

LoRa Mesh Network Experimentation in a City-wide Testbed

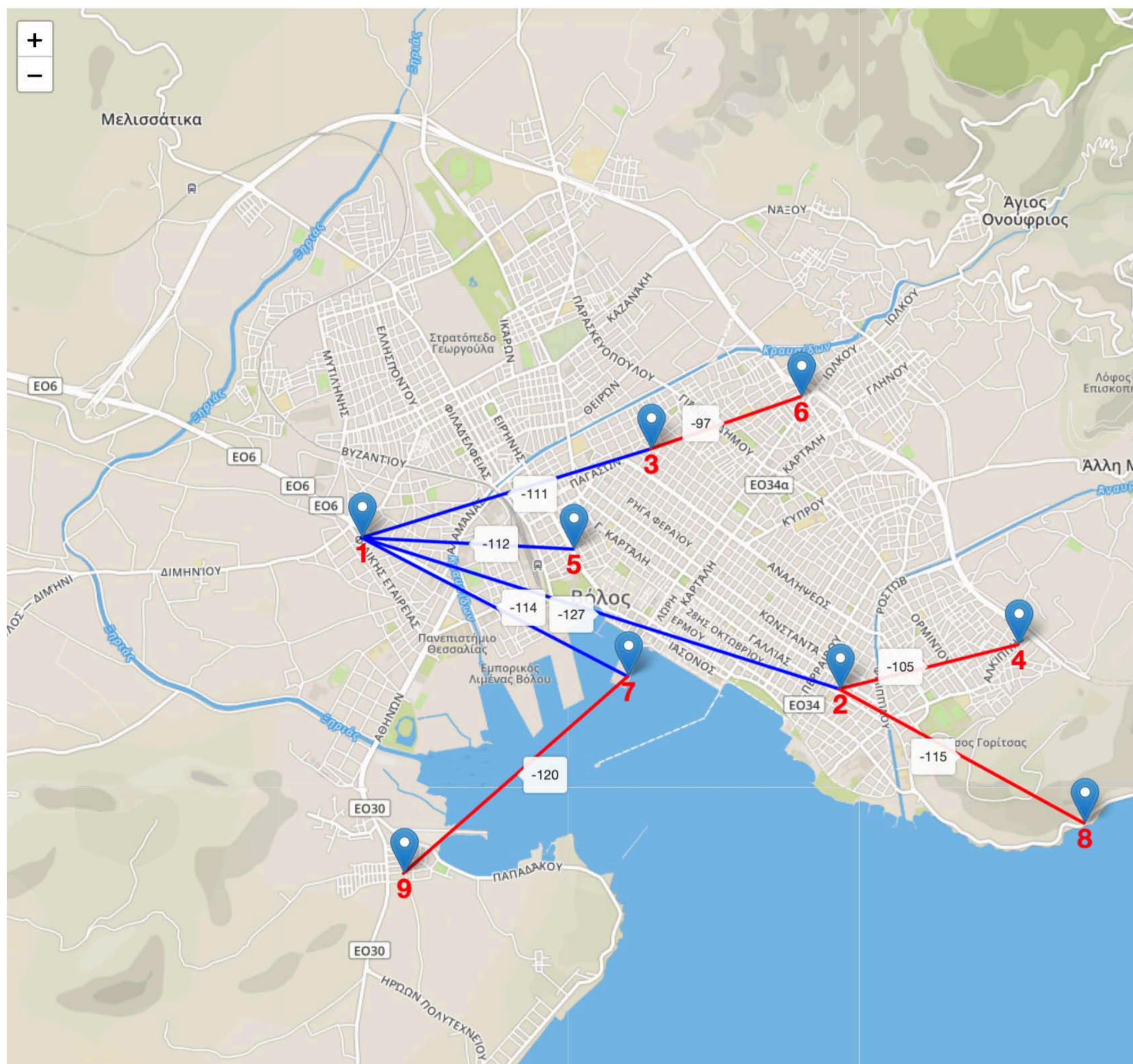
- ✓ LoRa IoT networks operates in a star topology whereby all nodes communicates to a central gateway.
- ✓ Despite the long area coverage provided by a LoRa gateway (5-10 km in urban areas), many gateways should be deployed in order to coverage even a small city.
- ✓ We present a **LoRa wireless mesh network** set of tools, offering a wide range of experimentation option and performance evaluation tools in order to analyze the performance of LoRa mesh network in urban setups

- ✓ Core configuration options supported by the toolkit include the following parameters:
 - ✓ **Transmission Mode (BW, SF, CR)**
 - ✓ **Transmission Power**
 - ✓ **Transmission Frequency**
 - ✓ **Network Topology (Star or Mesh)**
- ✓ Performance evaluation and visualization tools include the following:
 - ✓ **Ping** application to measure latency
 - ✓ **Iperf** application to measure throughput
 - ✓ **Visualization of Network Connectivity**

	node_2	node_3	node_4	node_5	node_6	node_7	node_8	node_9
Single-hop TXp: +0dBm	-134	-120	-	-124	-	-123	-	-
Single-hop TXp: +7dBm	-130	-115	-	-109	-	-119	-	-
Single-hop TXp: +14dBm	-127	-110	-	-109	-	-110	-	-
Multi-hop TXp: +0dBm	-133	-120	-118	-123	-117	-125	-127	-130
Multi-hop TXp: +7dBm	-131	-114	-111	-118	-109	-119	-121	-127
Multi-hop TXp: +14dBm	-127	-111	-105	-112	-97	-114	-115	-120

