



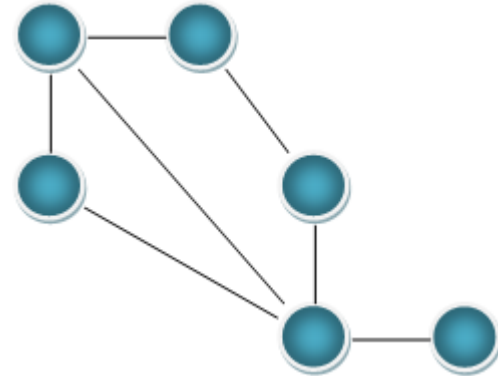
BLUETOOTH[®] MESH

Johan Hedberg

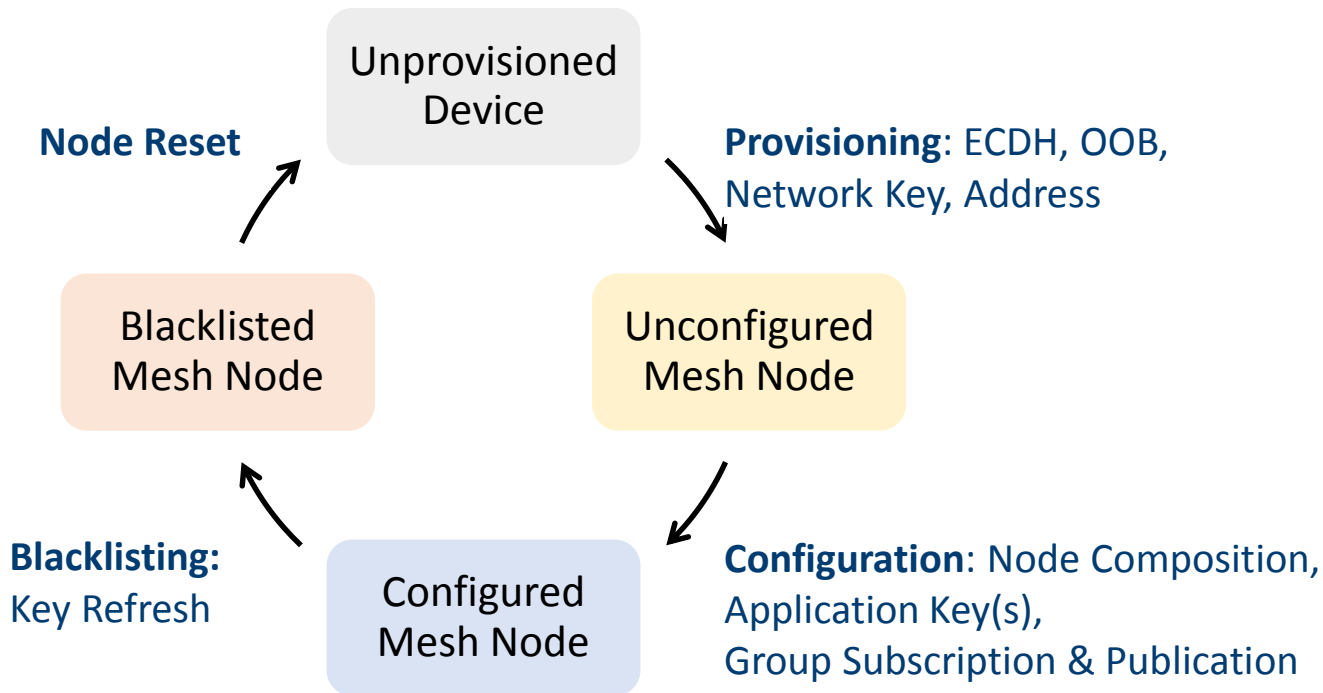


What is Bluetooth Mesh?

