

Constrained Signaling Over LR-WAN CoSOL

Alexander Pelov (a@ackl.io)

Laurent Toutain (laurent.toutain@teleocm-bretagne.eu)
Yannick Delibie (yannick.delibie@kerlink.fr)

Outline

- CoSOL
 - Use CoAP as main signaling protocol for Low-Rate WANs
- What are LR-WANs?
- Managing LR-WANs?
- Future work

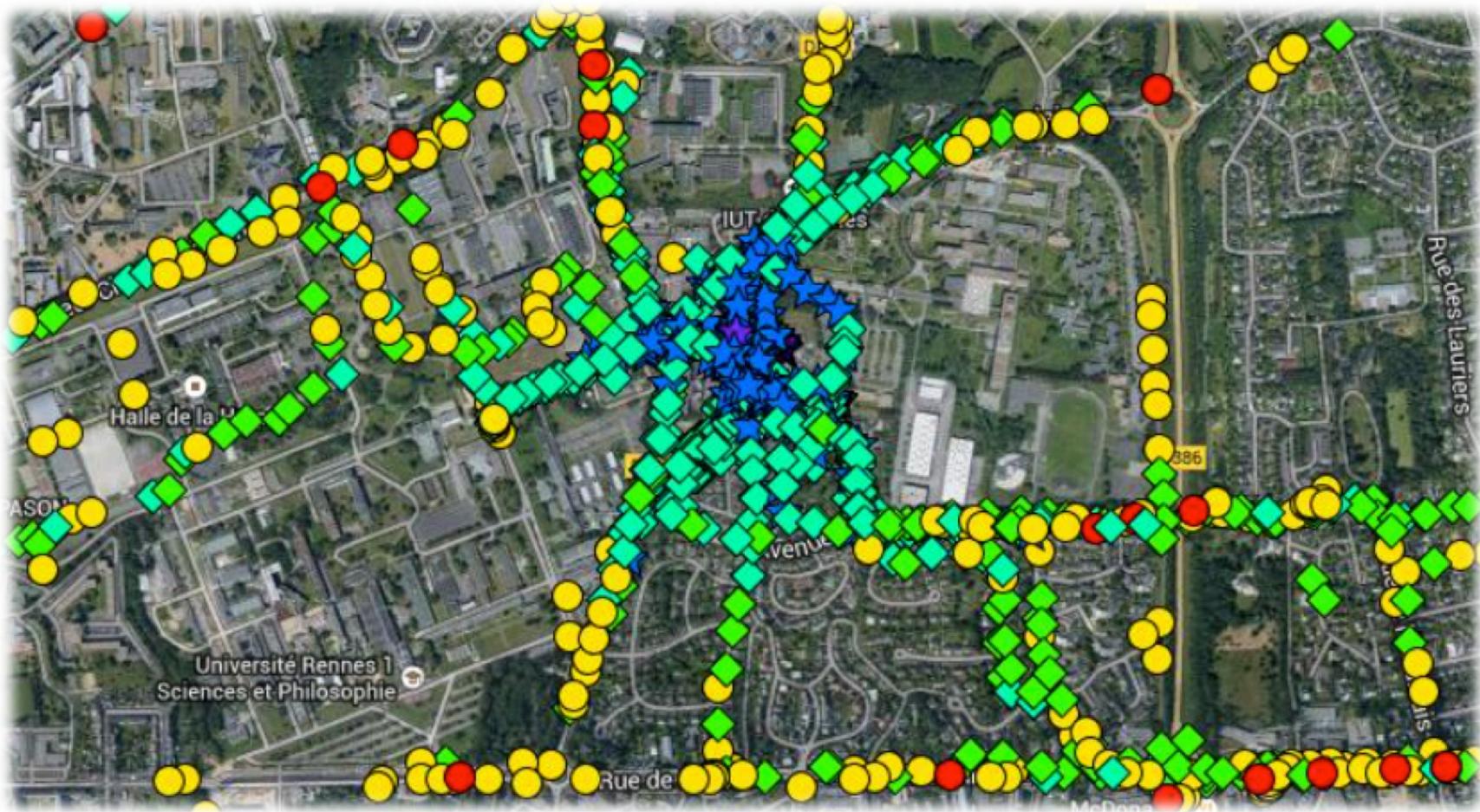
A revolution in the working

- A new family of **far-reaching** (FARE) radio communication technologies
 - With a single antenna cover 2-30 km
 - Excellent building penetration characteristics
 - Free spectrum (ISM bands 868 / 900 MHz)
 - Many possible applications
 - Smart City, Metering (Gas, Electricity, Water), Monitoring (Infrastructure, other), ...
 - “Replacement of SMS for M2M/IoT applications”
- Huge industry interest
 - Several telecom operators deploying networks
 - Several competing technologies



With this antena...

