Experiments on Using Vehicles as Data Mules For Data Collection From Urban Sensors

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Data Muling for Sensor Data Collection

UrbanSense Platform

- City-wide monitoring platform

- Sensing units deployed at strategic locations

- Data gathered at backbone server

- Challenge: collect data from disparate sites

Solution: **Data muling with *BusNet***

- STCP buses equipped with WiFi APs and DTN support

- Cost-free, but no delivery deadline guaranties

- Bus network routes have wide coverage

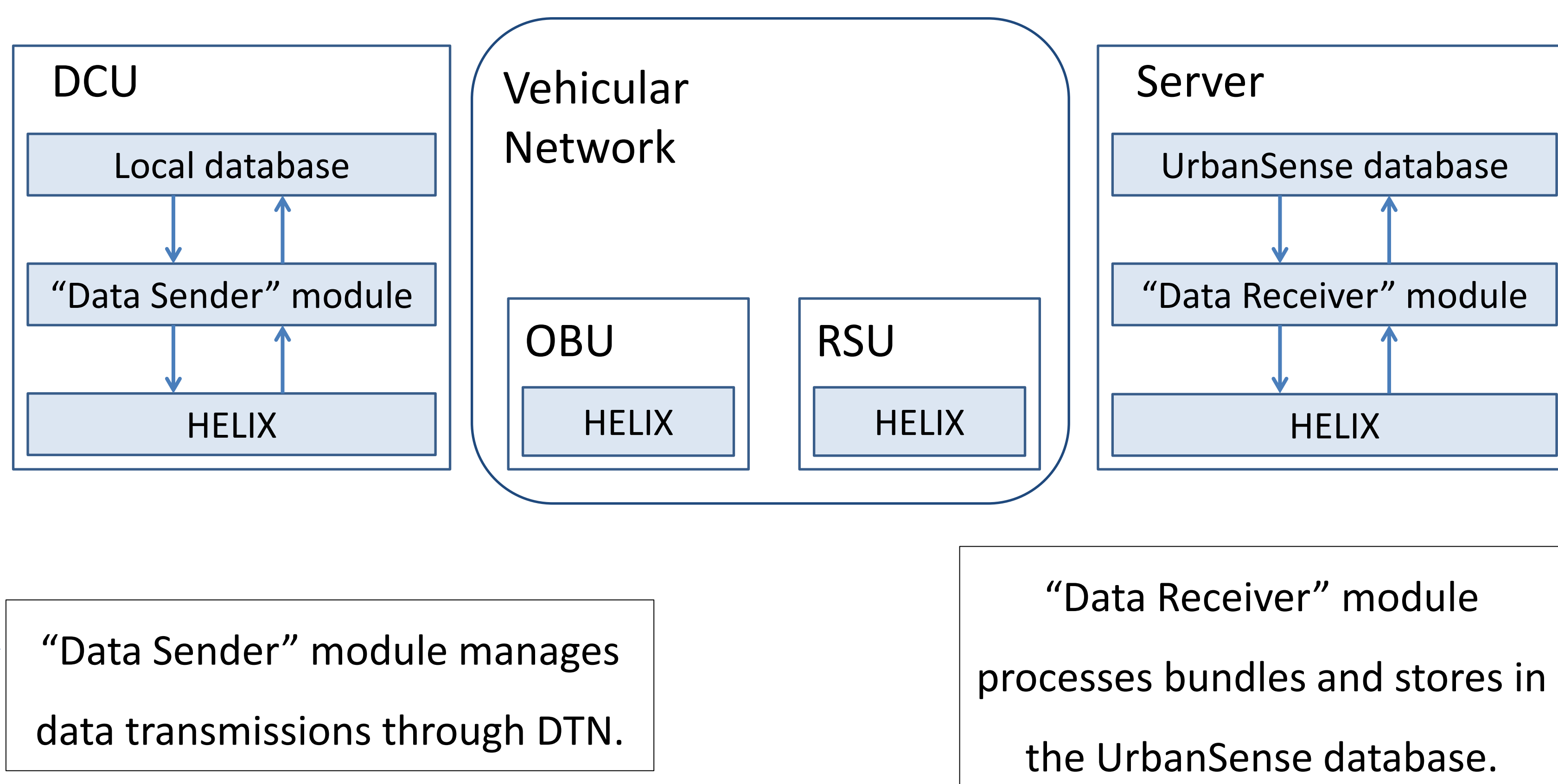- Avoids expensive cellular communication

DCU *Data Collection Unit*
(Sensor cluster with WiFi)

DCU at Rua Damião de Góis

DCU at Rua das Flores

RSU *Road-side Unit*
(Internet gateway for mobile nodes)

DSRC

Sensors:
- Luminosity
- Termometer
- Hygrometer
- Sonometer
- Pluviometer
- Wind Vane
- Anemometer

