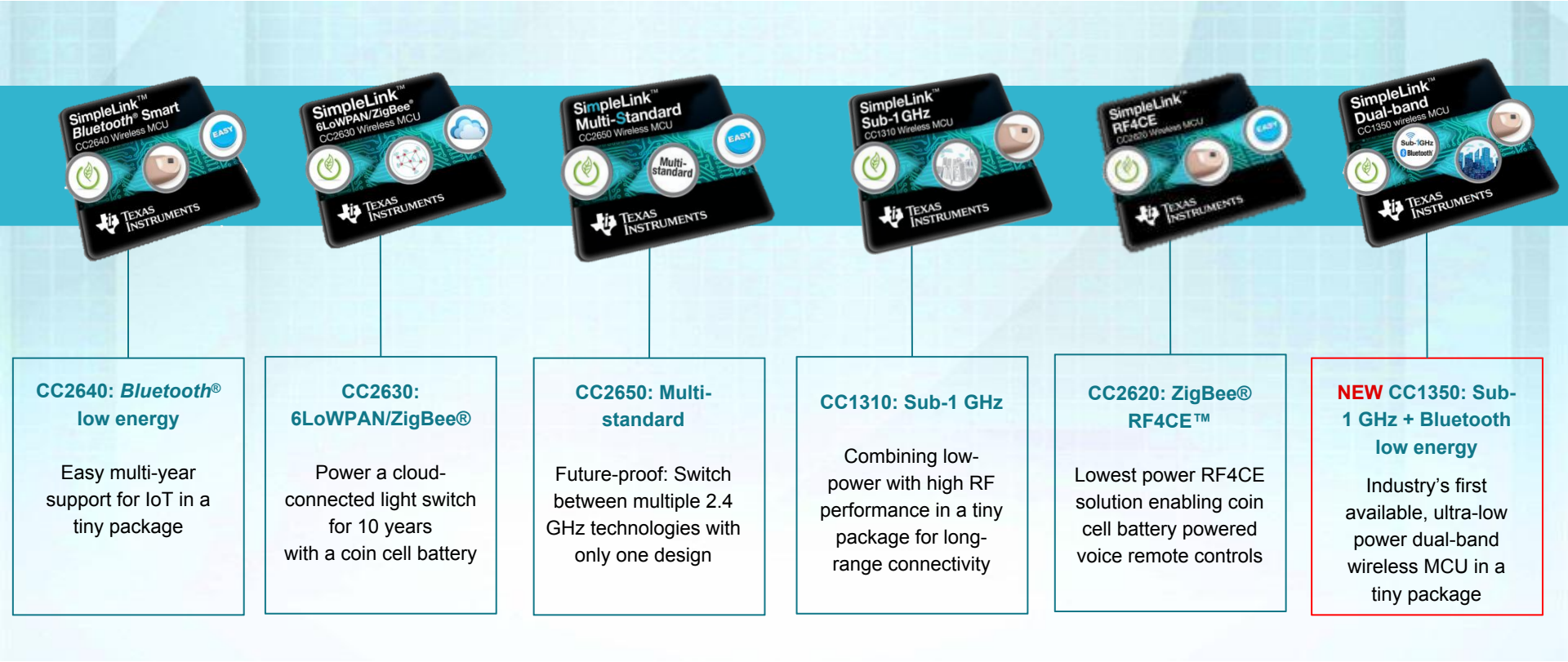
TI SimpleLink™ dual-band CC1350 wireless MCU

Sub-1 GHz and Bluetooth low energy in a single-chip

Presenter

Low-Power Connectivity Solutions

SimpleLink™ ultra-low power platform



CC2640: *Bluetooth*® low energy

Easy multi-year support for IoT in a tiny package

CC2630: 6LoWPAN/ZigBee®

Power a cloud-connected light switch for 10 years with a coin cell battery

CC2650: Multi-standard

Future-proof: Switch between multiple 2.4 GHz technologies with only one design

CC1310: Sub-1 GHz

Combining low-power with high RF performance in a tiny package for long-range connectivity

CC2620: ZigBee® RF4CE™

Lowest power RF4CE solution enabling coin cell battery powered voice remote controls

NEW CC1350: Sub-1 GHz + Bluetooth low energy

Industry's first available, ultra-low power dual-band wireless MCU in a tiny package