3 km



A revolution in the working FARE radios

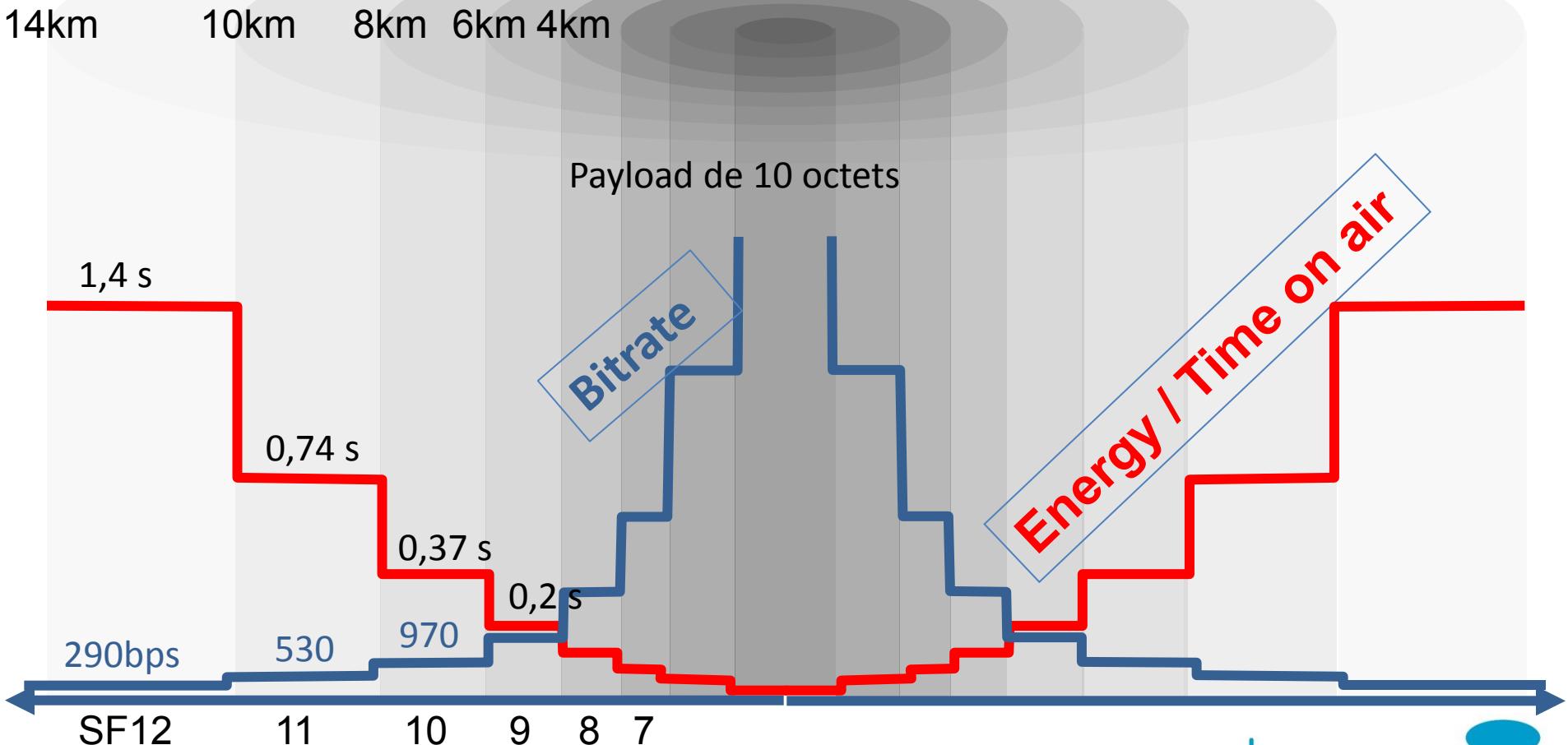
- **The Good**
 - Low-Power (link, device, antenna)
 - Low-Cost
 - 8000 antennas to cover France (4-5 antennas for a med-sized city)
 - Cost: \$5M
 - ISM
 - Private networks
 - No license fees
- **The Bad**
 - Low-Rate (300 bps – 200 kbps)
 - Very-high density (100k devices / antenna)
 - ISM
 - Interference
 - Duty cycle (1% or 10%), including antennas.
- **The Ugly**
 - Several competing technologies, proprietary, non-networking oriented approaches
 - Vertical (silo) architectures
 - No IP / Interconnection /

Competing technologies

- Two major approaches
 - Ultra-narrow band (25 kHz)
 - SigFox
 - QoWisio
 - Huawei Weightless-N
 - IEEE 802.15.4k
 - ...
 - Spread-Spectrum
 - Semtech LoRa™ (long-range)

Débit – Time on air

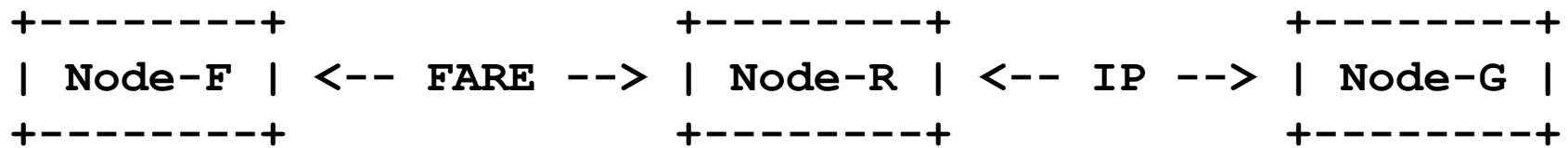
2D simulation (flat environment)



