



Navigation System for the Visually Impaired Based on an Information Server Concept

Mobile Venue '04, Athens
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Visual impairment and difficulties in navigation

- Public transport accessibility: time tables, finding bus stops and correct vehicle, lack of announcements
- Localisation and environment perception
- Selecting and maintaining a heading
- Detecting obstacles above waist and unexpected roadwork's
- In Finland about 1.5 % of population, most are over 65 years old

Development of Electronic Travelling Aids

- A long history, the use of GPS has been researched since late 80's
- Solutions for single problems
- Work well in small scale implementations, but a large scale implementation would be extremely costly (especially special devices and beacon based systems)
- The most important guidance aids are still the white cane and guide dog. Electronic travelling aids are only complementary equipment

Used Approach

- Standard mobile devices
- Based on personal navigation services and products
 - Modular, easy to update
- No installations to buses or anywhere else
- Improve the accessibility of public transport information services and route planners
 - www information is up-to-date, possibility to use real time information
 - interfaces and protocols a problem
- Service affordable for the users, no SMS/MMS pricing
- Service must be easy and very fast to use
- Speech user interface
- Easy to customize for various user groups and purposes
- Applicable both indoors and outdoors
 - accurate/indoor maps, positioning and guidance

Noppa Pilot Project 2002-2004 (a pre-study 2001)

- National pilot project, 500 k€
- Ministry of Transport and Communications Finland's Passenger transport information programme:
Accessing information, unbroken trip chain
- Project Participants:

[Ministry of Transport and Communications Finland](#)

[Helsinki Public Works Department](#)

[The City of Espoo](#)

[Finnish Federation of the Visually Impaired \(FFVI\)](#)

[Arla Institute](#)

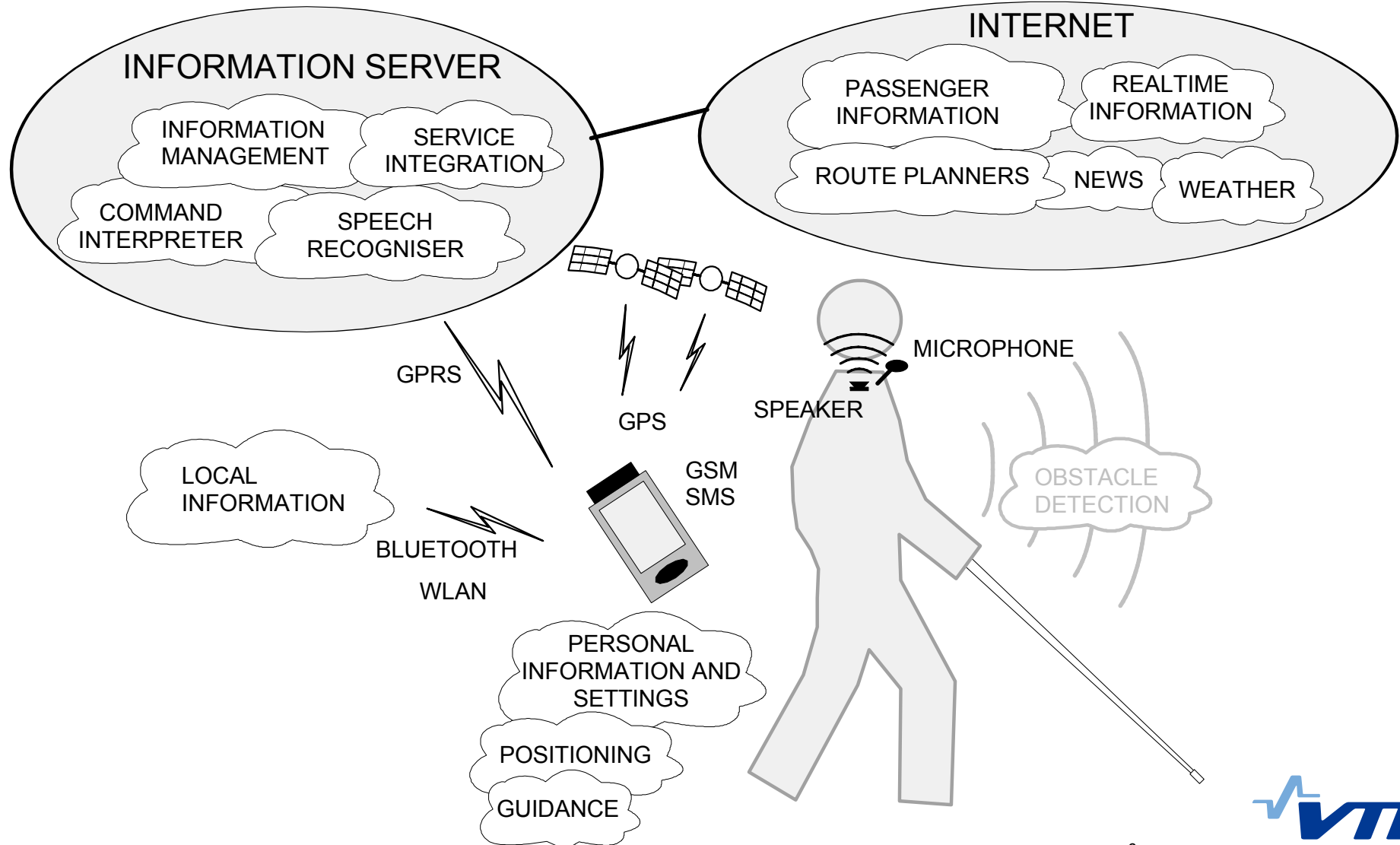
[Helsinki Metropolitan Area Council](#)

