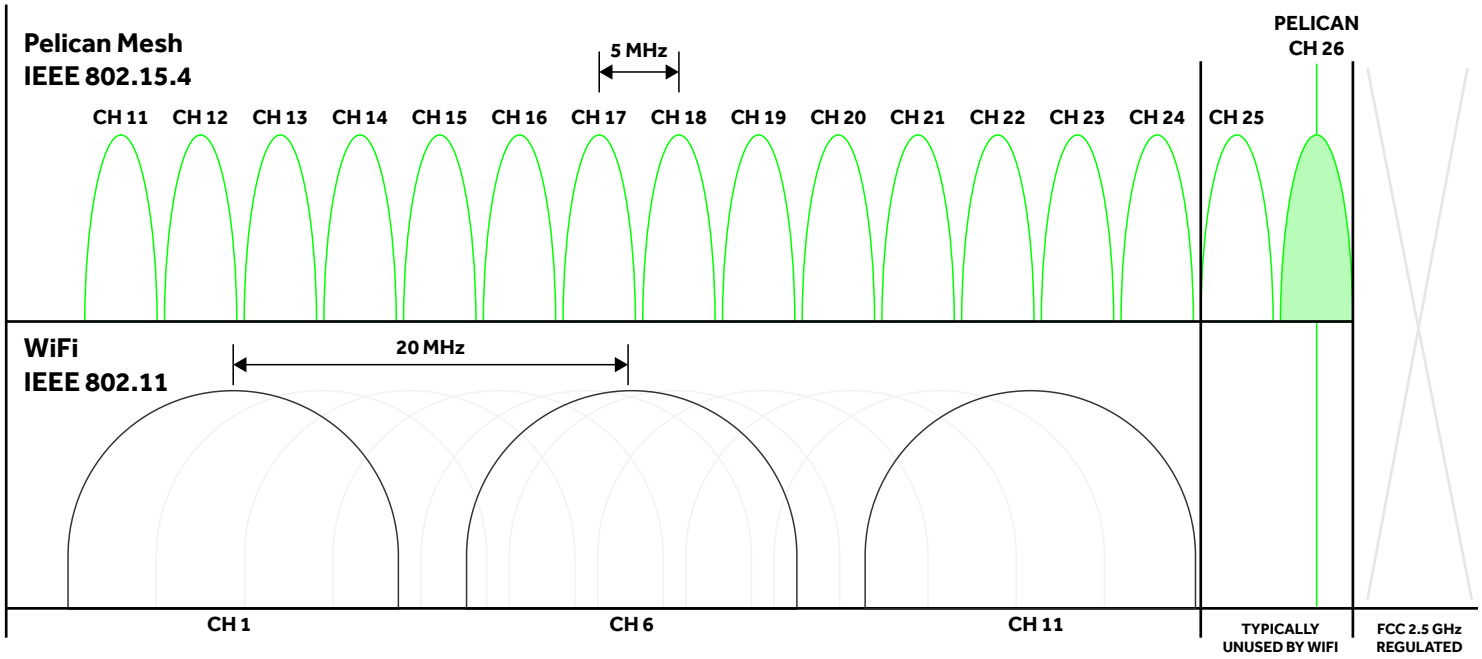


2.4 GHz Comparison — IEEE 802.15.4 & IEEE 802.11: Wireless Frequency Interoperability

The Pelican mesh network utilizes the IEEE 802.15.4 wireless standard for both its 2.4 GHz and 900 MHz communication bands.

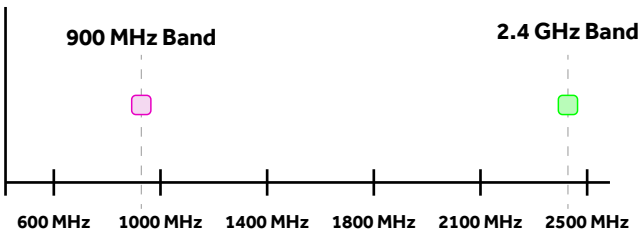
The Pelican/2.4 GHz/IEEE 802.15.4 standard is designed to coexist alongside the WiFi/2.4 GHz/IEEE 802.11 standard. Both standards employ a listen-before-transmit architecture to minimize signal interference. However, the IEEE 802.15.4 standard includes additional channels, some of which are not typically utilized by WiFi due to FCC regulations limiting the WiFi frequency range. As shown in the table below, the Pelican/802.15.4 frequency band is narrower (5 MHz) compared to the WiFi/802.11 band (20 MHz). This allows Pelican to utilize channels that are less crowded and typically unused, to remain further isolated from WiFi/802.11.

While the Pelican solution is capable of operating on any of the defined channels, it defaults to channel 26 (2.48 GHz), ensuring it remains unnoticed in standard WiFi installations. This separation helps to avoid interference and maximize network performance.

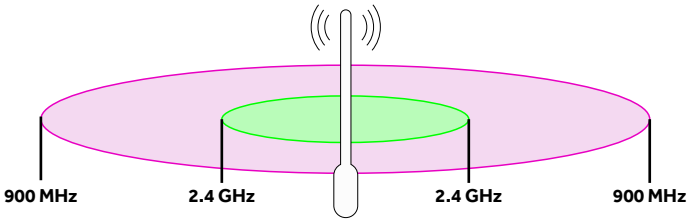


WR900 — 2.4 GHz & 900 MHz IEEE 802.15.4: Wireless Frequency Comparison

The Pelican/900 MHz/IEEE 802.15.4 standard is designed to provide greater range and better penetration through walls and other obstacles compared to the 2.4 GHz band. This makes it ideal for the WR900 since repeaters are typically used in applications requiring reliable communication over longer distances or in environments with numerous obstacles. Pelican leverages a listen-before-transmit architecture for its 900 MHz frequency to avoid interference with other 900 MHz wireless transmitting devices. The 900 MHz band operates entirely outside of the 2.4 GHz frequency band and features its own 10-channel architecture. While the Pelican WR900 can operate on any of these defined channels, it defaults to channel 5 (912.3 MHz).



The 900 MHz and 2.4 GHz Bands are Completely Isolated and Provide their own Wireless Benefits



Expectations for General Wireless Transmission Distances