Goal

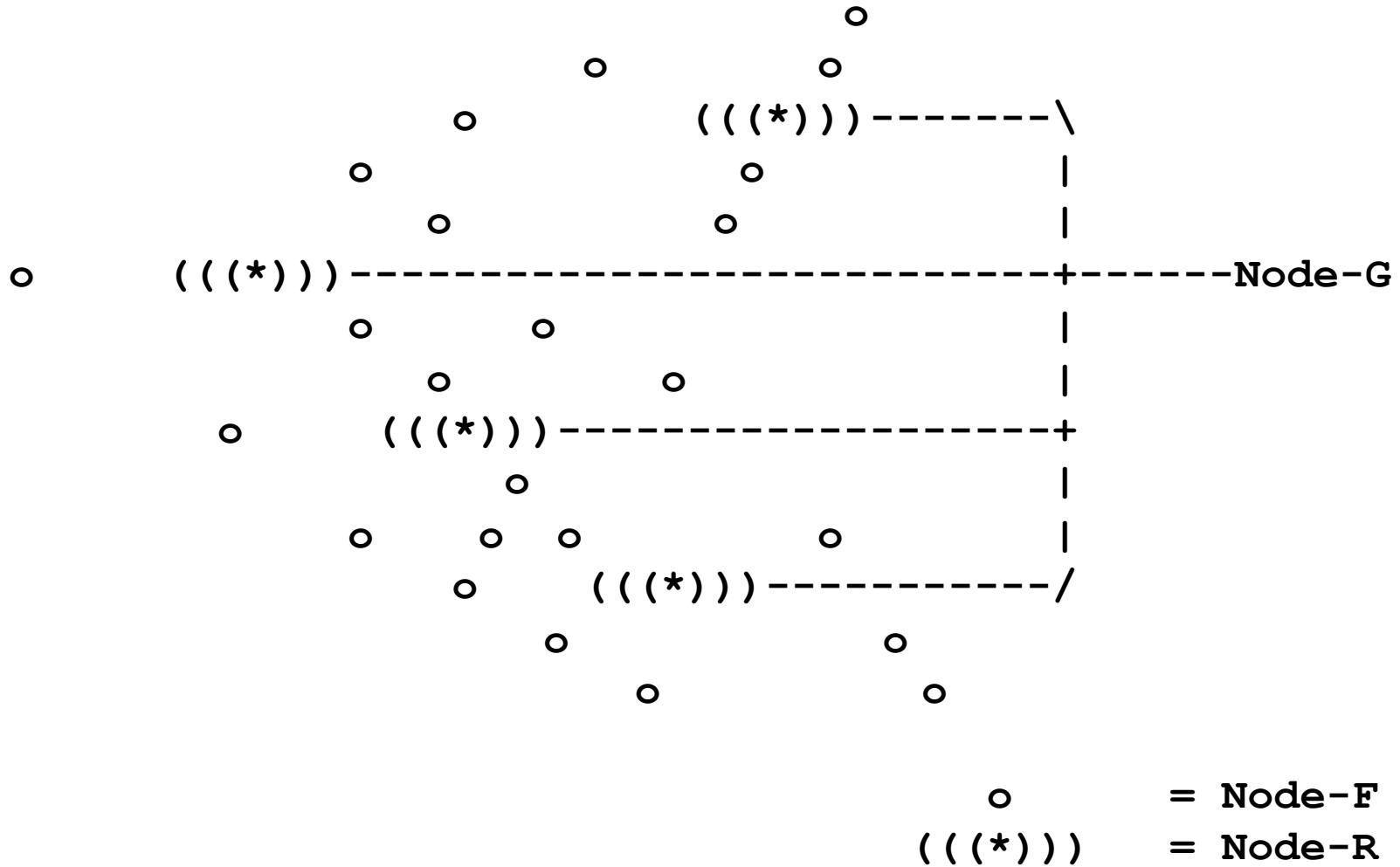
- Use CoAP as main signaling protocol for LR-WANs
- Low-Rate WAN
 - Infrastructure network with centralized operation built on FARE radios
 - One-hop
 - Star topology
 - Particular set of constraints
 - Infrastructure networks
 - Ultra-dense networks
 - Delay-tolerant networks
 - Low-power and lossy networks

