

LoRA Mesh Application Note

1. Address Assignments

All nodes are assigned addresses, Node ID, which are used to direct messages. The following table describes valid assignments of these addresses.

Address	Description
0000	Unassigned address
0001 – 3FFF	Unicast address assigned to a node.
C000 – FFFB	Group address

1.1. Pre-assigned feature addresses (it is not needed to assign these)

Address	Description
FFFC	All-proxies
FFFD	All-friends
FFFE	All-relays
FFFF	All-nodes

2. How messages are directed

- Nodes receive messages addressed to its unicast address or Node ID, its subscribed address.
- Nodes *must* have a single unique unicast address. Other nodes may use this address to send it messages.
- Nodes *may* have the same publish group address. If a node is a member of this group, a message sent to this group will be received by all members (if they are subscribed to this same group).
- Nodes *may* subscribe to one or several unicast or group addresses. Nodes will receive messages sent to a subscribed group.
- Messages can also be directed to feature addresses. These messages are received by all nodes of that feature/category.

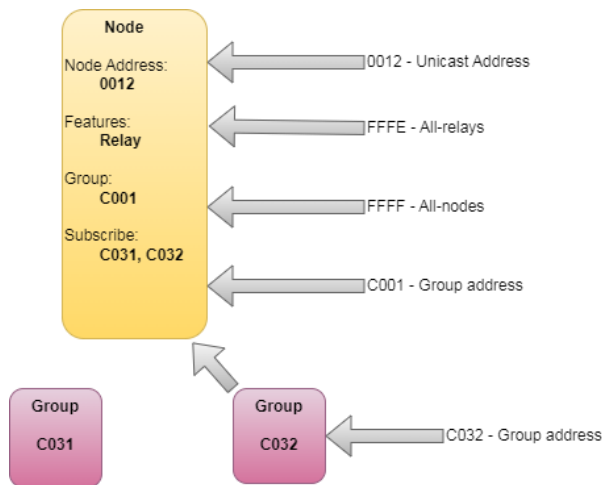
3. The Publish-Subscribe paradigm

Addresses are used to direct messages using a publish-subscribe paradigm.

Nodes that generate messages publish the messages to a unicast address, or group address. Nodes that are interested in receiving the messages will subscribe to these addresses. Subscribing to an address allows you to receive messages from that address.

4. Example

In this example a Node can receive a message sent to 0012, FFFE, FFFF, C001, or C032.



5. Subscribing to one or more group addresses

The config variable to Subscribe is flexible and can handle multiple addresses that are space or comma delineated. Subscribing to a group means you can receive unsolicited status messages from that group. For instance:

```
AT+AB config SubscribeAddr = C001,C002,C003
```

subscribes to groups C001, C002, and C003.

The settings for the addresses are handled through configuration variables. Each node has its own address and can optionally have a publish and subscribe addresses. The names for these variables are **NodeAddr**, **PublishAddr**, and **SubscribeAddr**. Each node must have a unique unicast address (0001 – 3FFF). For Publish and Subscribe only Group addresses are supported (C000 – FFFF). Note that addresses FFFC – FFFF are pre-assigned.

The AT commands below set the node address to **0005** and its group publish address to **C001**.

```
AT+AB config NodeAddr = 0005
```

```
AT+AB config PublishAddr = C001
```

6. Message ACKs

All messages sent to unicast addresses are ACKed by each node; they do not need to be subscribed. In the unicast case, just one ACK will be received. In the group case, the sender should use the subscribe address to select which ACKs it will receive: these can be group or unicast addresses. Note that a receiver must have its subscribe address set to this same group in order to initiate an ACK. For large groups, it's better to disable any non-desired ACKs by setting the receiver's subscribe to 0000, instead of filtering them on the sender – to save bandwidth.

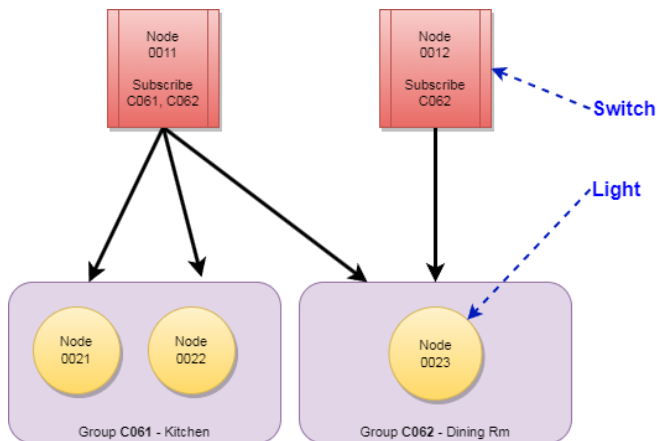
Messages to feature addresses are *not* ACKed.

- A message sent to a unicast address is always ACKed.

- A group message ACK is received if the sender is subscribed to that group or unicast Node ID. Up to 8 subscribed addresses is allowed.
- A message sent to a feature address is not ACKed.

7. Simple Example

In this example we are using five nodes, two for switches and three for lighting fixtures.



Here are a list of characteristics from this example.

- The node addresses for the switches is 0011 for switch one and 0012 for switch two.
- The node addresses for the lighting fixtures are 0021, 0022, and 0023.
- The lighting fixtures are organized in two groups. The address for Group one is C061, and C062 for group two.
- The first switch connects to both groups, and the second switch connects only to group C062.
- Switch one can send an on or off command to group one and two.
- Switch two can send an on or off command only to group two.
- Subscribing to a group means that you can receive unsolicited status messages from that group.
- Since switch one is subscribed to both groups, it can receive an unsolicited status from both groups (and ACKs as well).
- Since switch two is only subscribed to one group, it can only receive an unsolicited status from that group.

8. Encryption Keys

There are three encryption keys maintained in the mesh network. They are **Application** key, **Network** key, and **Device** key. Device keys are associated to specific nodes. **Network** keys can be used to distinguish multiple networks of nodes, **Application** keys for various applications (lighting group A, B, Meters, etc.), and **Device** keys for specific node devices. *The Device key is not yet implemented, so it can be ignored.*

Keys are 16 bytes and are generated through a hash algorithm derived from an alphanumeric password. These keys are hidden and cannot be displayed. The default passwords to generate the Network, Application, and Device keys are **Application123**, **Network123**, and **Device123**. It is recommended to choose unique passwords upon final installation. The syntax is



```
AT+AB SetKeyPass [dev | app | net] [password]
```

The following command sets the network key with a password of **District-009**.

```
AT+AB SetKeyPass net District-009
```