Inside the box:
- Raspberry Pi
- WiFi antenna
- Control electronics

WiFi

1,2

3

4

Optical fiber

OBU *On-Board Unit*
(Car PC with WiFi and DSRC)

Backend Server
(Stores data of all DCUs)

Operation:

1. DCU searches for AP from bus OBU

2. Data off-loaded to bus OBU using WiFi

3. Data routed to RSU through vehicular network
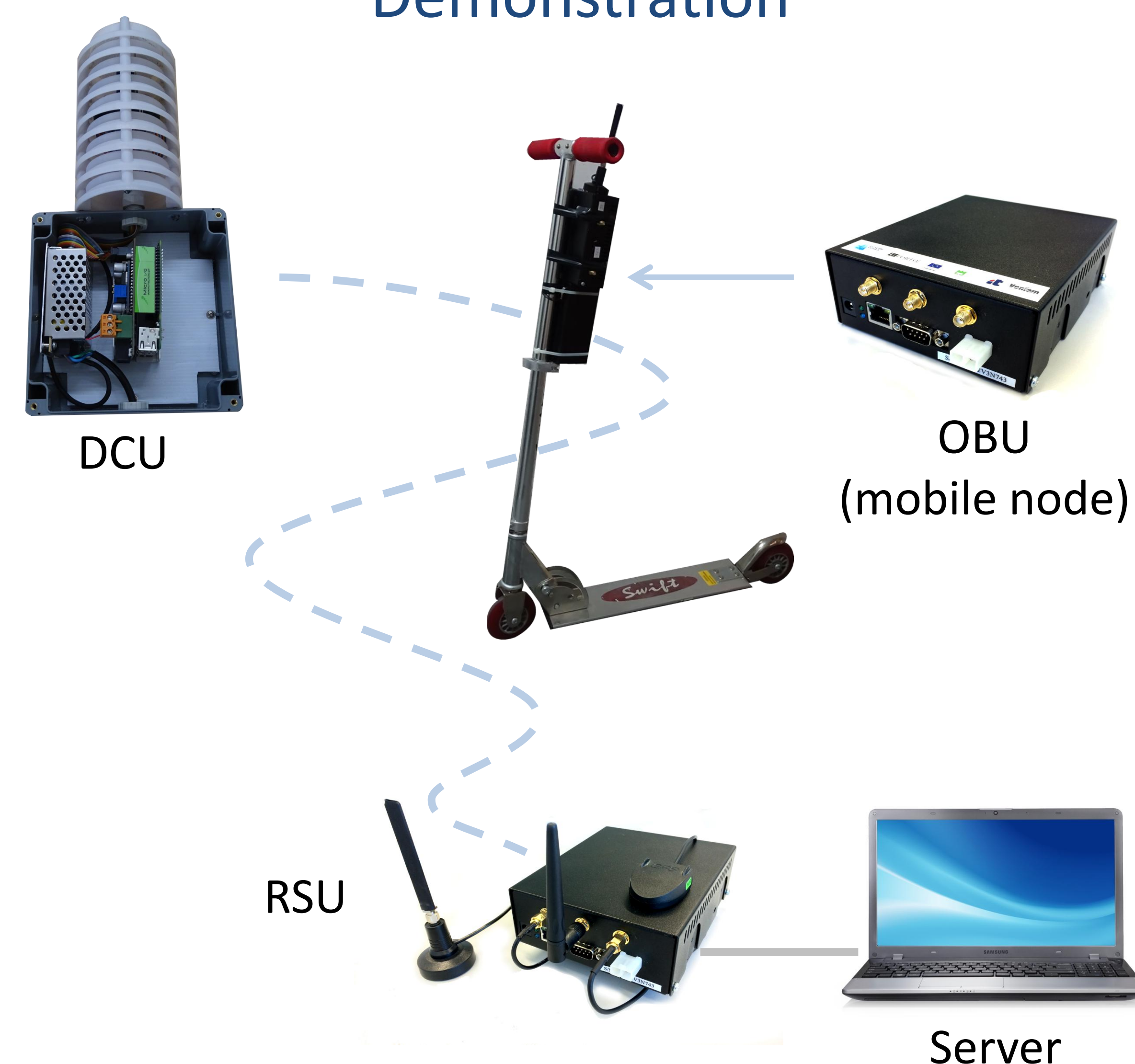
4. Data sent to server via backbone optical fiber

Implementation and Demonstration

Implementation Details

- DTN-oriented *bundle protocol* BP (RFC 5050) is used.

- Software implementation of BP exists in all architecture elements.

- HELIX: VENIAM's implementation of the Bundle Protocol.

DCU
- Local database
- "Data Sender" module
- HELIX

Vehicular Network
- OBU — HELIX
- RSU — HELIX

Server
- UrbanSense database
- "Data Receiver" module
- HELIX

"Data Sender" module manages data transmissions through DTN.

"Data Receiver" module processes bundles and stores in the UrbanSense database.

Demonstration

DCU

OBU (mobile node)

RSU

Server

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