Monitor IoT networks from your handheld device

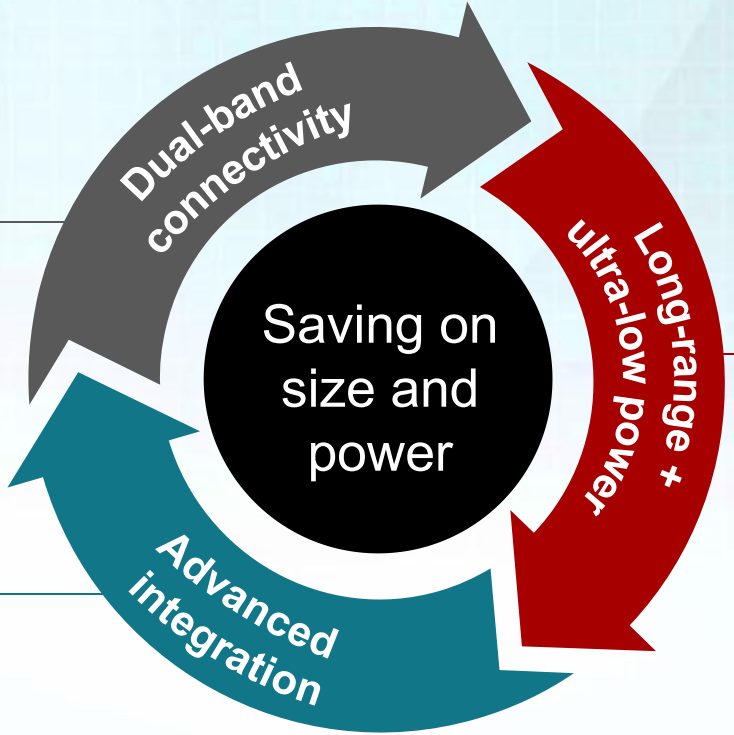
Dual-band CC1350 wireless MCU

Access to long-range data at your fingertips

Expand the functionality of your Sub-1 GHz network with Bluetooth low energy implementations to enable over the air updates, smart commissioning, beaconing, remote display and proximity detection with your smartphone

Reduce board space for smaller, more compact products

Move from a three chip solution to a tiny single chip with a full software stack, without compromising on long range or functionality



Connect things at a long distance without changing a battery

Achieve up to 20 km for over 10 years on a coin cell battery thanks to a dedicated sensor controller combined with a reliable radio transceiver.

CC1350 wireless MCU: Key features and benefits

Lowest-power Sub-1 GHz

- 5.5 mA Radio RX current
- 12.9 mA Radio TX @ +10 dBm
- 22.6 mA Radio TX @ +14 dBm
- 51 µA / MHz ARM® Cortex®-M3 @ 48 MHz
- 0.6 µA sleep current w/RTC + retention

Up to 20 year battery life for sensor nodes

Low-power BLE

- 6.5 mA Radio RX consumption
- 10.2 mA Radio TX @ +0 dBm

Enabling ULP smartphone connection

Long-range Sub-1 GHz

- -110dBm sensitivity @ 50 kbps
- -124dBm sensitivity @ 0.625 kbps
- +14 dBm output power
- Strong co-existence
  - Up to 90 dB blocking