[Finish Rail Administration](#)

[Finish Road Administration](#)

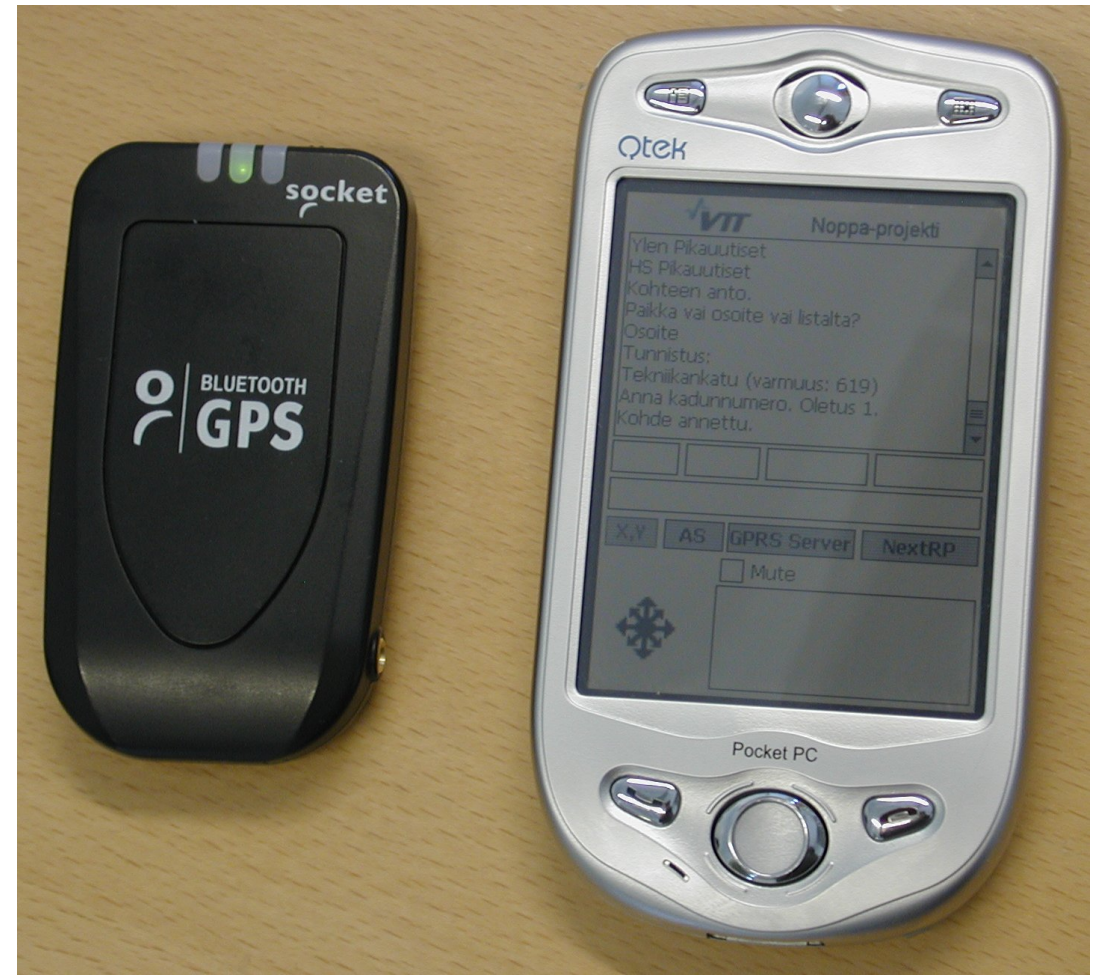
[Helsinki City Transport](#)

