Application Report
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Using the SimpleLink™ Sub-1 GHz 15.4-Stack: Choosing Between Synchronous / Asynchronous Mode

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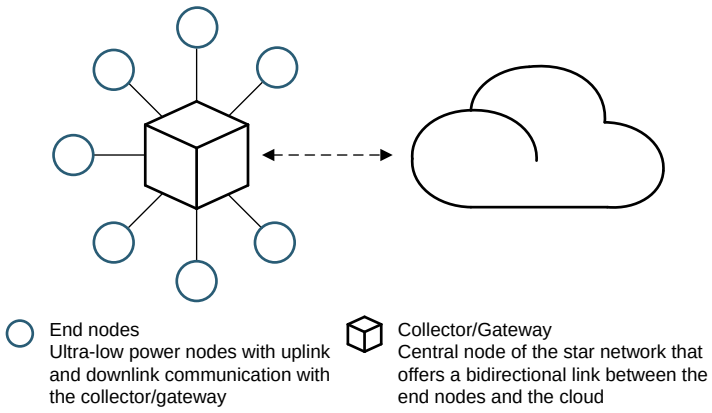
ABSTRACT

The SimpleLink™ Sub-1 GHz stack solution is built on the Texas Instruments SimpleLink MCU platform, offering a single development environment with code portability to multiple connectivity protocols. It is a complete solution for connecting long-range, low power sensors in the home, building, and city. The SimpleLink Sub-1 GHz stack offers a standards-based, star-network that makes Sub-1 GHz connectivity easy by providing all of the necessary components for a robust system. Benefits of the network solution include:

- Sub-1 GHz ISM bands provide RF advantages such as long range, wall penetration, and low power
- Future proof deployments with scalable network features
- Standards based network solution with robust performance
- Lower development cost by providing an end-to-end solution

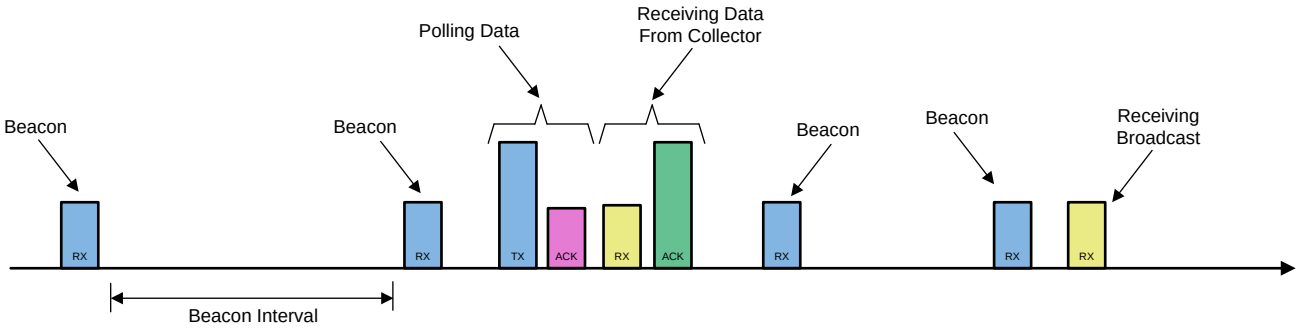


Visit ti.com/longrange to learn more about the key network features.

The SimpleLink Sub-1 GHz stack supports both synchronous and asynchronous mode for low power star networks that incorporate two-way communication with acknowledgements.

1 Operating in Synchronous Mode

Synchronous mode enables systems to have robust two-way communication with acknowledgements and retransmissions while maintaining low latency and low-power consumption. End nodes in the network can sleep for the majority of the time, waking up to listen for beacons from the coordinator, while maintaining low latency responses to incoming downstream commands.



Beacons

The coordinator sends periodic beacons to the nodes, which contain network information and per node notifications on pending incoming messages buffered at the coordinator. The time between beacons is the dominant factor in the latency calculation, and is configurable by the system designer, allowing the flexibility to trade latency vs power consumption.

Polling

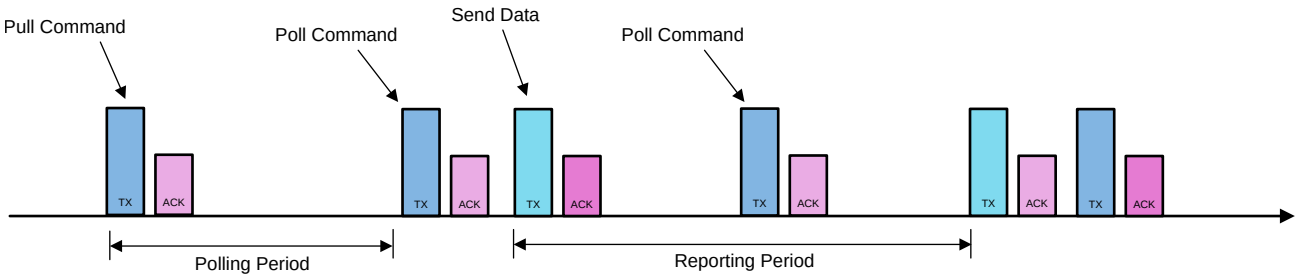
Once a node receives an incoming message notification, the node polls the coordinator asking to receive the message. Upon the coordinator receiving the poll, the buffered message is sent downlink to the node.

Asynchronous Messages

Uplink messages from the nodes to the coordinator, such as sensor data or status messages, can be sent at any time to an “always on” coordinator or during the coordinator active period. This time interval is configurable for power-sensitive coordinator applications.

2 Operating in Asynchronous Mode

Asynchronous mode is used when the downlink latency is not a critical parameter of the system and the amount of expected downlink communication is significantly lower than the uplink. The coordinator is always on and listens to transmissions coming from the nodes, allowing the nodes in the network to sleep for long time intervals and consume very low power.



Uplink Messages

When the node is ready to transmit a message (sensor data update or other status messages), it sends the data immediately and after receiving the data the coordinator responds with an acknowledgement.

Downlink Messages

Downlink messages from the coordinator to the sensor are buffered at the coordinator until the end node sends a "poll" packet to get incoming messages. The frequency in which the node is sending poll commands is a critical factor in the latency and power consumption tradeoff.

3 Choosing Between Synchronous and Asynchronous Mode

	Synchronous Mode	Asynchronous Mode
Device Type	Optimized for actuator devices when downlink commands to the end node are latency critical.	Optimized for sensors that report to the cloud periodically.
Downlink Messages	Downlink messages are indicated by the beacon.	Downlink messages are buffered at the gateway and are delivered to the sensor node upon request.
Battery Life	Over 3 years on 2 AAA batteries with a beacon interval of 1.2 seconds.	Over 10 years on coin cell batteries when polling for data every 10minutes and sending sensor updates every 20minutes.
Typical Applications	Smart electronic door lock, smart fan, shades.	Motion detectors, door and window sensors, temperature sensors.

4 Get Started With the SimpleLink™ Sub-1 GHz Network Solution:

1. Buy the LaunchPad™ Development Kit
2. Download the Software Development Kit (SDK)
3. Get started with the SimpleLink™ Academy

5 Trademarks

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