Full building to city-wide RF coverage

Long-range BLE

- +9 dBm Output Power
- -87 dBm Sensitivity

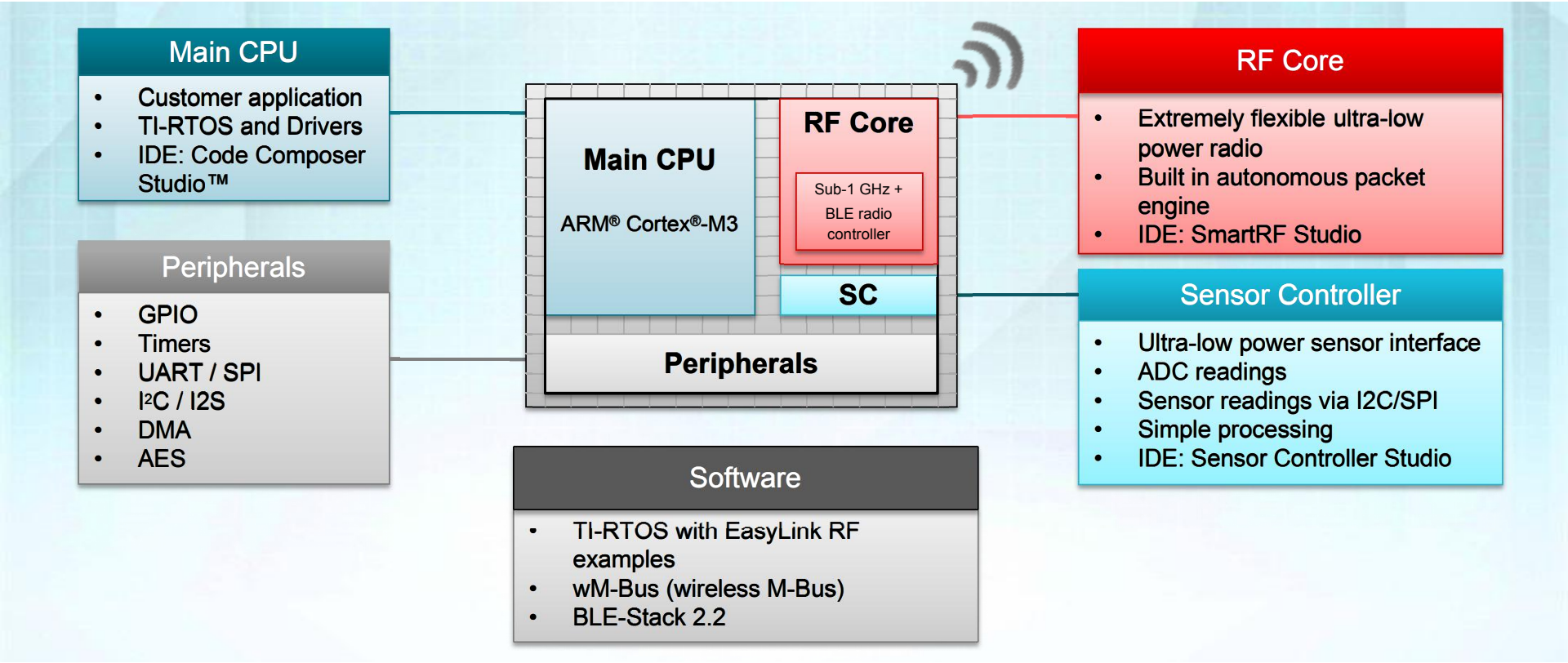
Up to 100m smartphone Connection

Most integrated

- Sub-1GHz + BLE RF Transceiver
- ARM Cortex-M3 application processor
- 128k Embedded flash
- 116k ROM
- 20k SRAM
- Sensor Controller Engine (SCE)
- 4x4 QFN
- On-chip DCDC
- TI-RTOS + RF Driver in ROM

Dual-band wireless MCU
on a finger-tip size

SimpleLink™ ultra-low power wireless MCU



Get started fast! Development kit offering

CC1350 LaunchPad™ development kit

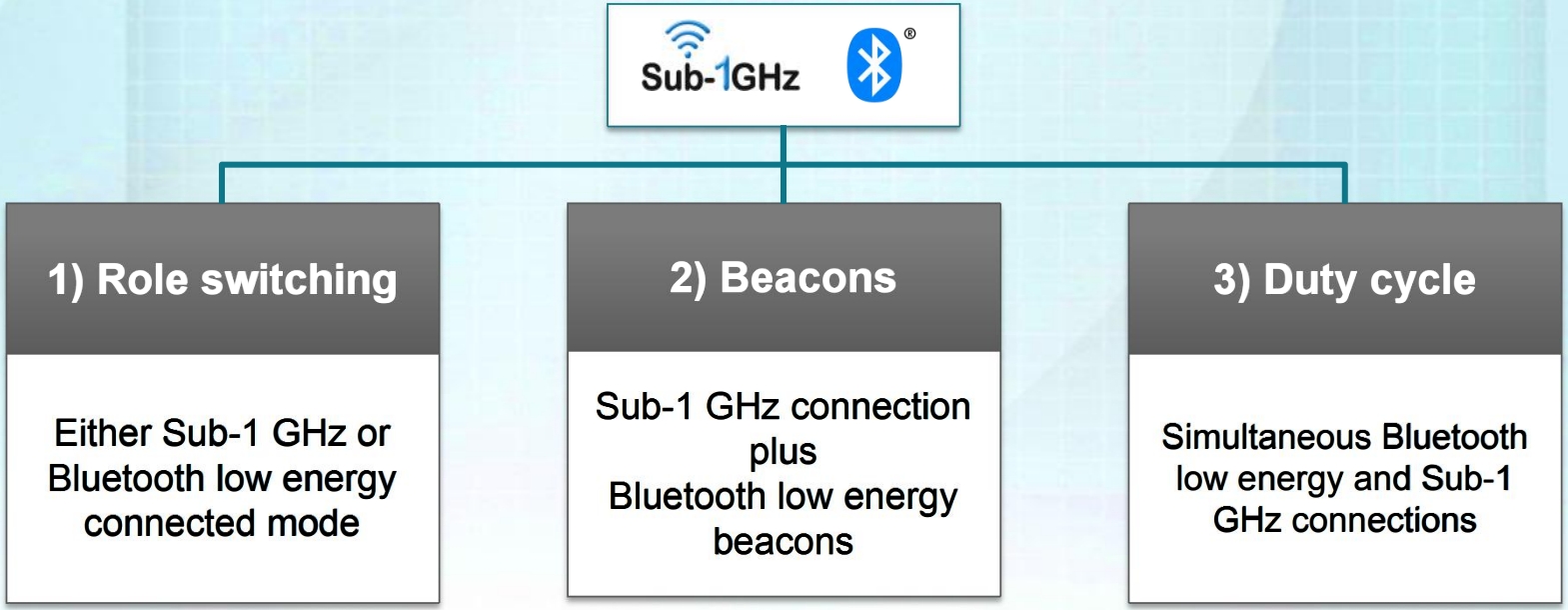
- Low-cost MCU evaluation kits and plug-in modules for quick development
- $29 through TI Store and distribution
- LAUNCHXL-CC1310 – 868/915MHz
- LAUNCHXL-CC1350 – 868/915MHz + BLE
- LAUNCHXL-CC1350 – 433MHz + BLE