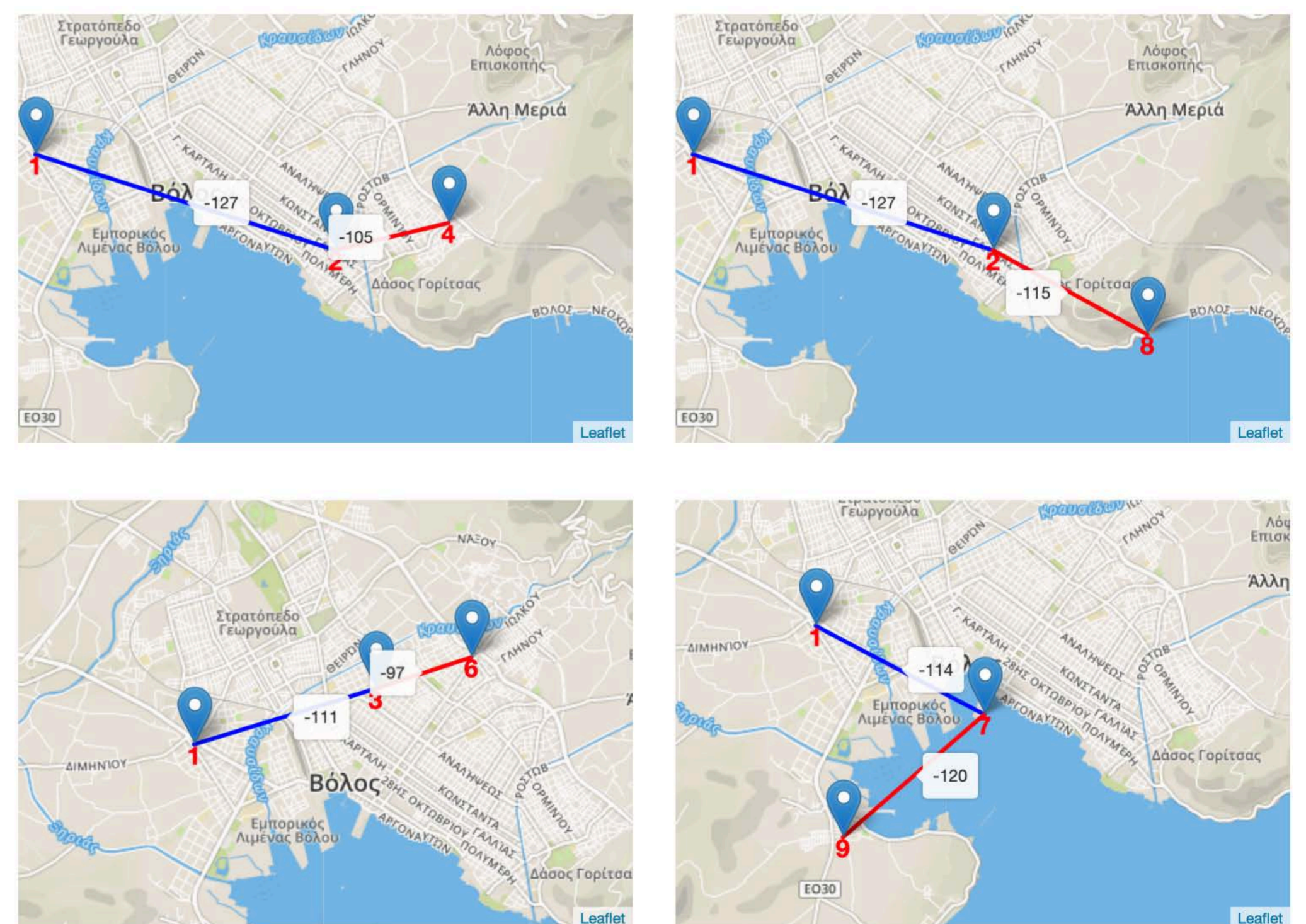
RSSI per link across different scenarios

- ✓ Mesh routing relies on our **AODV** implementation that has been ported to Arduino code.
- ✓ Both types of nodes are custom build based on the **SX1272 chipset** manufactured by Semtech and the **MK20DX128VLH5** micro-processor that is a 32-bit ARM Cortex-M4 CPU.



Snapshot of our testbed monitoring tool

- ✓ A single LoRa Gateway is deployed on the rooftop of our University premises and **8 edge nodes** are scattered across the city of Volos, Greece.
- ✓ Edge nodes receive custom data messages that describes the configuration that will be employed in the upcoming transmission period, while GW collects uplink data frames and evaluates the LoRa performance.
- ✓ **Round-Robin fashion execution** across all edge nodes to transmit data frames under specific configurations.



Routing path for individual two hop nodes