Noppa Architecture

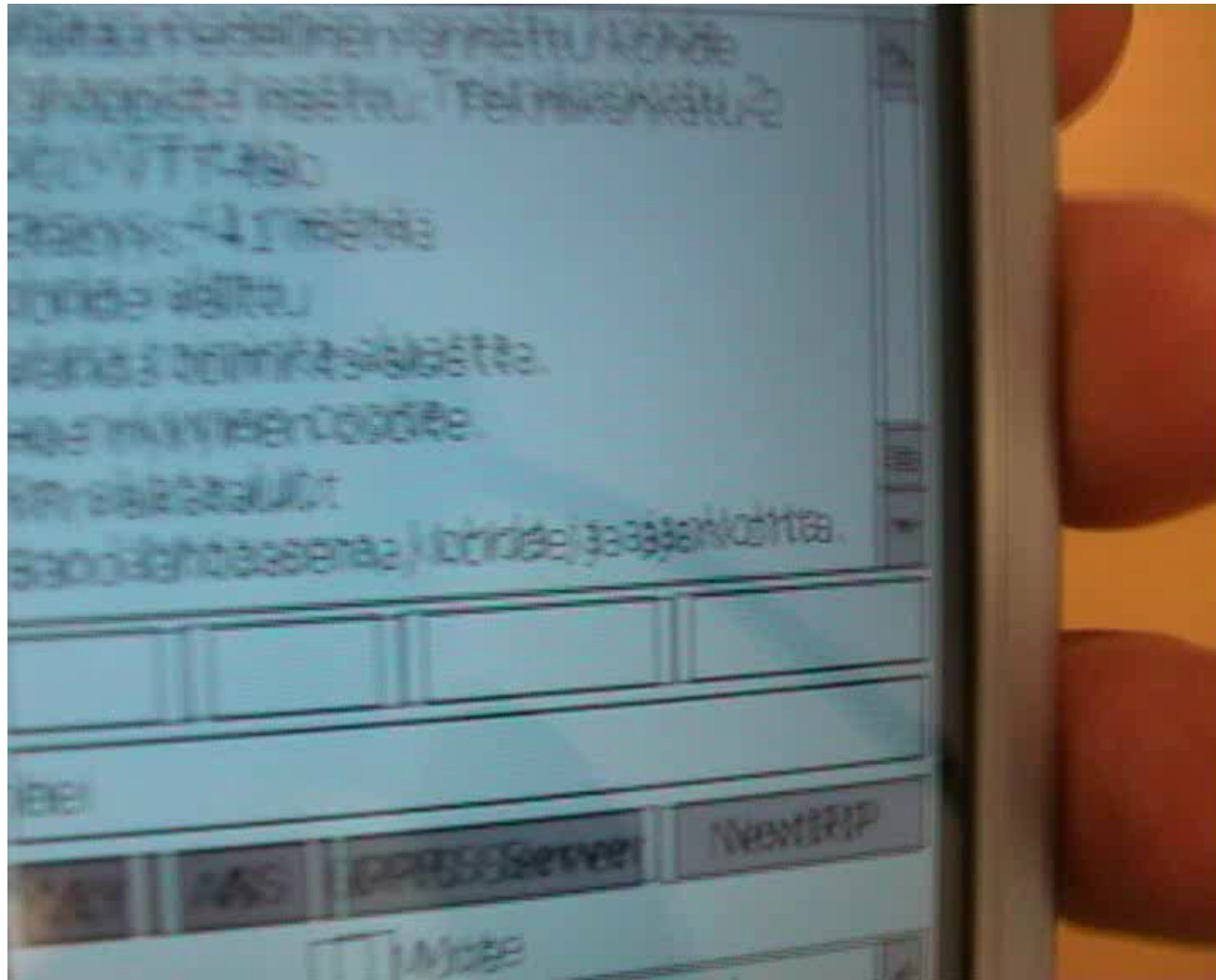


Current Prototype

- 6 user server program
- Speech user interface
- Microsoft Pocket PC Phone Edition / Symbian Series 60
- GPS (optional: pedometer & compass)
- GSM phone and SMS services
- Time tables, airport departures
- Route planning & guidance in four cities (bus, train, tram, metro)
- Personal stop announcements
- Early development: bus and train real time information
- Pedestrian guidance (also recorded routes, search of current address)
- Connection to a roadwork database
- News, watch, local weather, voice memo



Service example: Next trains from Tampere to Helsinki



Guidance Issues: Positioning and Map Accuracy

GPS receiver problems:

- Operating time if < 12 hours
- TTFF if > 30 s
- Sensitivity in indoor/bus

Maps:

- Maps are made for car navigation, not for pedestrians
- No indoor/accurate map standard
- Lot of work to add or collect data
- Generally: maps are not accurate - nor positioning