CC1350 SensorTag demo kit – coming 4Q ‘16

- Sensor-based development kit for IoT and Long Range applications
- Get connected to the cloud in 3 minutes
- Free app for iOS and Android
- $29 through TI Store and distribution
- CC1350STK - 868/915MHz+2.4GHz (4Q2016)

Dual-band roles, use cases and applications

CC1350 wireless MCU: Dual-band in practice



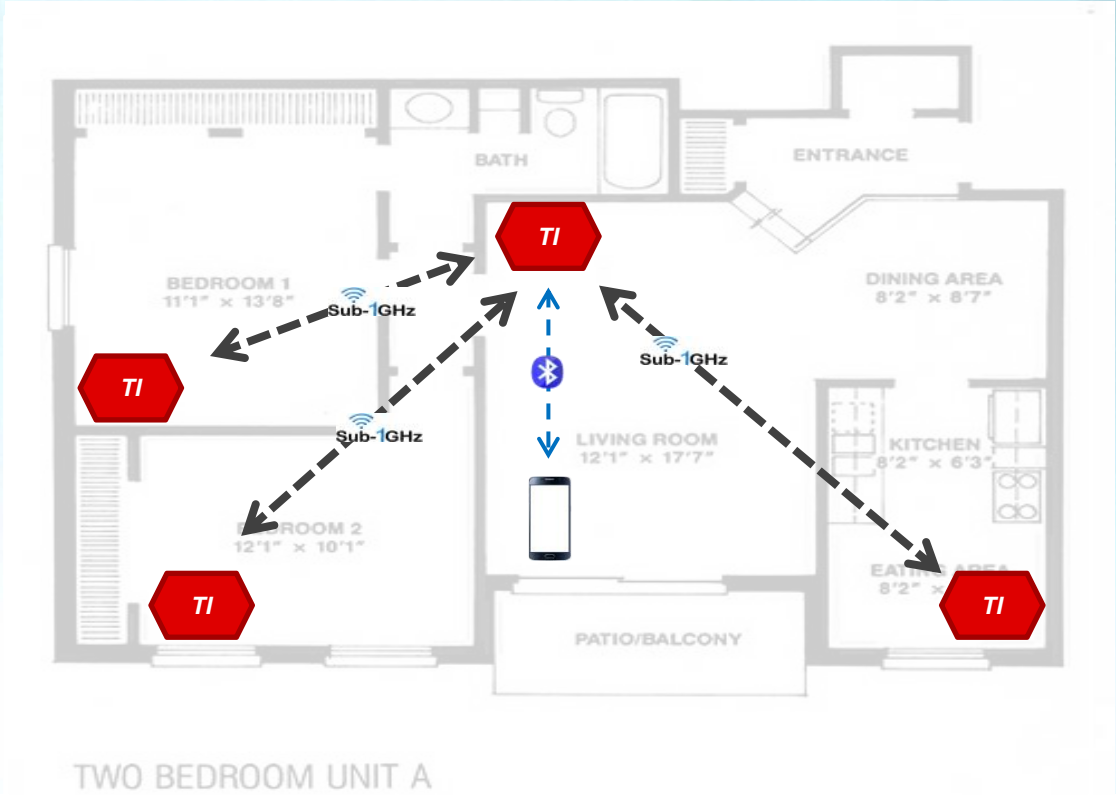
Supported in latest BLE -Stack on ti.com

Supported:
- *TI-RTOS SDK*
- *Open Source Contiki OS*

Coming soon!