Entities

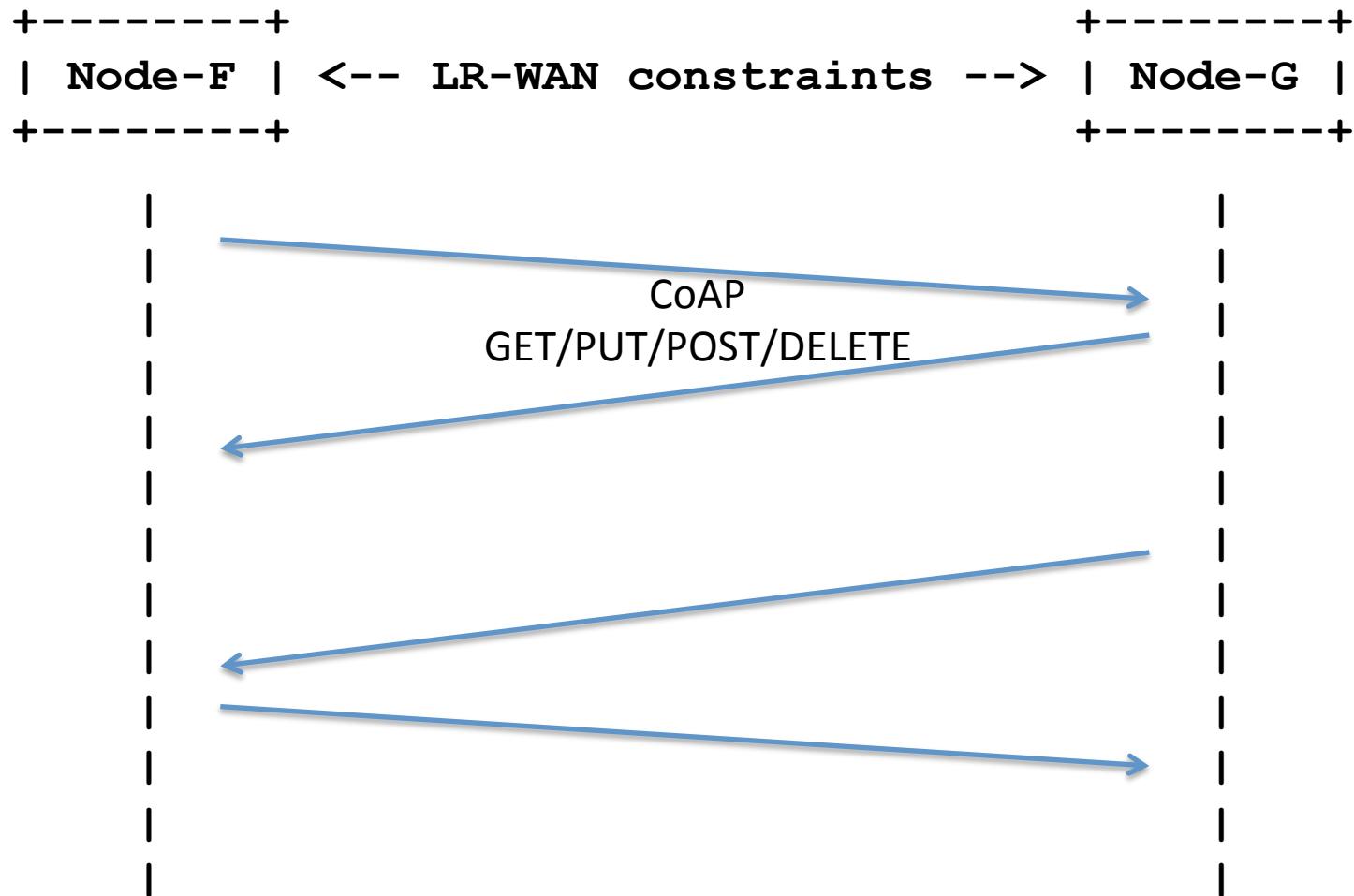


- Node-F: far-reachable node, e.g. the end-point, object, device
- Node-R: radio relay, bridging the Far-Reaching radio technology to a different medium
- Node-G: gateway node, interconnection between the radio-relay node and the Internet