Helsinki Metropolitan Council's Public Transport Journey Planner

From
Parliament Building, Helsinki 🔍

To
Pasila Railway Station, Helsinki 🔍

Time
13 : 10 Departure Arrival

Date
30 . 04 . 2004 ▼

SEARCH

1. Parliament Building - Pasila Railway Station

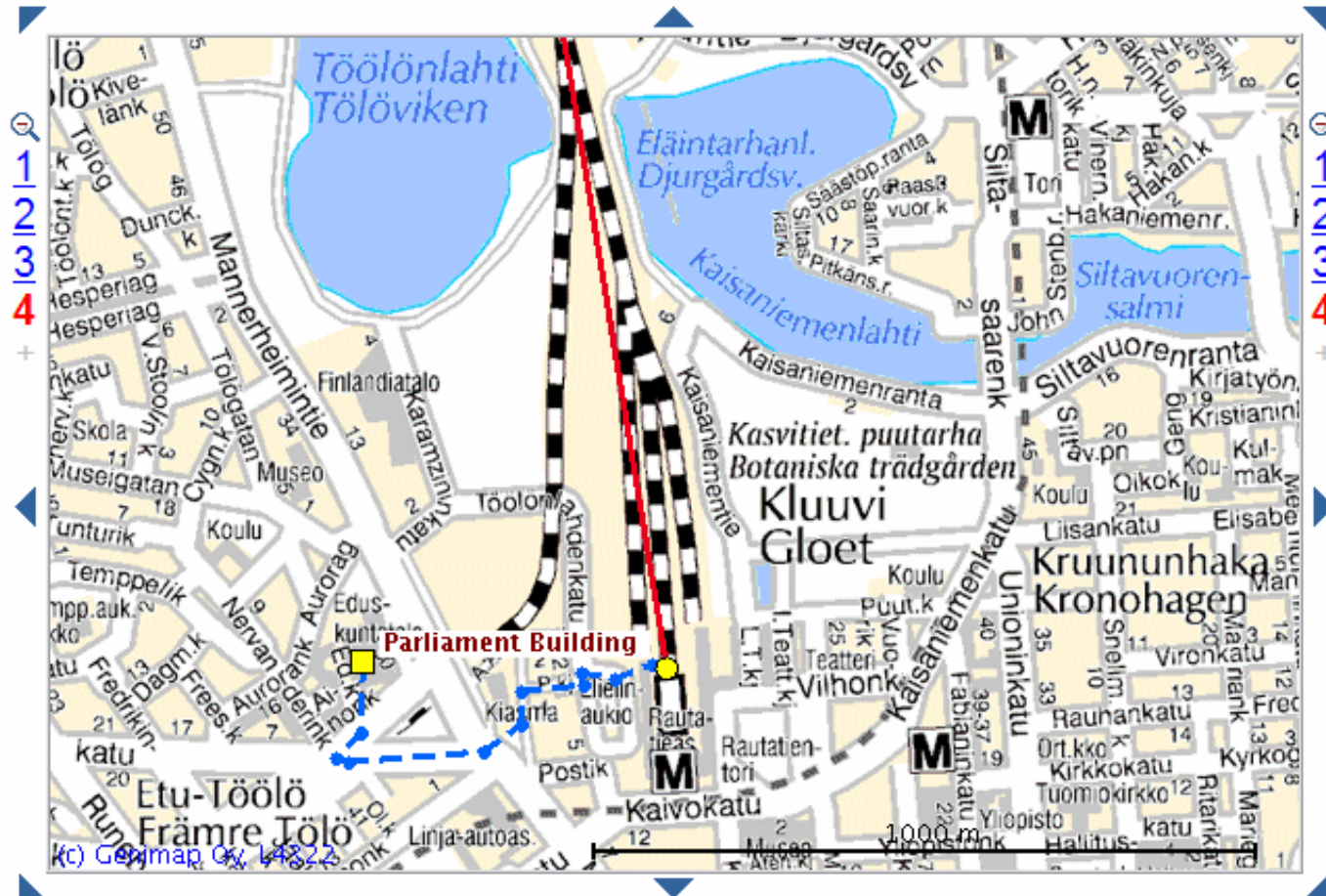
Linja	Origin	Start at
Walk	Parliament Building	13:10
P-Train	Hki, rautatieas/VR	13:22
Walk	Pasila,päärata/VR	13:27
at dest.	Pasila Railway Station	13:27

- [Show route on the map](#)

- An advanced route planner available with HTML and XML interfaces
- Some pedestrian route information
- Accurate bus stop coordinates, data quite up-to-date
- The same product in use in other cities



JOURNEY PLANNER



[Start - End](#)