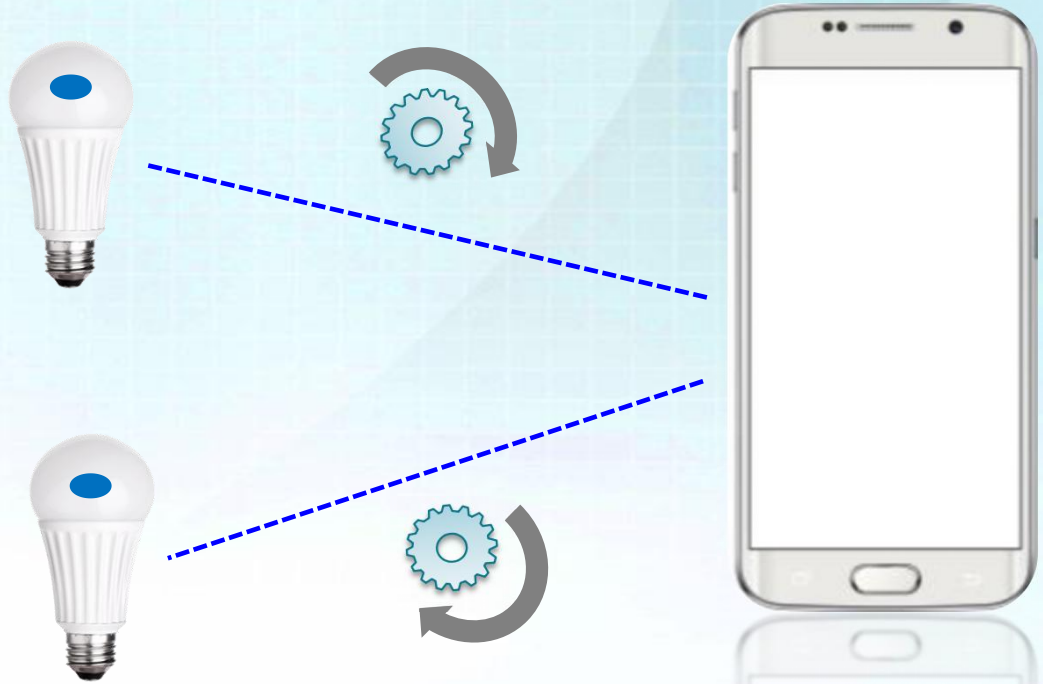
1) Role Switching: Sub-1 GHz + Bluetooth low energy

- **Either in Sub-1 GHz or Bluetooth low energy connected mode**
- **Full house Sub-1 GHz coverage**
- **Use e.g. button to switch mode**
  - E.g. single button interface to make it Bluetooth low energy connectable
  - Full Bluetooth low energy connection
    - Full-duplex communication
  - Full app integration
    - Device configuration or even image can be changed via phone, tablet or PC



