

tINFINET – SW and Apps

This document lists intended software and smartphone Apps for simple “*IoT Long Range Swarm Networking*” demonstrations and solutions. The Apps are used as demonstration and applications for tINFINODE Long Range IoT wireless links.

The document does not cover any meshed network or “*Swarm Networking*” based requirements and solutions. The main focus is the use of Long Range wireless links.

tINFIUART

Target platforms: smartphones with Android and iOS, Android version ≥ 4.3 , including version 5 (Lollipop)

Use case: used during field tests, as demonstrator and evaluation tool

Brief description:

A smartphone is connected via UART communication to the tINFINODE. The serial communication should be based on:

- USB OTG (wired connection) with UART ASCII protocol
- BLE UART (wireless connection, via HM-10/HM-11 module) with UART ASCII protocol
- App should support both, the selection which one to use can be done manually by user

Features version 1:

- Configure tINFINODE: simple GUI with buttons, checkboxes and indicators, used to change or set parameters on tINFINODE transceiver. Example: set LNA, set SF, CR, display the SNR and RSSI
- Get received message from Long Range receiver and display it, set a message to send via Long Range transmitter, a simple “Long Range Chat Client”, peer-to-peer
- Aggregate GPS location information and store in a log file, together with SNR, RSSI and some other values, used via post-processing to generate a Google Map (to display results, coverage and distances during a field test)

Features version 2:

- Send the aggregated data, such as GPS location, SNR, RSSI, also messages received via WiFi/3G/4G link directly to a web server (cloud)
- Store data in a database, e.g. MySQL
- Based on database, users can visit a website where the information gathered is rendered and displayed, e.g. to see where is a node, what was the message received there, what are the RF parameters there
- Extend by having device IDs, e.g. a tINFINODE MAC address, to differentiate between different devices, to address a particular device

- Send messages from web site to a particular node so that user can use Long Range links in order to forward such a message to another device

Different users of tINFINODE can discover via web site which nodes are out there. They can send a message to a particular node. Or, they can use a tINFINODE as a hop to let travel a message via Long Range links to a more far away device. A user can receive or send short messages from/to web site to a smartphone without to have Internet connection on remote site. The message will be forwarded via Long Range links between meshed nodes.

A community can be set up for tINFINODE users. They could be grouped, e.g. “my friends” and authorized access to particular nodes or to use them as a “communication hop” can be configured.

tINFIBLUE

Target platforms: smartphones with Android and iOS

Use case: the BLE stack in smartphone is used for BLE based sensor tags/motes, connect from smartphone to BLE on tINFINODE, extend this BLE via Long Range link and “bridge” to a remote BLE sensor seamlessly, so that it can be used as any BLE sensor device on a smartphone (or BLE client, e.g. Raspberry Pi).

Brief description:

A BLE sensor device connected on a remote tINFINODE via BLE will be extended via Long Range link. The capabilities of the remote BLE sensor (GATT) are “bridged” over Long Range. It will be “mirrored” on the other, local peer where a user can connect via smartphone to it. Via this local BLE link the smartphone will see the remote BLE device in the same way as it would be located close to smartphone, used as a native, local BLE sensor device.

The BLE link will be transparently “bridged” and extended via Long Range. The local tINFINODE will behave like a native BLE sensor. But the actual sensor is located on the remote tINFINODE. The BLE is extended over larger distance.

Features version 1:

- *tINFINODE FW:* discover the BLE sensor connected on the remote node, discover the device capabilities on remote BLE sensor device
- Bridge the BLE (GATT and all descriptors, UUIDs etc.) via Long Range link to the local tINFINODE
- Configure the local BLE module to act as such a BLE device, as GATT server. But instead to talk a local sensor – talk via Long Range to remote BLE sensor
- *Smartphone App:* use this BLE-to-Long-Range as any BLE device, discover device, services, bond to it, get notifications for the sensor data
- Version 1 is still a peer-to-peer link and communication

tINFINODE has an onboard sensor (accelerometer). Use this sensor on remote node in order to protect something. For instance: tINFINODE mounted inside a car, on a motorcycle or children carrying such a

node – the remote sensor data is transmitted via Long Range to a local node with connection to smartphone or Internet.

Sensor data is used to realize if a protected object is moving or not moving anymore anymore. An alert will be sent to the user's smartphone (or displayed on a web site).

The onboard sensor is used as such a native BLE one, just extended via Long Range link.

Remark: there is not a need for any smartphone on remote site, costly 3G/4G service, no Internet connection on remote site (just on local node). There is not any GPS location information yet on tINFINODE (might come as extension for tINFINODE). But via RSSI the approximate distance between local and remote node can be calculated. A dramatic change on RSSI level might indicate if children will step into buildings, shopping malls etc.

The Long Range wireless link should work also in larger buildings and home, including shopping malls.

Main use case is to protect belongings and people such as cars, motorcycles, children over a longer distance where BLE or WiFi does not work anymore. There is not a need to have 3G/4G connectivity or to carry smartphones. The aim is to use a much smaller device (half the size of a smartphone), running from battery or solar panel for at least 2 week without recharging it.

The distance via Long Range link should be at least 1 mile in cities and apartment communities, 5 miles in rural areas and 200 feet deep inside buildings.

Features version 2:

- From one local tINFINODE, several remote tINFINODEs can be addressed and selected
- Similar to a star topology, the local tINFINODE can establish a connection to any other remote node as peer-to-peer, on demand
- Also a connection to more than one tINFINODE should be possible, simultaneously
- User can see more than one BLE sensor device, select a sensor device, or even more than one at the same time, user can discover available remote BLE sensor devices and capabilities in the Long Range network
- Version 2 is extended by N remote nodes and remote BLE sensors, App should support to discover the available sensors, to select one or even to use several at the same time (if BLE supports such feature on smartphone to use more than one BLE at a time)
Remark: a dedicated smartphone App is needed to support several BLE sensors in one App
- *tINFINODE FW*: the local node has to provide more than one BLE "bridge" or GATT servers simultaneously

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