Tree-based Routing

Sébastien Vaucher Benjamin Bediako

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University of Bern

Contents

Goal of the algorithm

1. Establish a tree of nodes
   - The **sink** is the root of the tree
2. Route sensor data towards the sink

Two phases

1. Discovery phase
   1. Regularly *flood* discovery packets from the sink
   2. Re-broadcast the packet at intermediate nodes
   3. $\rightarrow$ Only if interesting packet
   4. Choose parent according to strategy
2. Send temperature data hop-by-hop
   1. Each node sends to its parent
   2. Recursively forward until sink is reached

Algorithm configuration

1. 2 MAC protocols
   - NullMAC
   - X-MAC
2. 2 parent choice strategies
   - Lowest hop-count
   - Highest RSSI (best signal quality)

Producing data

To produce data to analyze, we added some printf

Sink

Every 30 s, print the hop-count distribution of incoming packets

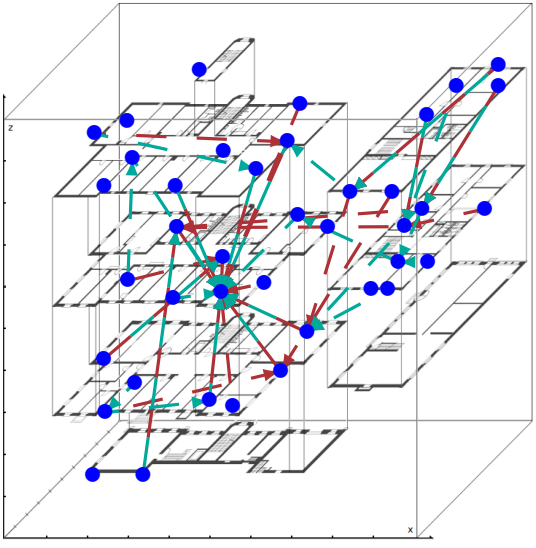
Sensor nodes

When setting a new parent, output its ID

Parsing the generated data

Custom Python script with embedded XML parser.
It generates:

1. All numerical statistics
2. A 3D representation of the links between nodes

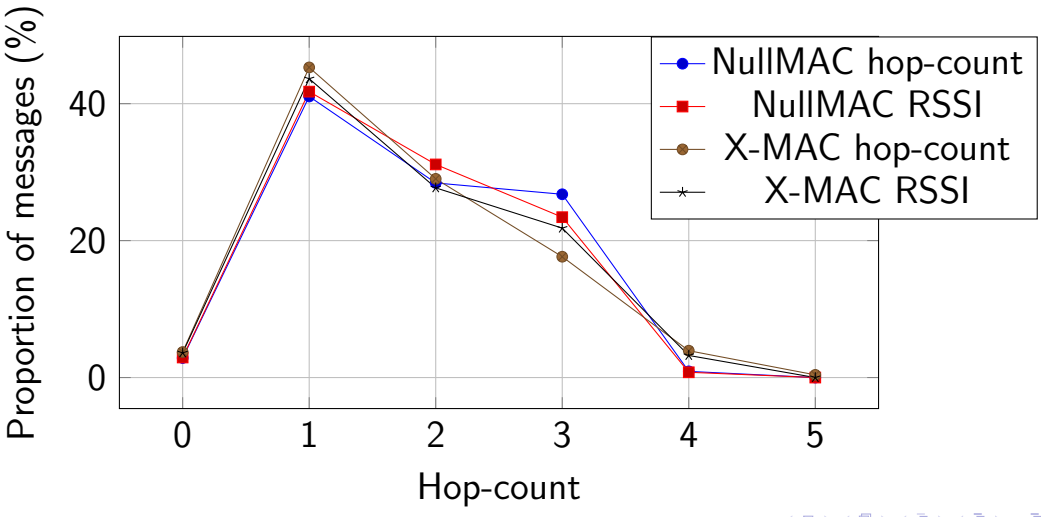


- TikZ picture generated by the Python script
- MAC = X-MAC

Legend

hop-count RSSI

Hop-counts distribution



Metrics

Average hop-count

	Hop-count	RSSI
X-MAC	2.72	2.61
NullMAC	2.77	2.73

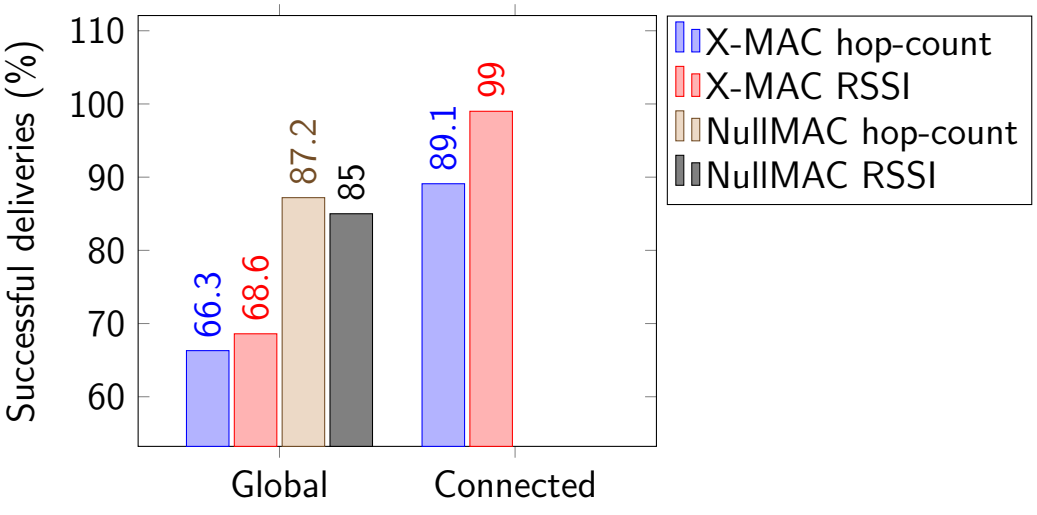
Average physical link length

	Hop-count	RSSI
X-MAC	49.52	46.06

Percentage of connected nodes

	Hop-count	RSSI
X-MAC	72.5 %	67.5 %

Packet delivery rate



Encountered problems

1. On TARWIS using NullMAC, printf does not always arrive
   - Impossible to parse child relations
   - Some statistics missing
2. Less than $\frac{3}{4}$ of the nodes managed to connect

Conclusion

- Our implementation works
- NullMAC (seems to) perform better
- The RSSI strategy is the best

- Possible improvements
  - Return channel
  - Implies sending ACKs to parent