

STUDY ON THE IMPLEMENTATION OF WIRELESS SOLUTIONS IN TRANSPORTATION

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Introduction

- ◆ In public transport, communications are already used in many applications. Technology APTS (Advanced Public Transport System for advanced public transportation systems) and "intelligent vehicle" requires integrated communications functions, such as:
 - ◆ interaction between bus and control center;
 - ◆ access lanes to high occupancy vehicles or express buses transport;
 - ◆ priority traffic signals;
 - ◆ multimodal interfaces;
 - ◆ information on multimodal transport;
 - ◆ Information on the vehicle.

International projects - The fleet management

- ◆ Communication Systems;
- ◆ Geographical information systems;
- ◆ Automatic vehicle location;
- ◆ Automatic passenger counting;
- ◆ Software for transport operations;
- ◆ Treatment priorities at traffic signals.

International projects - Tracking system of traffic in real-time

- ◆ Control and monitor transport;
- ◆ Detailed route of vehicle;
- ◆ Communication with drivers via SMS;
- ◆ Helps to increase fleet productivity;
- ◆ Prevents cheating on working time;
- ◆ Allows for better management of labor;
- ◆ Real-time tracking of cargo route;
- ◆ Ability to use Microsoft Map Point or other maps;
- ◆ Enables efficient planning of transport routes;
- ◆ You can easily identify what is carried in tractor trailer.

International projects - Traffic Planning

- ◆ Graphical planning schedules;
- ◆ Review links
- ◆ Park planning optimisation
- ◆ Advanced calendar functions
- ◆ Automatic generation of schedules
- ◆ Fast and efficient;
- ◆ Integrates information in real time
- ◆ Easy to use interface
- ◆ graphical presentation
- ◆ Open platform

International projects - Traffic Management

- ◆ Verify whether in time of ± 1 second;
- ◆ Vehicle diagnostic
- ◆ Vehicle positioning with a map of possibilities for increasing the areas
- ◆ Messages from and to vehicles
- ◆ Alarm signal

Standard technologies for wireless networks



- ◆ IEEE 802.11b
- ◆ IEEE 802.11g
- ◆ IEEE 802.11a
- ◆ IEEE 802.16 - WiMAX

Personalized technologies for wireless networks

- ◆ ISM Band 433.92 MHz
- ◆ Modulation ASK, FSK, PSK, PSK variants
- ◆ Communication channel
 - One channel with carrier sense multiple access with collision avoidance (CSMA/CA)
 - Multi-channel

Implementation (1)

- ◆ The communication data for public transport (RATB) is different from that for private transport (private cars). For public transportation the communication is personalized, that means that is used a non-standard protocol for the application.
- ◆ In terms of data transmitted, in each station is a panel with messages, to inform travelers, and display the current location of the bus station and the estimated time until it reaches the station.

Implementation (2)

- ◆ There are displaying only the buses which should reach, who have not passed the current station (where the panel). That way, they could achieve any various statistics, such as each bus arrived at each station at what time and how it is stayed, there can identify areas and periods of traffic congestion, etc. It can add other information on the panel, too.

Implementation (3)

- ◆ Regarding the transmission of messages may illustrate three approaches:
 - Each mode of transport is a communication hub, which corresponds to mobile ad hoc networks.
 - Each station will be a node, so the routes of RATB become fixed channels of communication.
 - A mixed approach and given that buses and stations are equipped with transceivers.

Implementation (4)

- ◆ Type of messages
 - From bus to bus station
 - From bus station to bus station
 - From bus station to the base station
 - From the base station to the Internet
 - Alerts

Implementation (5)

- ◆ The message from bus contains:
 - a field *ID*, formed by line number and registration mark
 - a field *arrived_time*, the time when the bus will arrived to the next station, computed from its speed and the distance until the station