Role switching use case: OTA firmware update

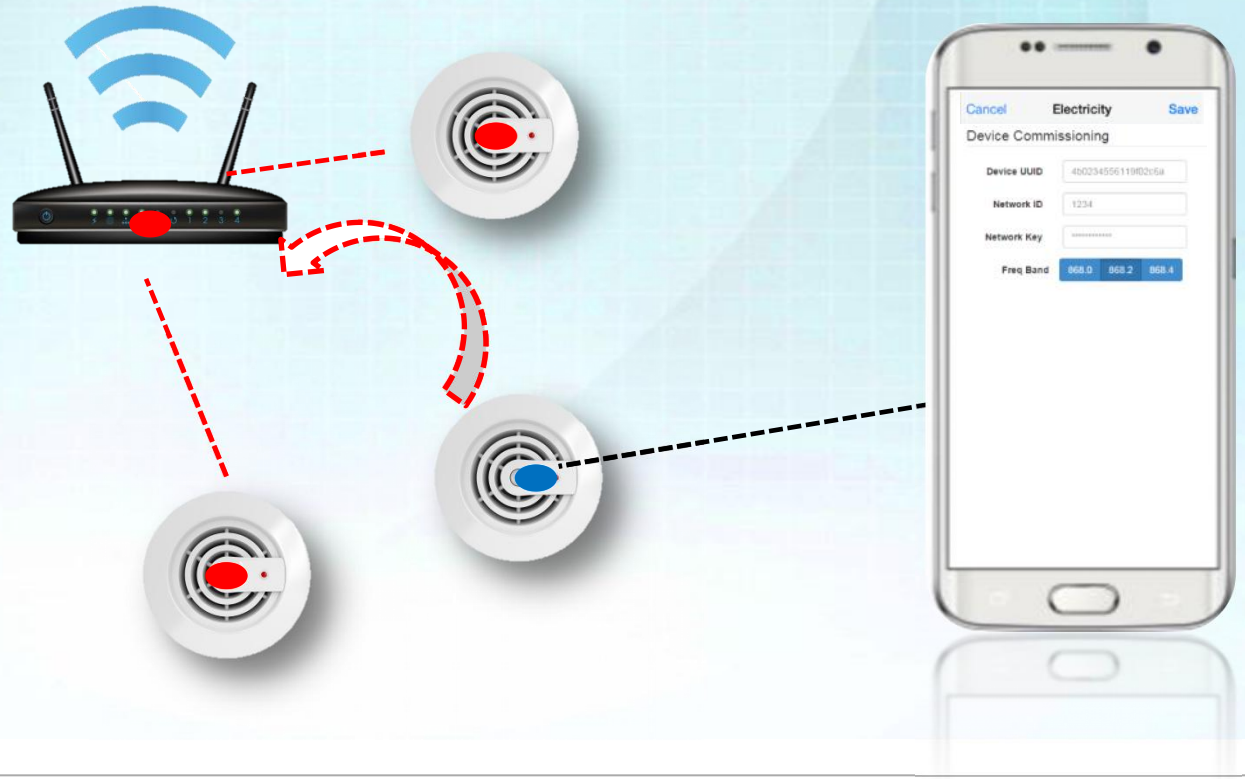
- Upgrade the firmware for the Sub-1 GHz node using a Bluetooth low energy smart device
- Bluetooth low energy connection for faster firmware upgrade, then the device operates back in Sub-1 GHz



CC1350 enabled
Sub-1 GHz + BLE device

Role switching use case: Commissioning

- Commissioning devices to a Sub-1 GHz network, i.e. give credentials via BLE connection
- First runs in full Bluetooth low energy connected mode, then the device takes part of Sub-1GHz network



CC1352 enabled
Sub-1 GHz + BLE device

Sub-1 GHz network

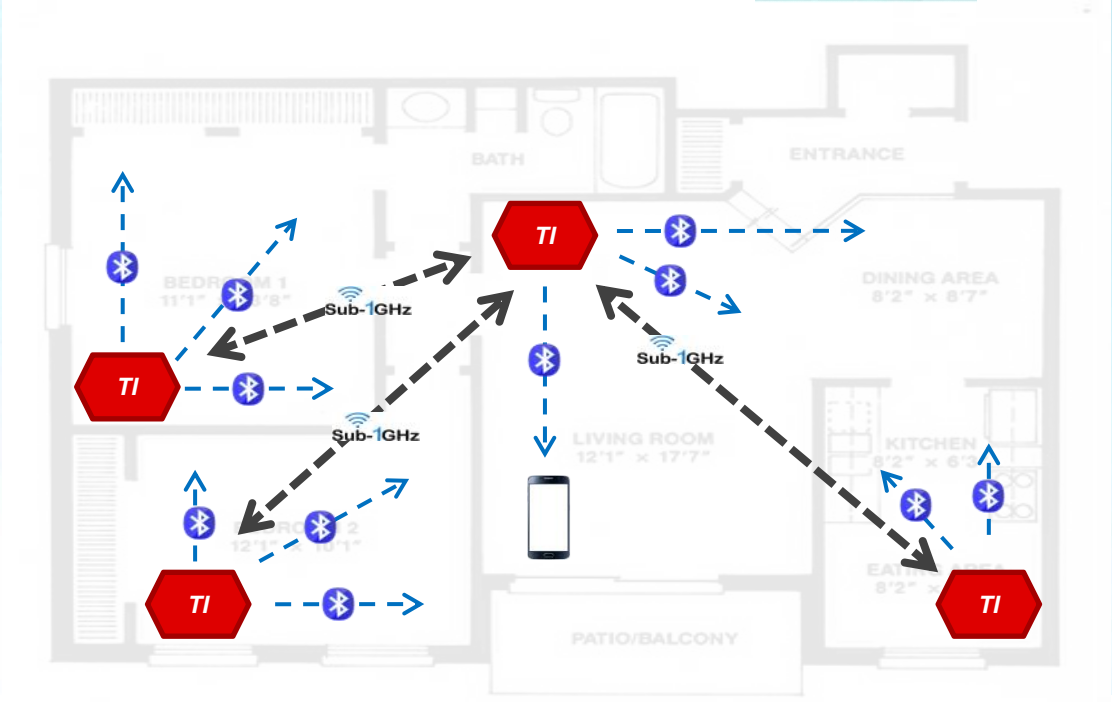
2) Beacons: Sub-1 GHz + Bluetooth low energy