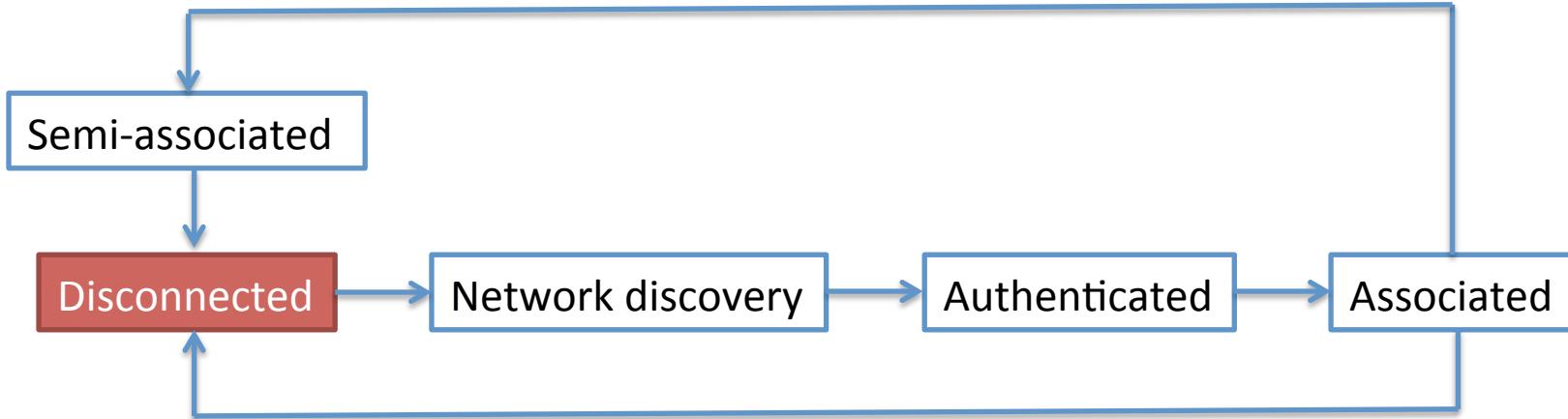
A network deployment



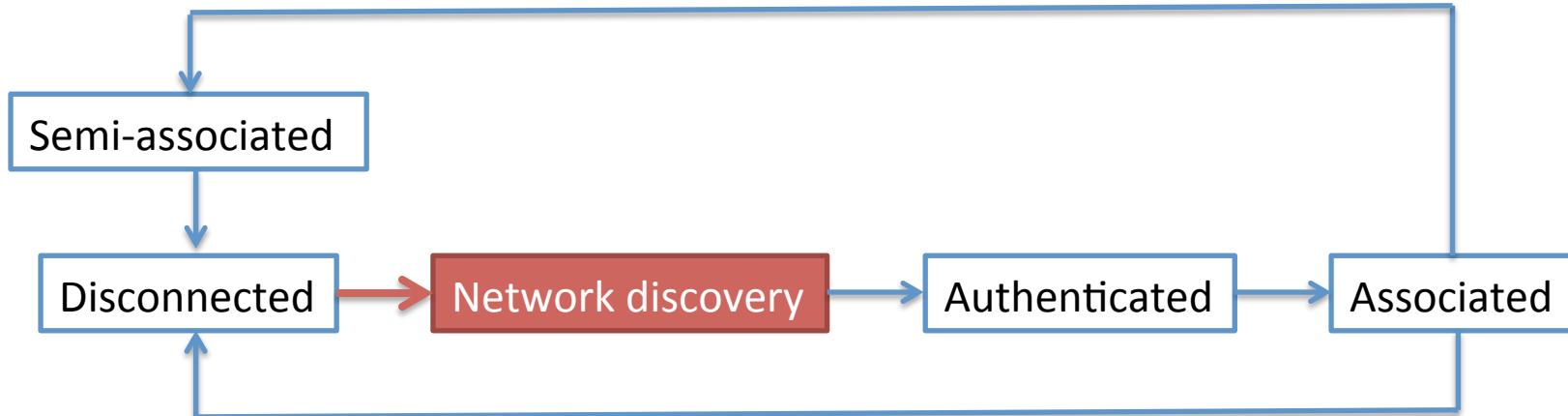
Managing an LR-WAN



Managing an LR-WAN



Managing an LR-WAN



Reactive

Node-F Node-G

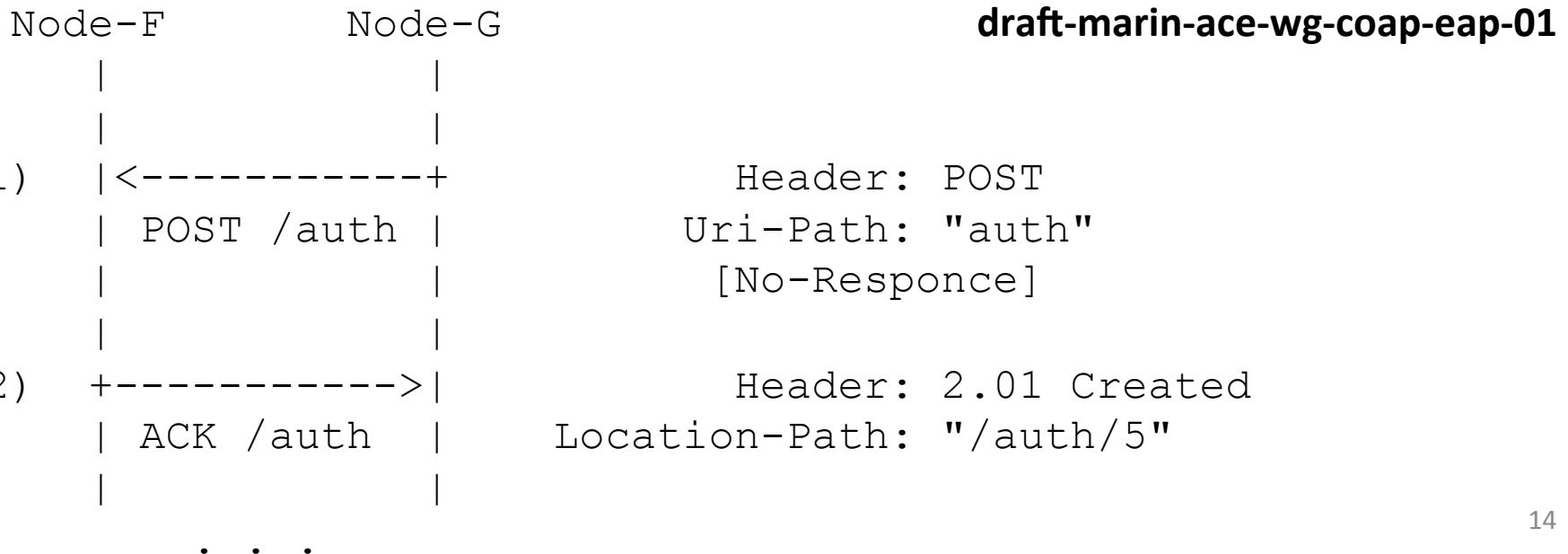
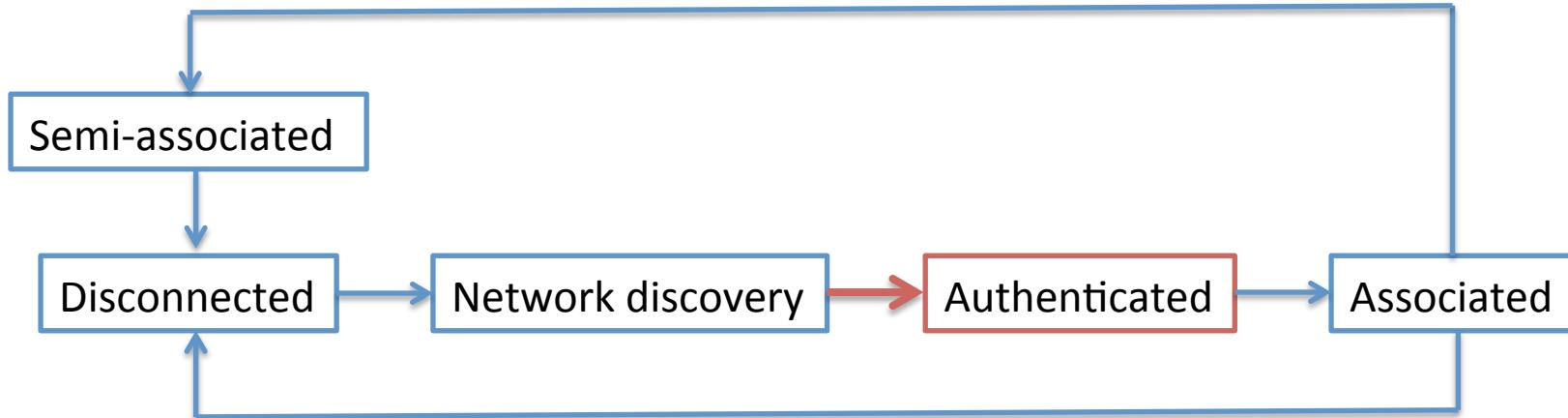
```
|-----+        Header: POST  
