Smart On-Street Parking Assistance System

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Context

Problems:
- Traffic congestion ← cars looking for parking
- Smart parking app - information broadcast → several drivers chasing the same place (conflict)
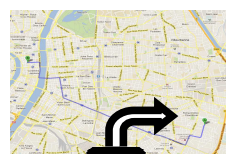- Informations missing or outdated (reliablility)

Objectives:
- Real-time and energy-efficiency WSN
- Parking assistance system based on distributed parking selection model
- Integration of crowdsourcing with the system to improve the information quality
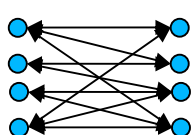
Service
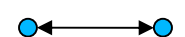
Guidance
- Navigation

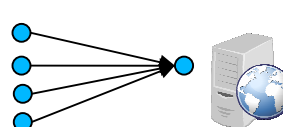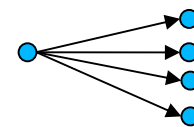### Diffusion
- Information update
  - parking availability
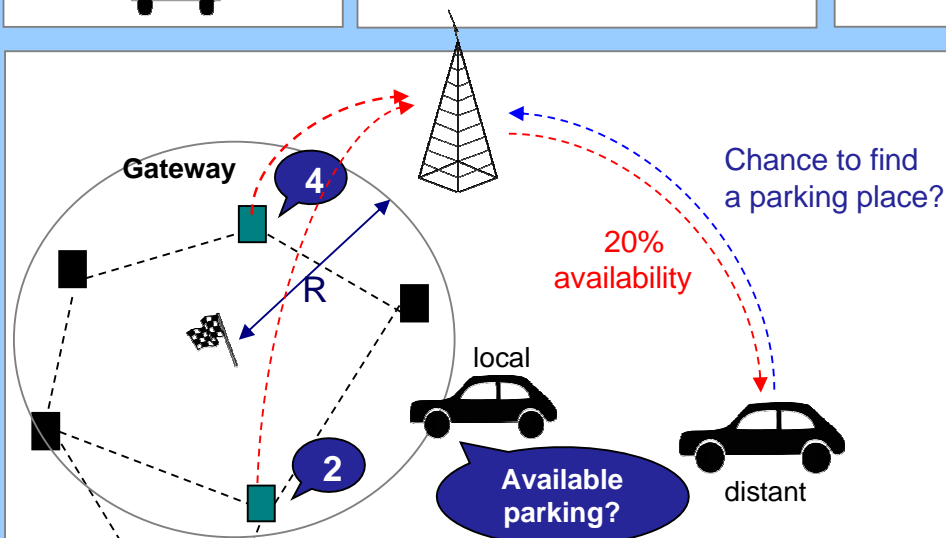 (empty slot detection)
  - parking occupancy

Statistics
- Occupancy rate
- Management

Alert
- Illegal parking
- Low battery status
- Component failure
- System anormality
- etc

Information dissemination

Gateway

4

R

2

local

Available parking?

distant

Chance to find a parking place?

20% availability

- Direct com. (vehicle - GW/server)
- Information augmentation (for drivers)
  - Add the info of parking places into the packet
- Data aggregation
- Information delivery geolcoalized
  - Distant drivers: statistics (time, destination)
  - Local drivers: available parking places
  - Threshold for distant and local drivers
- Crowdsourced information

Real-time WSN

Router

node distance - 2* sensing range < vehicle length

Vehicle departs

Vehicle arrives
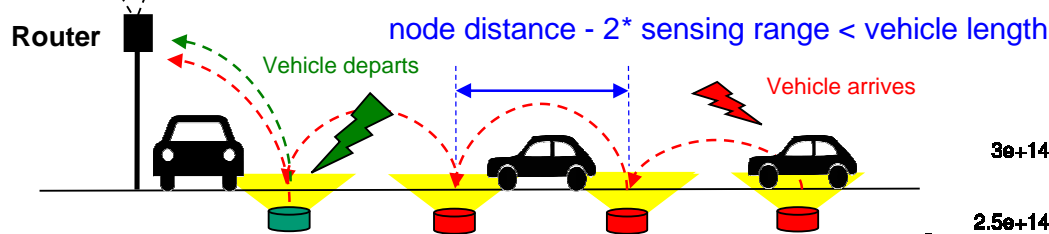
- Measuring real-time information
- Battery-powered (energy constraint)
- Impact from urban environment (packet loss)
- Network performance (delay contraint) << 60s
- Sensor coverage (node density and sensing tech.)
- Traffic variation (vehicles' arrival and departure)

Energy-delay tradeoff in WSN

Energy: BPSK 20kbps
Energy: BPSK 40kbps
Energy: O-QPSK 250kbps
Delay: BPSK 20kbps
Delay: BPSK 40kbps
Delay: O-QPSK 250kbps

Total energy consumption (J)

Delay time (s)

Transmission power (dBm)