- Device switches between sub-1GHz operation and BLE beacon operation
- Full house Sub-1GHz coverage
- Local Bluetooth low energy beacon content

Google Eddystone

iBeacon

Proprietary



Pros

Non-intrusive to Sub-1 GHz network
- Does not affect Sub-1 GHz link
- Send beacons when radio is available

Very light-weight
- No need for the entire Bluetooth Smart stack

Cons

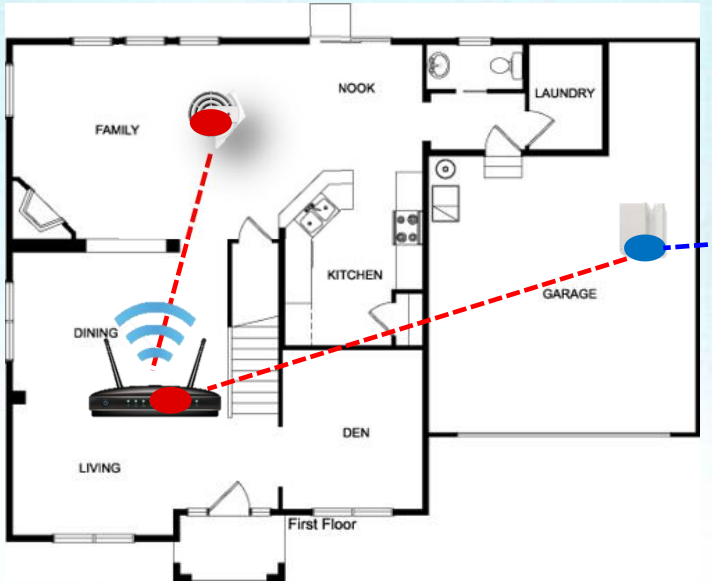
One way broadcast communication
- Beacon can only TX

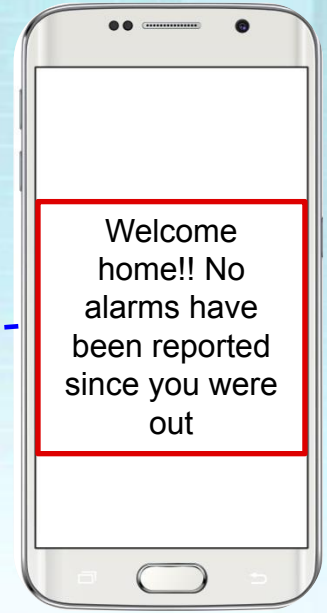
Limited amount of data payload
- 31 bytes of payload

Multiple payload standards

Beacon use case: Proximity

- Devices send Bluetooth low energy advertisements with unique ID, while concurrently operating in the Sub-1 GHz network