|  POST /g |   Uri-Path: "g"  
|           |    [No-Responce]  
|-----+
```

Proactive

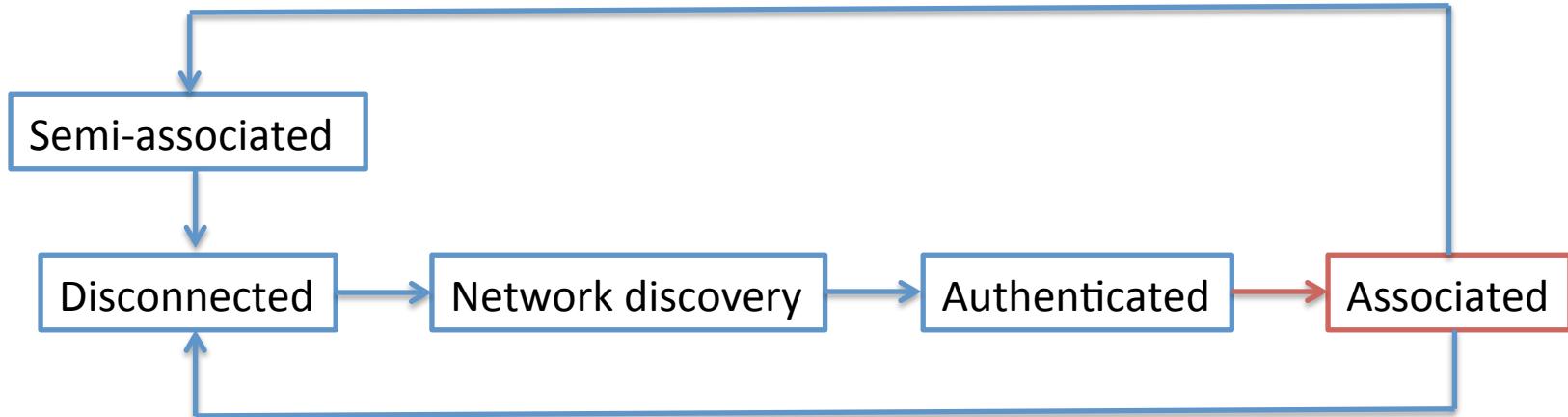
Node-F Node-G

```
+----->|        Header: GET  
|  GET /g |   Uri-Path: "g"  
|           |    Accept: cbor  
|-----+        Header: 2.05  
|  2.05   |    Payload: ...  
|-----+
```