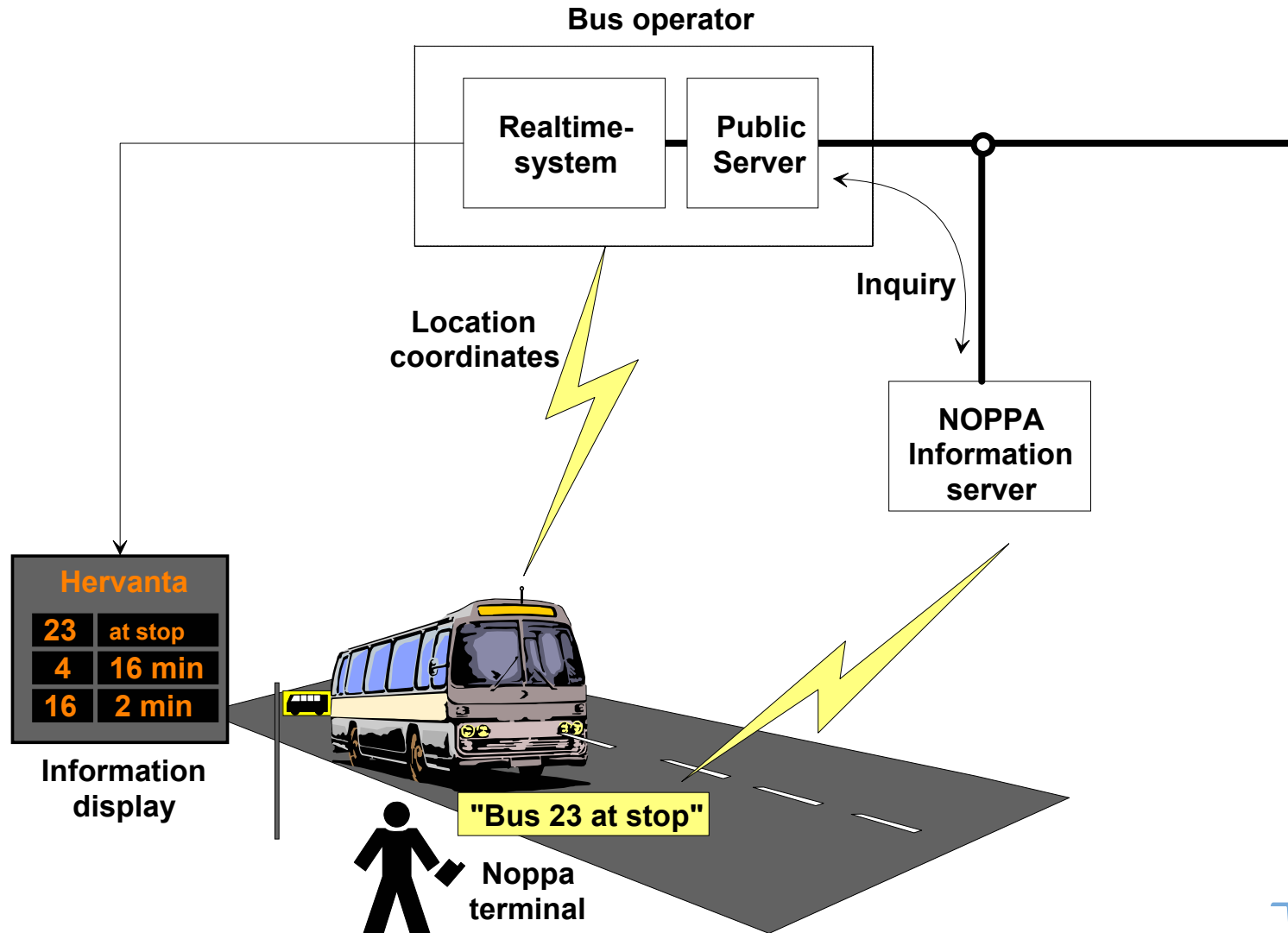
- [Show listing of stops on the route](#)

