LoRaWAN® Roaming

Alper Yegin, Actility
LoRa Alliance AMM, Berlin 2019
Why Roaming?

Coverage extension

Running core without radio network

Coverage densification

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Coverage Extension

Public or private/enterprise networks

Geographically adjacent or disjoint

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Coverage Extension

Public or private/enterprise networks

Geographically adjacent or disjoint

Always roaming

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Enterprise networks can choose to have their own core network w/o building the radio networks. Feasible with LoRaWAN® due to low cost infra.
Coverage Extension not Needed?

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Coverage Densification

Macrodiversity! (several receivers)

⇒ Closer GWs
⇒ Higher data rate, lower power (ADR!)
⇒ Less interference (win-win)
⇒ Less packet error rate
⇒ More battery life

⇒ More GWs
⇒ Better TDOA/RSSI geoloc accuracy

ADR: Adaptive Data Rate
TDOA: Time Difference of Arrival
RSSI: Received Signal Strength Indicator
Coverage Densification

Simultaneous roaming with multiple networks
⇒ Even closer GWs
⇒ Even more GWs

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Coverage Densification

Macrodiversity! (several receivers)

Device at home and roaming with multiple networks at the same time

**Very unique** mode of roaming:
- Not available to NB-IoT, Wi-SUN (tech limitation)
- Not available to SigFox (business model limitation)
Step 1: Implement the Specs

Technical Committee specs:
- LoRaWAN® Backend Interfaces 1.0
- LoRaWAN (Link-layer) 1.x
Step 2: Get a NetID

NwkID is a scarce resource (limited # of bits)

NwkID generated from NetID

NetIDs assigned to LoRa Alliance™ members

Identifies your network, when your devices send uplinks in visited networks

<table>
<thead>
<tr>
<th>NetID Type</th>
<th>NwkAddr Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25bit</td>
</tr>
<tr>
<td>3</td>
<td>17bit</td>
</tr>
<tr>
<td>6</td>
<td>10bit</td>
</tr>
</tbody>
</table>

LoRa Alliance® members

Contributors

SpoAnsors

Adopters/Institutionals

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Avoid Mistakes

Random DevAddr or JoinEUI/AppEUI ⇒ Device loses home while roaming

Identifies your network, when your devices send uplinks in visited networks

Identifies Join Server, that helps visited network discover the home of an activating device

Random DevAddr or JoinEUI/AppEUI ⇒ Device loses home while roaming

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Step 3: Partner up!

Not only a “necessity” but also a “strength” for LoRaWAN

Treat collaboration/roaming as "default" choice
Step 4: Setup!

On your NS, configure Peer's:
- NetID(s)
- Channel plan
- fNS URL
- sNS URL
- NS IP address(es)
- HTTP auth credentials
- JS URL(s)
- JS IP address(es)
- JS HTTP auth credentials
- And roaming policy (roam-in, roam-out, stateful/stateless)

On the JS(s) you are using, configure Peer's:
- NetID(s)
- fNS URL
- NS IP address(es)
- HTTP auth credentials

Your network    Roaming peer's network
Mesh Interconnect

Configuration and management does not scale
Hub Insertion

JS: Join Server
fNS: Forwarding Network Server
sNS: Serving Network Server
RH: Roaming Hub

1. PRStartReq/HTTP Request
2. PRStartReq/HTTP Request
3. HTTP Response
4. HTTP Response
5. PRStartAns/HTTP Request
6. PRStartAns/HTTP Request
7. HTTP Response

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ThingPark Exchange: Peering hub

- Easy and scalable interconnections
- Lower cost: Interconnect your network ONCE, reach ANY network
- Faster network onboarding
- Reaching a larger peering pool
  - Any size, any vendor, any geography
- Centralized and extensible policy control
- Security shield against NS/JS peering nodes
- Extensible business/peering models
- Unified and live visibility (web UI, UDRs, logs)
Interconnecting Networks for Roaming

+ Levikom, Enforta (ERTH), …
Interconnecting Networks for Roaming & Activation

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Provision a device ONCE, activate on ANY network
Roaming standard available
Implemented
Deployed

Welcome to join!

ThingParkExchange