Managing an LR-WAN



Managing an LR-WAN



Node-F

Node-G

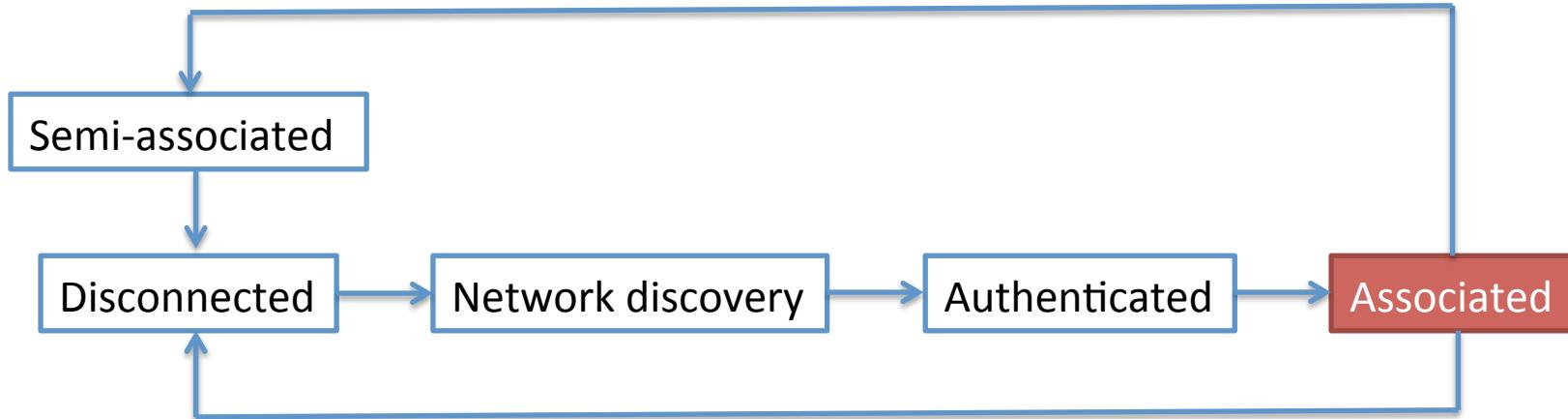
7

```
Header: POST  
Uri-Path: "n"  
Payload: ...
```

| <-----+
| 2.01 |
|

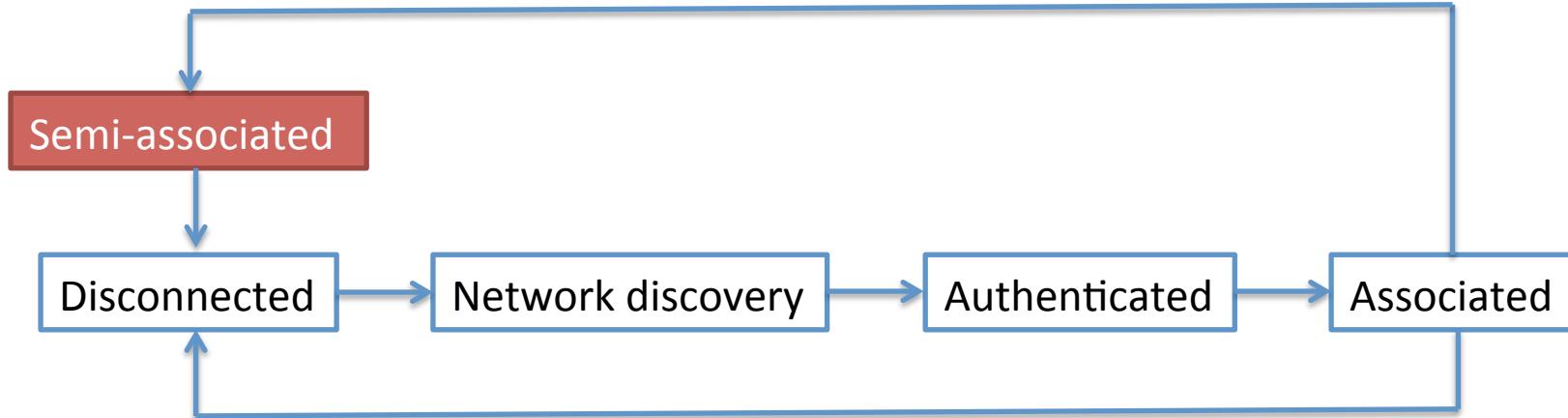
Header: 2.01 Created
Location-Path: "/n/n705"