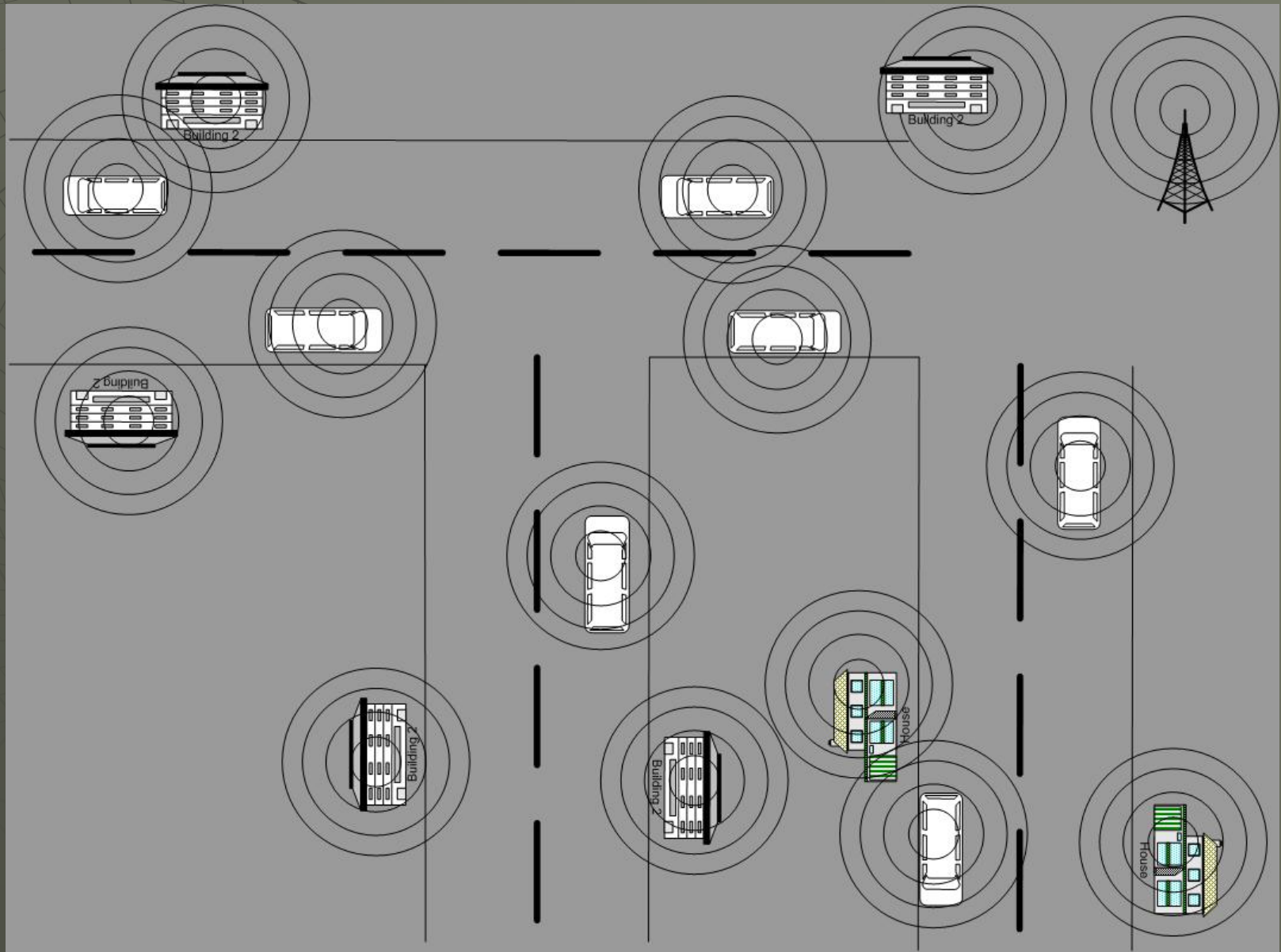
Implementation (6)

- ◆ The messages from the bus station are:
- ◆ A message to the next station and contains:
 - A field *ID* formed by the identifier of the station
 - A field *bus_ID* formed by the ID of the bus
 - A field *arrived_time* which contains the time when the bus will arrived to the sender station