- New standard which came out in 2017
- Many-to-many, multi-hop topology
- No new Bluetooth HW required
- Broadcast & relay in a flooding/ripple fashion
- Mainly for signaling – not large data transfer
- Message publication & subscription
- Multi-level security



Node Lifecycle



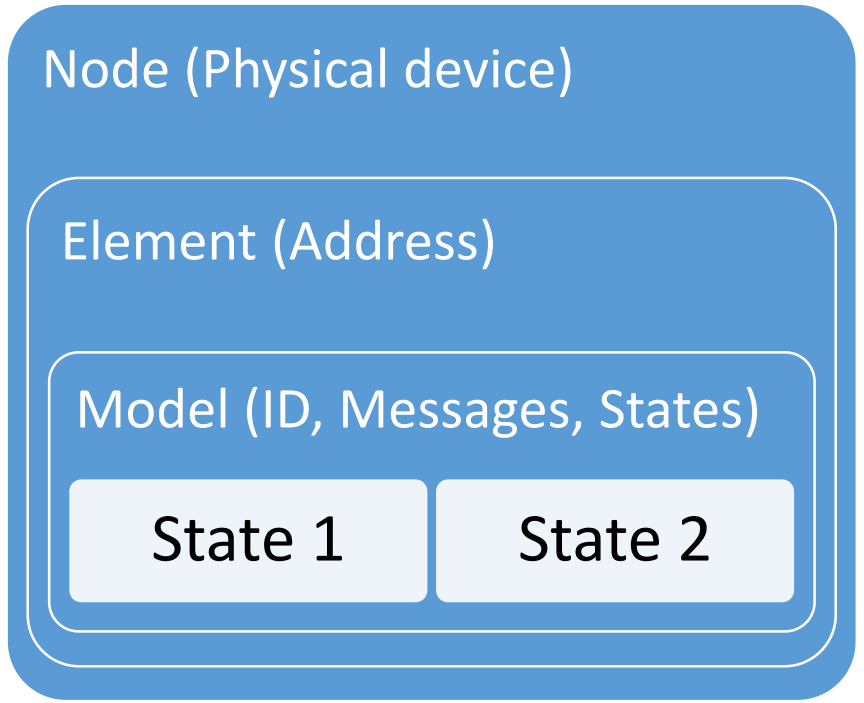
Node Composition: Elements & Models

Elements

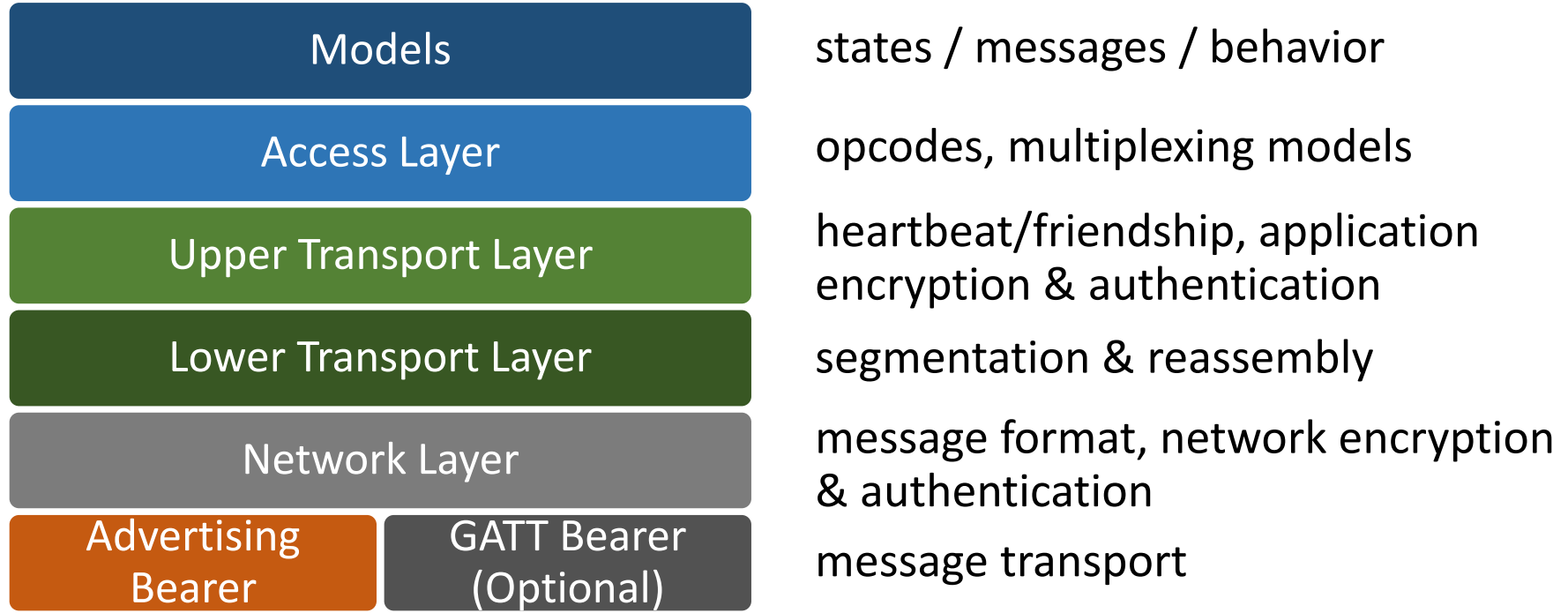
- Unique Network Address
- Implements one or more Models