Managing an LR-WAN



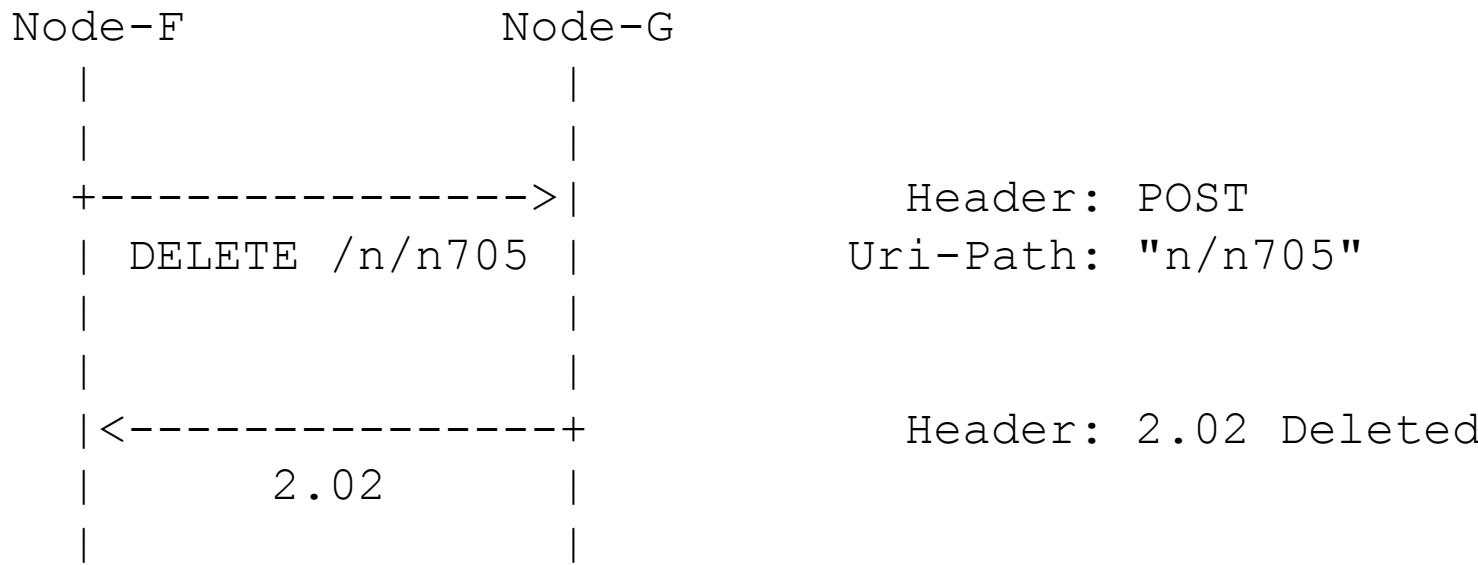
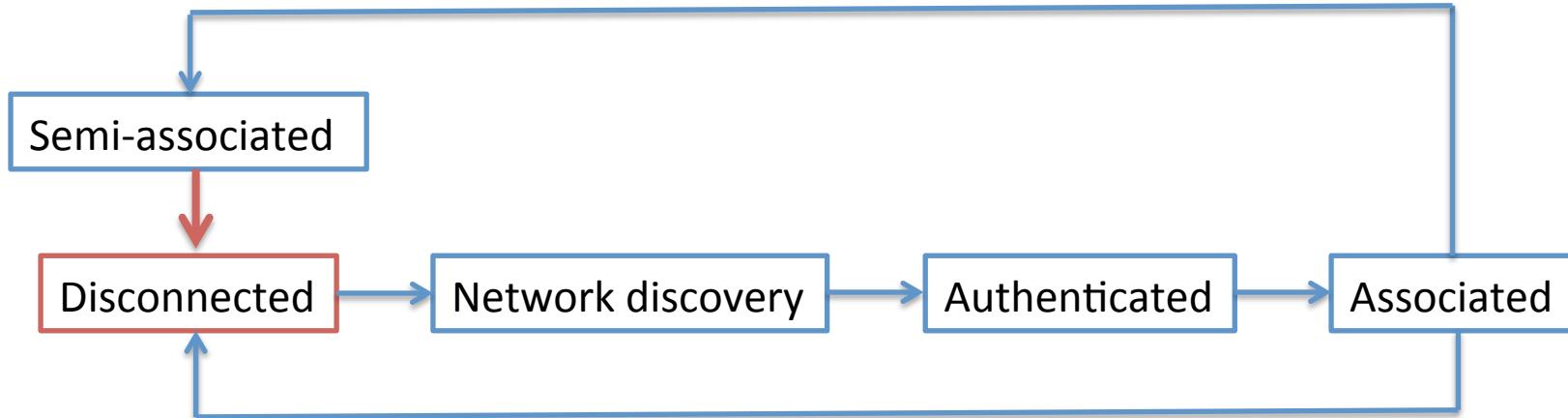
- Use CoMI [I-D.vanderstok-core-comi] for device management
- Alternatively, define short naming of the parameters
 - YANG hash aliasing
 - Technology-specific naming
 - /sf for spreading factor
 - /cr for coding rate
 - ...

Managing an LR-WAN



- Special, uni-directional communication
 - Use CoSE for message signature
 - Long-lived DTLS sessions
 - ...

Managing an LR-WAN



Managing LR-WANs?

- CoSOL
 - Use CoAP as main signaling protocol for Low-Rate WANs
- What are LR-WANs?
- Managing LR-WANs?
- Future Work

Future work

- How to have the most-compact CoAP exchanges?
- Interest to pursue the work? T2T? CoRE?
- Link with CoMI
 - /mg/XXXXX is (too) long
 - YANG hash aliasing
 - YANG structured ID
 - ...
 - See YANG Cool
- Use CoAP as signaling protocol for managing and operating networks
 - LR-WAN
 - Others? CoSI?