EGNOS: an emerging technology to support urban transport

POLIS – Bruxelles – November 2011

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21 October 2011 : GALILEO becomes a reality

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What is EGNOS?

6 Navigation Land Earth Stations

34 Ranging & Integrity Monitoring Stations (RIMS)

GPS signals

2 Support Facilities

4 Mission Control Centres

EGNOS Service Area

3 GEO Satellites

EGNOS Satellite Footprints

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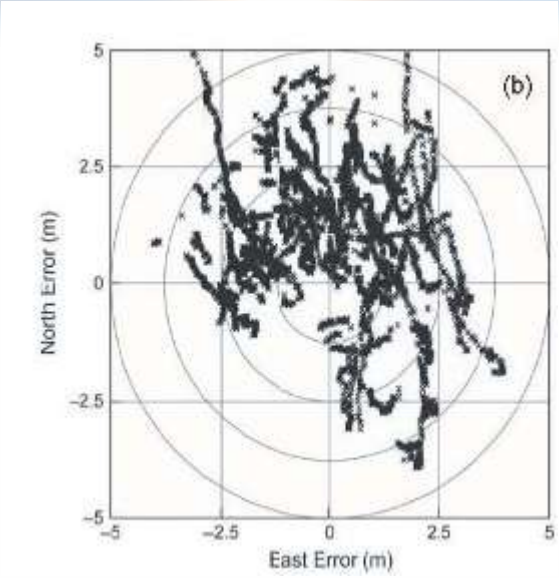
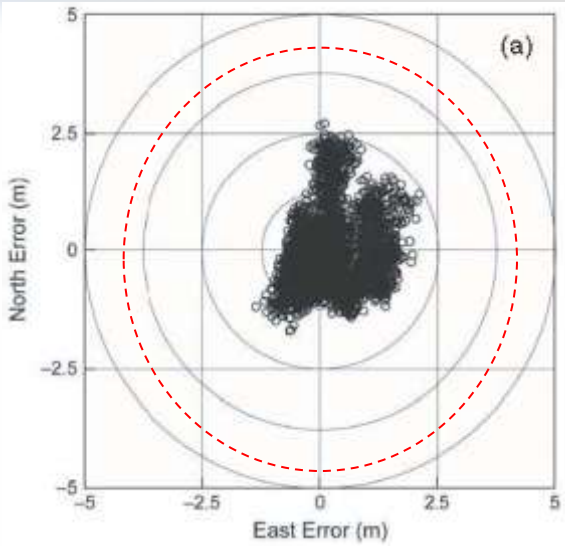
What is provided by EGNOS?



GPS



SBAS (EGNOS)

- EGNOS Open Signal added value
  - → enhanced accuracy in the position
- EGNOS Commercial Serivce/EDAS added value
  - higher availability of the enhanced accuracy
  - qualification/ confidence in the position (so called “protection level”)

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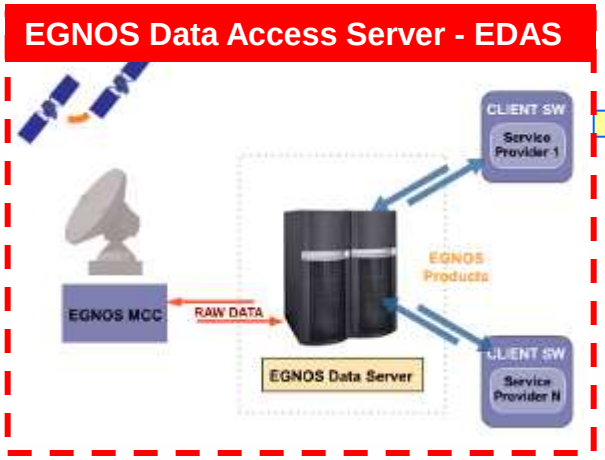
What is EDAS ?

The EGNOS commercial service (EDAS) will be made available in 2012



EGNOS data (real-time):

- **RIMS raw observations**
- **SBAS messages**

Value-added service provider

End users

- EGNOS corrections are broadcasted through Internet ou GPRS
- Better availability in urban and difficult environments