Models

- OpCode addressing
- States & Messages
- Client & Server



Mesh Protocol Layers



Relaying

- Time-to-Live (TTL, 7-bit, i.e. max 127)
- Decrypt with Network Key
- Decrement TTL

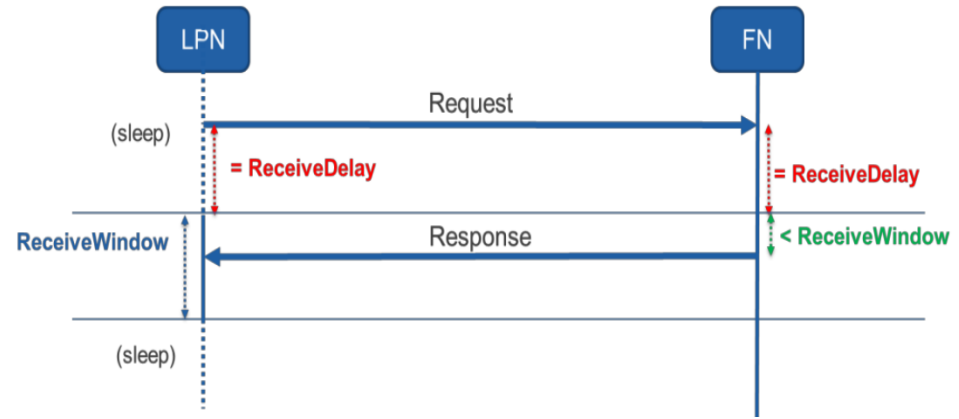
If TTL > 0:

- Re-encrypt with Network Key
- Send out to Network
- Application layer payload remains encrypted & untouched
 - Relay Node may not even have the Application Key



Friendship

- 100% duty-cycle scanning needed for reliability, but consumes a lot of power
- Mix of battery & mains powered nodes
- Solution: pair up stable power supply nodes (Friends) with Low Power Nodes (LPNs)
- Friends queue up messages for the LPN
- LPN queries the Friend periodically if there are any messages for it



IMPLEMENTATION STATUS & PLANS



Support in Zephyr* OS

- Available starting with Zephyr 1.9
- All mandatory features implemented
- Tested against multiple other implementations
- Ported to MyNewt
 - Multiple valuable fixes ported back to Zephyr
- Demos possible with many popular supported Zephyr boards
 - Come to the Zephyr booth to see it in action!
- Minimum RAM footprint (entire OS with Mesh) is ~12kB
 - Fits even the most constrained 16k boards, like BBC micro:bit



Support in Linux*

- meshctl tool released with BlueZ 5.47
 - GATT Client
 - PB-GATT Provisioner
- Ongoing work both in user space (BlueZ) and kernel
 - Advertising & Scanning managed in the kernel
 - Controlled through mgmt API extensions
 - Essentially everything else in a user space meshd



Future development

- Mesh Vendor HCI Extensions
 - Supported both by Linux & Zephyr
- More features
 - Friend support for Zephyr
- More standard models
- More demos with various boards



QUESTIONS?





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