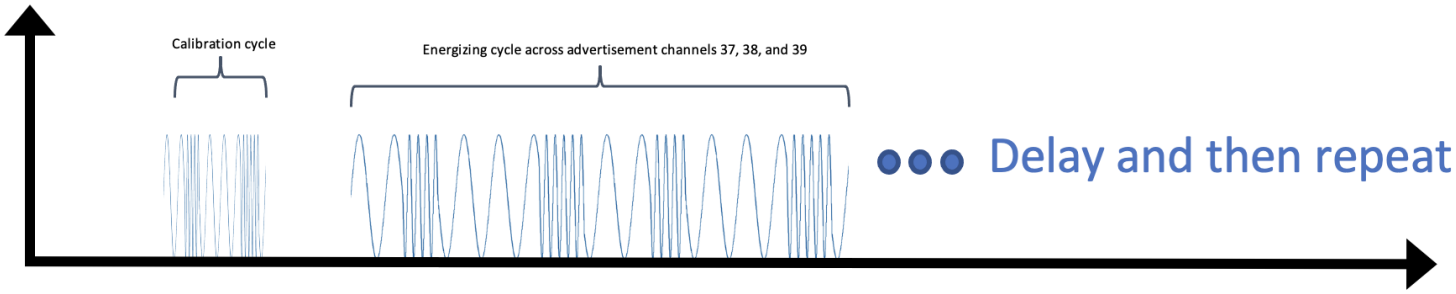
Bridge Operations

A bridge has 3 main operational tasks. It is responsible for energizing the Wiliot Pixels, receiving those packets to perform filtering of the duplicate packets, and then finally echoing the filtered packets. Below are more details about the three main tasks.

Energizing

During the energizing task phase of the bridge operation, different energizing patterns can be configured to assist the tag with the energy harvesting cycle as well as clock calibration. The energizing frequencies that can be used are the default BLE advertising channels 37 (2402 MHz), 38 (2426 MHz), and 39 (2480 MHz). The signals are modulated using the Gaussian Frequency Shift Key (GFSK) technique which helps with spectral bandwidth amongst other benefits.

Below is a sample sequence of the energizing cycle. A short pulse of calibration signals is first sent followed by a series of channel-specific pulses depending on the energizing pattern chosen.



Duty Cycle

As part of the energizing cycle, it is important to also note the duty cycle, that is the amount of time that the transmitter is actively on and transmitting versus not, ie for receiving the Pixel data packets or receiving repeated echo packets from nearby bridges. Each bridge can be managed and configured directly from the Wiliot cloud, via a nearby gateway (or the Wiliot mobile phone app), and the transmit period versus receive period can be adjusted to fit a given environment and Pixel responsiveness. For example, with a longer transmit period time on, there will be more RF energy provided to the Pixels in view and they will respond more frequently, but the tradeoff is more RF signals in your environment and the device may overheat. It is recommended to use the default settings when possible.

Echo

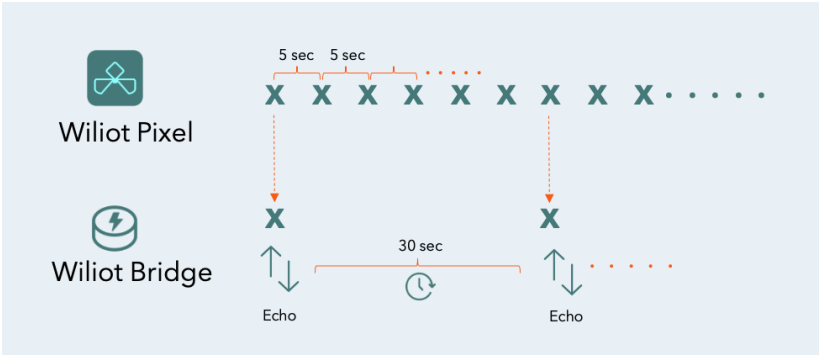
During the echo phase, the bridges queue the Wiliot Pixel data packets that were received during the pacing cycle. The echo packets are then sent during the energizing pulses so that a nearby gateway can collect that information to send to the cloud. By performing this action during this particular time period, the bridges can continue to energize the tags in the field of view while also repeating the tag's response at a much higher power level which conveniently increases the range between a bridge and the gateway.

When bridges echo the Wiliot Pixel's data, relayed data also includes additional telemetry data such as the bridge id, and additional data which is used by the Wiliot cloud to provide additional sensing capabilities.

Pacing interval

Pacing interval is a configuration to reduce the amount of over the air traffic which also reduces the amount of data going to the cloud. This in turn has implications on cost with the reduction of Pixel data packets constantly being uploaded to the cloud.
Bridges throttle the data received by the pixels and echo the data only after the pacer interval has passed. It is important to note that the pixel data transmitted during the pacer interval, will be counted by the bridge but will not be saved and will be lost. Pacing will also affect sensing, as filtered and discarded packets cannot be used in the cloud.

In the example below a Wiliot Pixel is transmitting a packet once every 5 seconds and the pacer interval is configured to 30 seconds, thus only a small amount of the packets is echoed to the cloud.



By default, the pacer interval setting is set to 300, which means that the bridge will send information from a pixel at a maximum rate of once every 300 seconds. In some use cases, where timing is important, lower pacer intervals can be configured to reduce the overall latency of the system, keep in mind that this will affect pricing.

Number of Tags per Bridge

Due to the pacing mechanism employed by bridges, each bridge can support a maximum of 1000 Wiliot IoT pixels in its vicinity. Contact support for use cases that require more than 1000 tags with a single bridge

Follow this guide to learn more about managing the configuration of the bridge.