Bluetooth® Mesh and Zephyr

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**Specification**
We expand the capabilities of Bluetooth technology

**Qualification**
We drive Bluetooth interoperability

**Promotion**
We grow the Bluetooth Brand
audio streaming
- wireless headsets
- wireless speakers
- in-car infotainment

data transfer
- sports & fitness devices
- health & wellness devices
- peripherals & accessories

location services
- point of interest
- navigation & wayfinding
- item & asset tracking

device networks
- control systems
- monitoring systems
- automation systems

topology
- point-to-point
- point-to-point
- broadcast
- mesh

radio
- Bluetooth BR/EDR
- Bluetooth Low Energy
Introducing Bluetooth Mesh
multi-hop and multi-path
Bluetooth mesh: industrial grade solution

Peer-to-peer communications

• Nodes communicate directly

• No hubs or routers

• No single points of failure
Bluetooth mesh: industrial grade solution

Multipath using “managed flood”
- Source node broadcasts message
- Nodes relay message to destination
- Node failures do not impact delivery
Industrial grade security

Bluetooth Industrial grade security

• Nodes provisioned using 256-bit elliptic curves and OOB authentication
• Messages secured using AES-CCM using 128-bit keys
• Encryption and authentication at network and application layers
• Message privacy
• Device blacklisting
• Open to public review

What does that mean?

Protection against…

• Brute force attacks
• Replay attacks
• Man-in-the-middle attacks
• Trash-can attacks
• Physically insecure device attacks
• Visitor attacks
Publish/Subscribe

Bedroom  Living Room  Dining Room  Garage

Publish

Subscribe
Low power nodes (LPNs) are highly power constrained; LPNs reduce the duty cycle to saving power; LPNs need Friend node to store messages addressed to LPNs; LPNs use polling mechanism to get stored message(s).
Friendship

To: Sensor
“set temperature thresholds”
To: Sensor
“set temperature thresholds”
"do you have any messages for me?"

To: Sensor
"set temperature thresholds"

Low Power Node (sensor)

• LPN are highly power constrained;
• LPN reduce the duty cycle to saving power;
• LPN needs Friend node to store messages addressed to LPNs
• LPN uses polling mechanism to get stored message(s);

Friendship
"do you have any messages for me?"

To: Sensor
"set temperature thresholds"
Friendship

Friend: "do you have any messages for me?"

To: Sensor
"set temperature thresholds"

Low Power Node (sensor)

Developer basic concept about friendship:
- Friend node need RAM to allocate for message storage;
- Support more LPN, more RAM usage;
- RAM consumption = LPNCount * bufferCount * bufferLength
- Know what interrupt sources can wake up LPN when it’s sleepy;
- Know how many low power modes support, select a reasonable mode to use;
- Know how long it will take from sleepy to standby;
• nodes communicate with each other by sending messages
• nodes have state values which reflect their condition (e.g. ON or OFF)
• access messages operate on state values
  o SET - change of state
  o GET - retrieve state value
  o STATUS - notify current state
Lighting

Air Conditioner

Station Occupancy

Ambient light sensor

Lighting
Beacon Lighting

Lighting

Indoor Navigation

Lighting

Beacon
Bluetooth Mesh on Zephyr
Study Guides and Resource

Thank you!