



User Guide

Sensor Aware States

Important Note: For best results, please wait to power on your LTE Cellular Gateway until after you have registered an account on the sensor portal and added your gateway and sensors to the online system.



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Understanding Sensor Heartbeats

Event Sensors vs. Interval Sensors

To start, there are two types of sensor radio behaviors associated with ioX-Connect wireless sensors. First, there are “Event” type sensors that respond immediately to an event as it occurs (think of event type sensors as yes/no data). Second, there are “Reading” type sensors that work on a timed basis to wake up at set intervals, gather data, transmit the data, then go back to sleep until the next interval.

Examples of event type sensors;

- water detection
- door/window
- motion
- dry contact, etc.

Examples of reading type sensors;

- temperature
- humidity
- voltage
- pressure, etc.

Heartbeats

Note: Minimum heartbeats using the free ioX-Connect sensor software subscriptions are 120 minutes. In order to achieve a more frequent minimum heartbeat of 10 minutes using ioX-Connect, a paid ioX-Connect subscription is required. ioX-Connect paid subscriptions also includes Advanced Sensor Settings, such as Aware State Heartbeats and Assessments which are not available to free/ basic accounts.

ioX sensors are battery operated and have been accordingly designed to operate with efficient use of battery power. Since the radio hardware of the sensor consumes significant power, part of this design includes the strategic radio transmission of sensor readings. Rather than streaming data through the sensor’s radio which would rapidly deplete the sensor batteries, ioX sensors transmit readings to their gateway in intervals called Heartbeats. The default Heartbeat for sensors when they are assembled is 120 minutes, but this is configurable.

Every sensor has a heartbeat regardless of the type of radio behavior. Event type sensors use the heartbeat function to tell the system that they are still active (and will report the current sensor state as well as signal strength and battery status). Reading type sensors use the heartbeat as their set interval for gathering and sending information.

Understanding Sensor Aware State

Aware State

Note: In order to immediately transmit an Aware reading, the gateway must have the “On Aware Messages” setting (also known as Force Transmit on Aware) set to “Trigger Heartbeat” (set to On). This is what allows the gateway to transmit Aware readings immediately to the ioX-Connect sensor portal. This setting is enabled by default.

The Aware State of ioX sensors allows for a sensor reading to be transmitted to the ioX-Connect sensor portal immediately when a preconfigured condition is detected. Since ioX sensors are often monitoring for events that require immediate detection, an Aware State reading allows for this to occur.

Every sensor has an aware state function. The aware state allows the sensor to function at a higher level when certain conditions are met. For event type sensors, the detection of an event automatically triggers the aware state. For reading type sensors, the user sets the conditions that must be met for a sensor to enter its aware state (also used for “Assessments per Heartbeat”). Once in the aware state, the sensor will operate based on the “aware state” settings.

Setting the aware state heartbeat to a quicker interval allows the user to receive more frequent sensor information and/or notifications until the sensor reports a condition that is back in the normal operation range. Also, messages flagged as aware cause the gateway to communicate to the server immediately. Standard (unaware) messages are queued on the gateway until the next gateway heartbeat (default gateway settings).

Assessments per Heartbeat

Reading type sensors also support “Assessments per Heartbeat”, where the sensor will wake up, gather data and compare it against conditions set for the Aware State, and if conditions are met, send that information to the software immediately (otherwise the sensor goes back to sleep).

The more frequently your sensor takes assessments, the more responsively the sensor can detect an Aware condition, transmit an Aware reading, enter its Aware State, and start checking in with the Aware State Heartbeat frequency.

If an Assessment does not meet the triggering condition for an Aware Message, the Assessment is discarded. There is no manner by which Assessments can be converted to data points (except for the occasion in which the Assessment is triggering an Aware State Heartbeat).

Understanding Sensor Heartbeats & Aware States

Examples of How the Aware State Works

With the sensor configurations set as shown below:

- Heartbeat Interval: 120 Minutes
- Aware State Heartbeat: 30 Minutes
- Assessments per Heartbeat: 2 (every 60 minutes)
- Aware State threshold: 257°F
- Scale: Fahrenheit.

1:00 PM -> 38°F

Sensor wakes and assesses the current conditions. The temperature read is under the threshold, not Aware, sensor transmits current temperature of 38°F. Sensor begins the countdown to 60 minutes for the next assessment to be taken and 120 minutes for the next heartbeat. The sensor goes to sleep.

2:00 PM -> 60°F

Sensor wakes and assesses the current conditions. The temperature read is under the threshold, not Aware. The sensor does NOT transmit the data as this was only an assessment, not a heartbeat, it goes back to sleep. Sensor begins the countdown to 60 minutes for the next assessment to be taken and continues the 120 minutes for the next heartbeat. The sensor goes to sleep.

3:00 PM -> 200°F

Sensor wakes and assesses the current conditions. The temperature read is under the threshold, not Aware. Sensor transmits current temperature of 200°F as it is time for the next heartbeat. Sensor begins the countdown to 60 minutes for the next assessment to be taken. The sensor goes to sleep.

3:20 PM -> 258°F

As sensor is asleep, there will be no action until 60 minutes after the last heartbeat or until the next assessment 60 minutes after the last assessment.

4:00 PM -> 258°F

Sensor wakes and assesses the current conditions. The temperature read is over the threshold, and the sensor enters the Aware State. The sensor transmits the data to the gateway with an "urgent" tag which tells the gateway to send the data to the server immediately. The Heartbeat is now set to 30 minutes, and the assessments are twice within that heartbeat, or every 15 minutes. The sensor goes to sleep.

4:15 PM -> 262°F

Sensor wakes and assesses the current conditions. The temperature read is over the threshold, is in the Aware State. The sensor does NOT transmit the data as this was only an assessment, not a Heartbeat. Sensor begins the countdown to 15 minutes for the next assessment to be taken. The sensor goes to sleep.

4:30 PM -> 262°F

Sensor wakes and assesses the current conditions. The temperature read is over the threshold, and the sensor goes into the Aware State. The sensor transmits the data to the gateway with an "urgent" tag which tells the gateway to send the data to the server immediately. The sensor sets the Heartbeat countdown to 30 and the assessment countdown to 15 minutes.

4:45 PM -> 258°F

Sensor wakes and assesses the current conditions. The temperature read is over the threshold, is in the Aware State. The sensor does NOT transmit the data as this was only an assessment, not a Heartbeat. Sensor begins the countdown to 15 minutes for the next assessment to be taken. The sensor goes to sleep.

5:00 PM -> 258°F

Sensor wakes and assesses the current conditions. The temperature read is over the threshold, and the sensor remains the Aware State. The sensor transmits the data to the gateway with an "urgent" tag which tells the gateway to send the data to the server immediately. The sensor sets the Heartbeat countdown to 30 and the assessment countdown to 15 minutes. The sensor goes to sleep.

5:15 PM -> 256°F

Sensor wakes and assesses the current conditions. The temperature read is under the threshold. The sensor has left the Aware State. It does NOT transmit the data as this was only an assessment, not a Heartbeat. The sensor continues the countdown to the next heartbeat. The sensor goes to sleep.

5:30 PM

Sensor wakes and assesses the current conditions. The temperature read is under the threshold, and the sensor is not Aware. The sensor transmits the data to the gateway. The sensor sets the Heartbeat countdown to 120 and the assessment countdown to 60 minutes. The sensor goes to sleep.