A Bluetooth 5 Opportunistic Edge Computing System for Vehicular Scenarios

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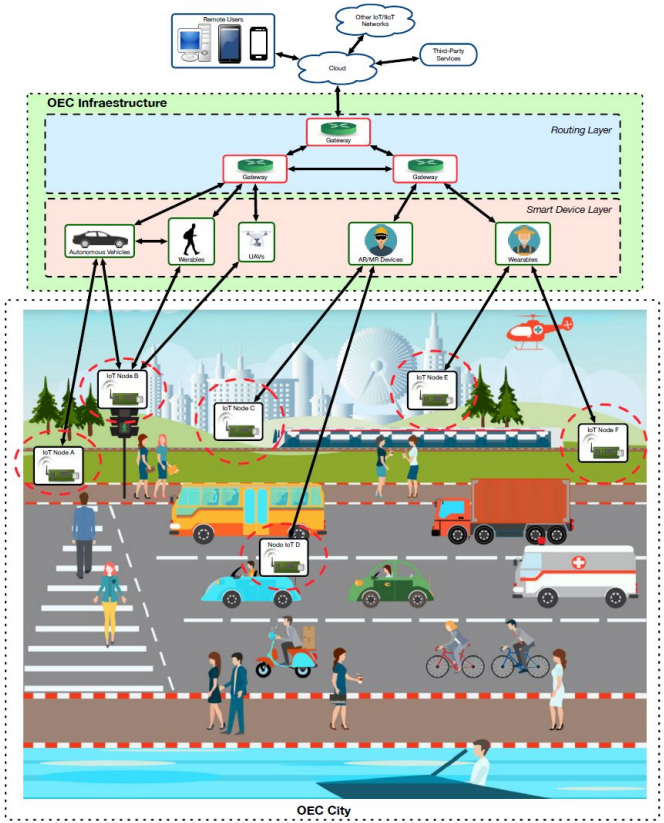
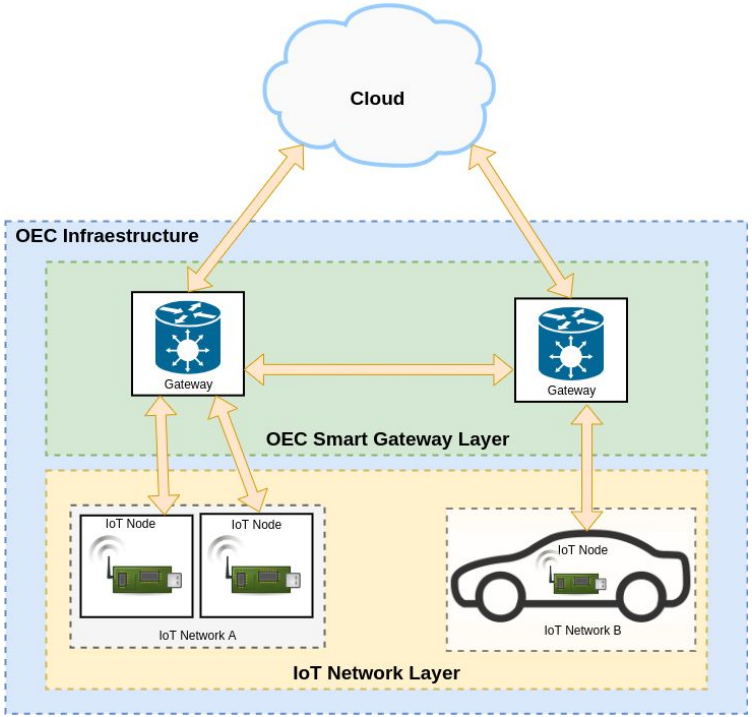
Motivation

- 75 billion devices in 2025
- Limitations of storage, power and energy consumption
- Dependency on other remote devices to perform tasks
- Lack of wireless communications coverage



Architecture

- IoT network layer
  - Uses sensors to monitor and interact with its environment
  - Ability to exchange data with the upper layer
- OEC Smart Gateway Layer
  - Ability to provide services opportunistically
  - Storage in a shared DHT
- Cloud layer
  - Responsible for providing services that cannot be provided by other layers
  - Intensive processing or storage of large amounts of data
- Bluetooth 5



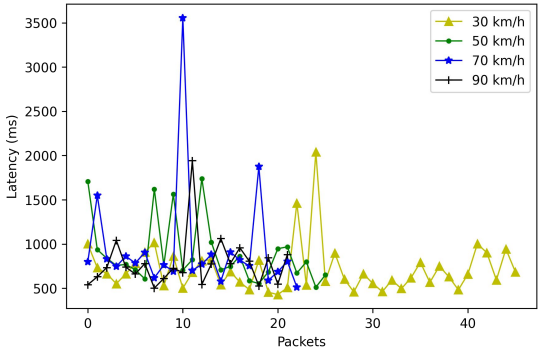
Experiments

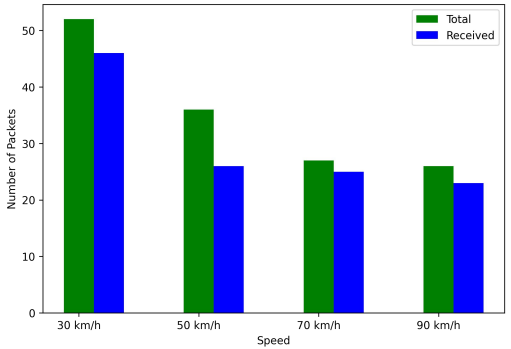
- Two IoT nodes (Raspberry Pi 3B and MDK nRF52840)
- Two gateways (Raspberry Pi 3B+/Raspberry Pi Zero and DK nRF52840)
- Bluetooth Mesh Communication (0 dBm TX)

Experiments

- The data were first sent from the static IoT node to the smart OEC gateway located locally in the office.
- The indoor OEC gateway received the data and uploaded them to the DHT network.
- The outdoor OEC gateway collected the data sent through the DHT network
- The outdoor gateway sent the message to the mobile IoT node through Bluetooth 5
- The car was driven at different constant speeds between the points A and B

Experiments





- The lowest average latency was 700 ms for 30 km/h
- The highest latency was 950 ms for 70 km/h
- For 50 km/h and 90 km/h, such average latencies were 890 and 780 ms, respectively.

- The slower the vehicular speed, the higher the number of packets that could be sent and received
- The speed with the fewest packet losses was 70 km/h (7 %).

Conclusions

- Relatively low latency values (between 716 and 955 ms) at speeds between 30 and 90 km/h
- Losing a relatively small number of packets (between 7 % and 27 %)
- The proposed opportunistic network is a valid solution for implementing opportunistic vehicular IoT applications

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Thanks for your attention