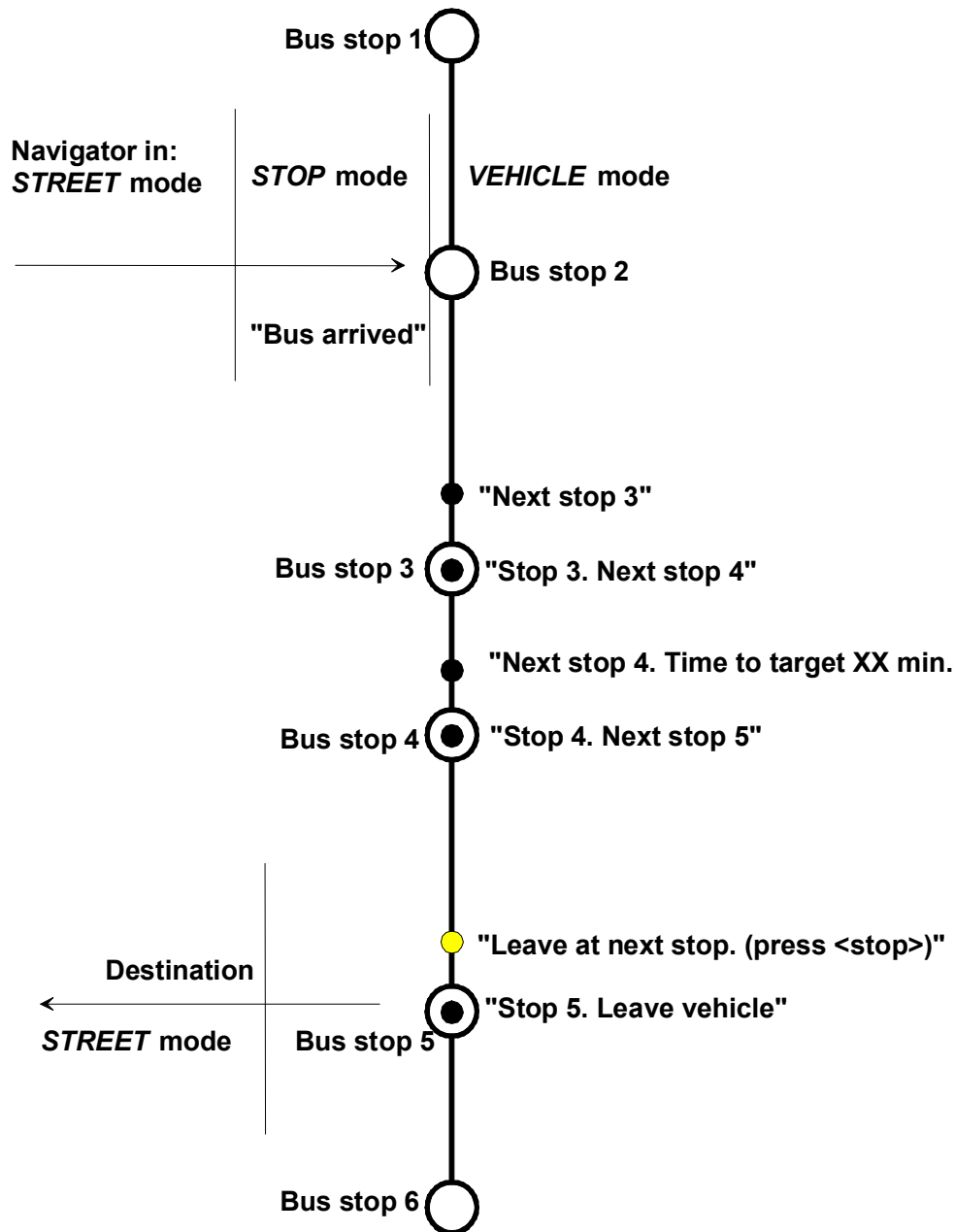


Public Transport Real Time Information

- Exact time of e.g. bus arrival helps the visually impaired
- Personal stop announcements
- Use of WWW and navigation systems to replace radio beacon systems / real time displays. No installations
- Problems with interfaces and availability

Real Time Information Flow





Personal Stop Announcements

- Both when waiting on stop and in-vehicle
- The visually impaired, minor languages, tourists
- Results: Excellent operation based just on route plan when GPS signal available

Conclusions - Service Concept

- The prototype fills the set requirements
- A Smartphone and a GPS are expensive (1000 euro)
- The service is cheap to provide, minimum work to maintain
- All the information is originally produced for other purposes, it's about finding new uses to the information and bringing it to the users
- Group server / Service portal must be cheap, a monthly fee?
Large volumes
- The information server (client-server) concept has also other use