CC1350 enabled
Sub-1 GHz + BLE device

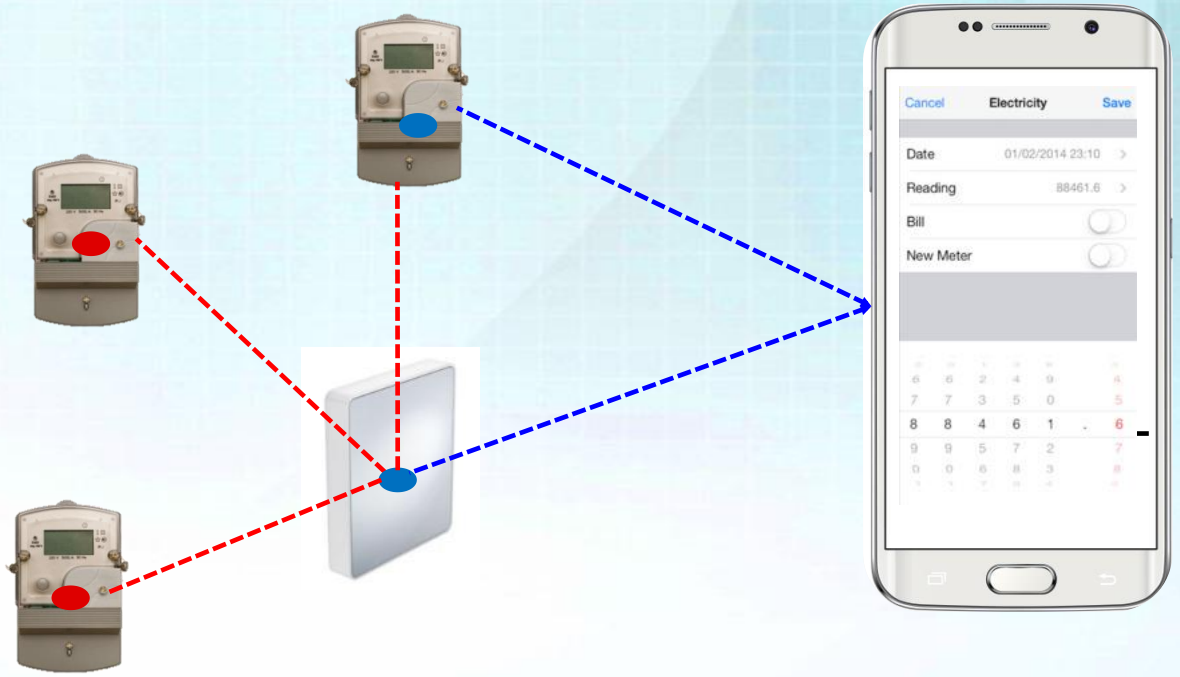
CC1310 enabled
Sub-1 GHz device

Beacon use case: Remote display

- Extracting information from the Sub-1 GHz network directly from the node
- Run time data sending while in Sub-1 GHz, using the Bluetooth low energy advertisement as uplink channel

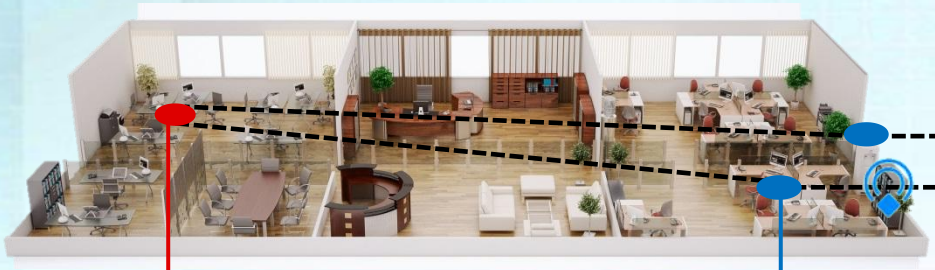
CC1350 enabled
Sub-1 GHz + BLE device

CC1310 enabled
Sub-1 GHz device



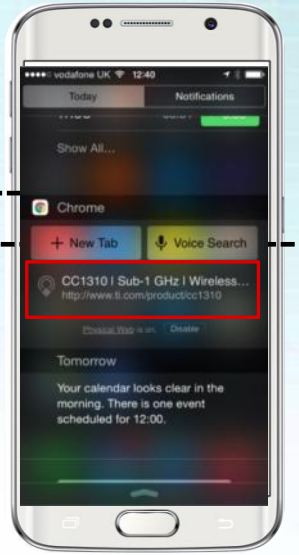
Beacon use case: Remote beacon management

- Configuring Bluetooth low energy advertisements (e.g Google physical web) via a long range Sub-1GHz server
- Low power dynamic physical web update



CC1350 enabled device connecting Sub-1 GHz and Advertising URL

CC1310 enabled Sub-1 GHz device



Easy-to-use: Software, support and more

Software

Common software

Across all SimpleLink ULP products:

- TI-RTOS operating system
- Code Composer Studio integrated development environment
- IAR Embedded Workbench

Available software:

Fits developer's network needs:

- EasyLink: Point-to-point communication examples
- wM-Bus protocol stack
- BLE-Stack 2.2 supporting Bluetooth 4.2 specification
- www.ti.com/tool/cc13xx-sw

Support

Comprehensive

Development documentation, guides and wikis available online

E2E online support

TI E2E™ community – answers at your fingertips from engineers

Training

Online videos and other resources to learn more about the parts and tools

And more…

TIDesigns

TI reference designs online

TI IoT cloud ecosystem

TI store 24/7

Samples & kits on TI Store

Questions?

- CC1350 Product Folder: www.ti.com/product/CC1350
- CC1350 LaunchPad: http://www.ti.com/tool/launchxl-cc1350
- CC1350 Software: http://www.ti.com/tool/cc13xx-sw
- TI-RTOS: http://www.ti.com/tool/ti-rtos
- TI SimpleLink Academy: ti.com/simplelinkacademy