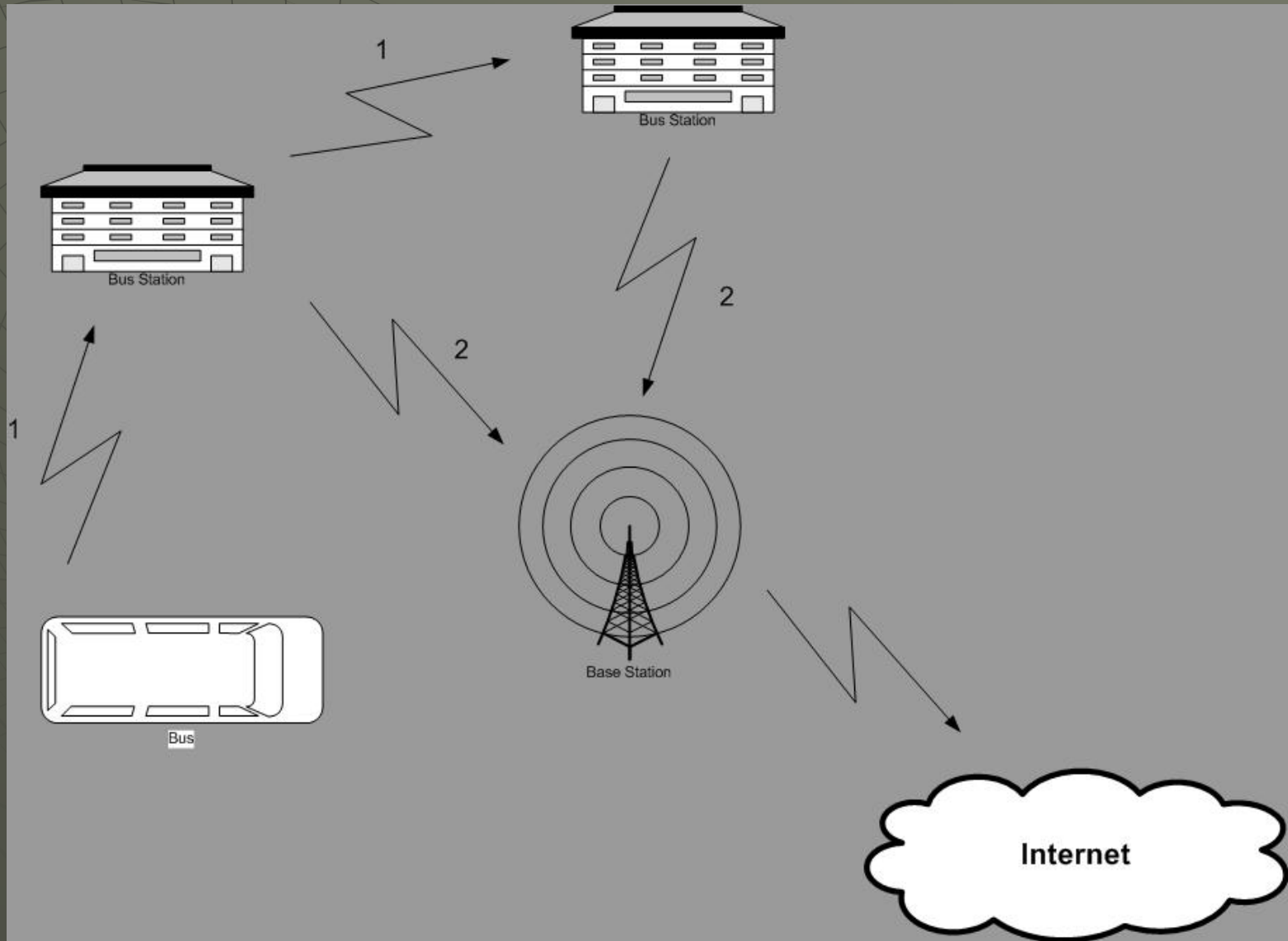
Implementation (7)

- ◆ A message to the base station and contains:
 - A field *ID* formed by the identifier of the station
 - A field *bus_ID* formed by the ID of the bus
 - A field *arrived_time* which contains the time when the bus has arrived to the sender station

Implementation (8)



Implementation (9)



Conclusion

- ◆ Easy to implement
- ◆ Low cost
- ◆ Automatic vehicle location
- ◆ Control and monitor transport
- ◆ Detailed route of vehicle
- ◆ Helps to increase fleet productivity
- ◆ Prevents cheating on working time
- ◆ Allows for better management of labor
- ◆ Park planning optimisation
- ◆ Verify whether in time
- ◆ Alarm signal