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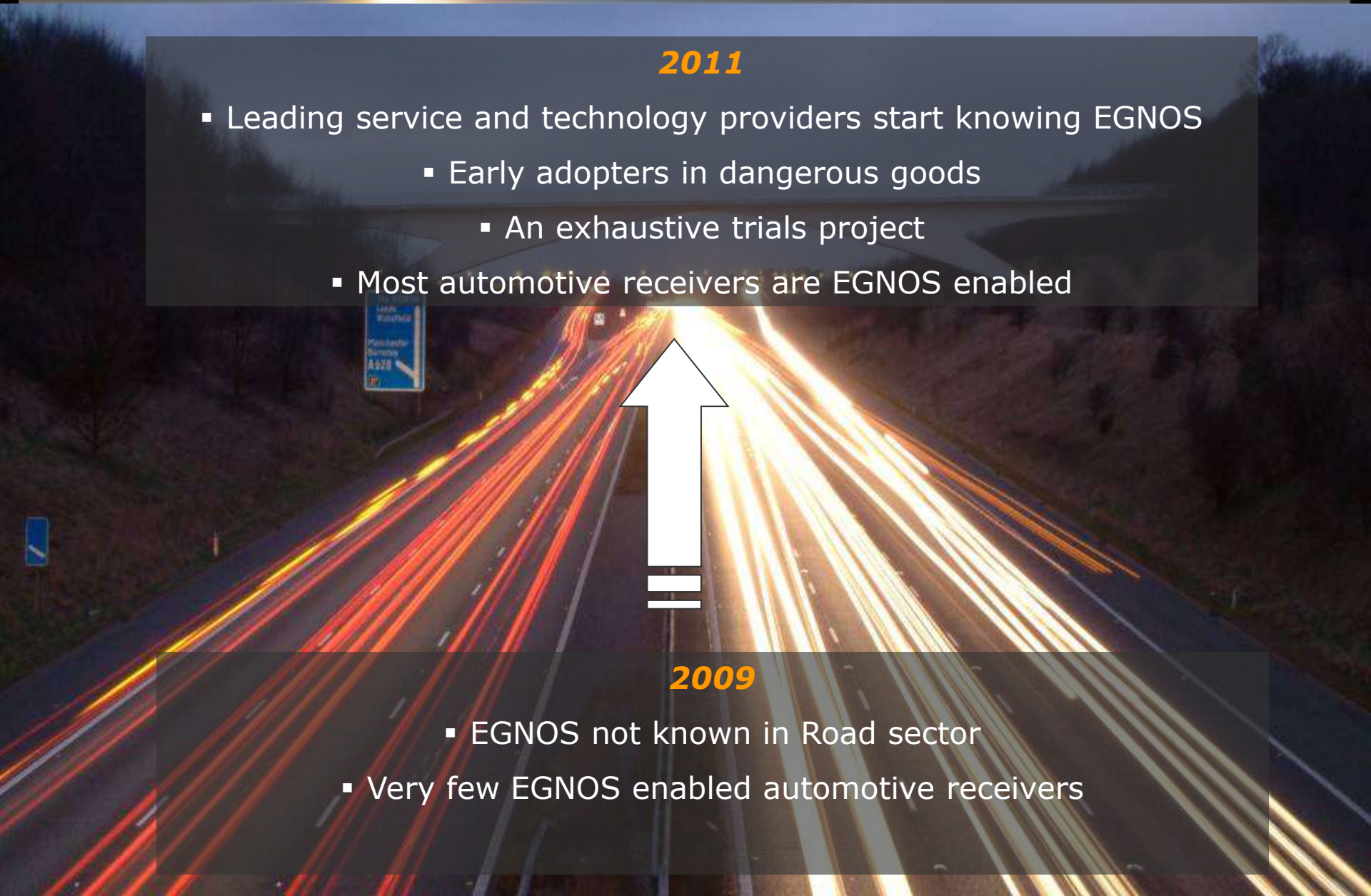
Availability of EGNOS for Road applications



2011

- Leading service and technology providers start knowing EGNOS
- Early adopters in dangerous goods
- An exhaustive trials project
- Most automotive receivers are EGNOS enabled

2009

- EGNOS not known in Road sector
- Very few EGNOS enabled automotive receivers

EGNOS 2 road Project

EGNOS2road project was run to provide a **technical and economical evaluation** of the use of EGNOS/ Galileo wrt GPS for road transport in extra-urban and urban applications

EGNOS2road has been funded by the European Commission and ended in August 2011

Trials were performed with the

- **EGNOS open Service**
- **EGNOS commercial service (EDAS)**

Business cases

Extra-urban business cases:

- Road charging
- Tracking & tracing of third-party service fleets

Urban business cases:

- Tracking & tracing of touristic coaches
- Tracking & tracing/ monitoring of access/ circulation in Limited Traffic Zone (LTZ)
- Tracking & tracing of Local Public Transport fleets operated by a Service Provider
- Management and monitoring of vehicles for goods delivery in a large urban area, according to the local regulation

Involvement of two road operators:

- Extra-urban/ Società Autostrada Tirrenica
- Urban/ City of Rome

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Trial campaign (1)

Conducted along extra-urban and urban road networks/ driving environments/ critical and interesting stretches

Using EGNOS-ready technology available on the market:

- **GPS/EGNOS off-the-shelf receivers and antennas**
- **Commercial device for the automotive markets**
- **Proven solution EGNOS CS/EDAS enabled**

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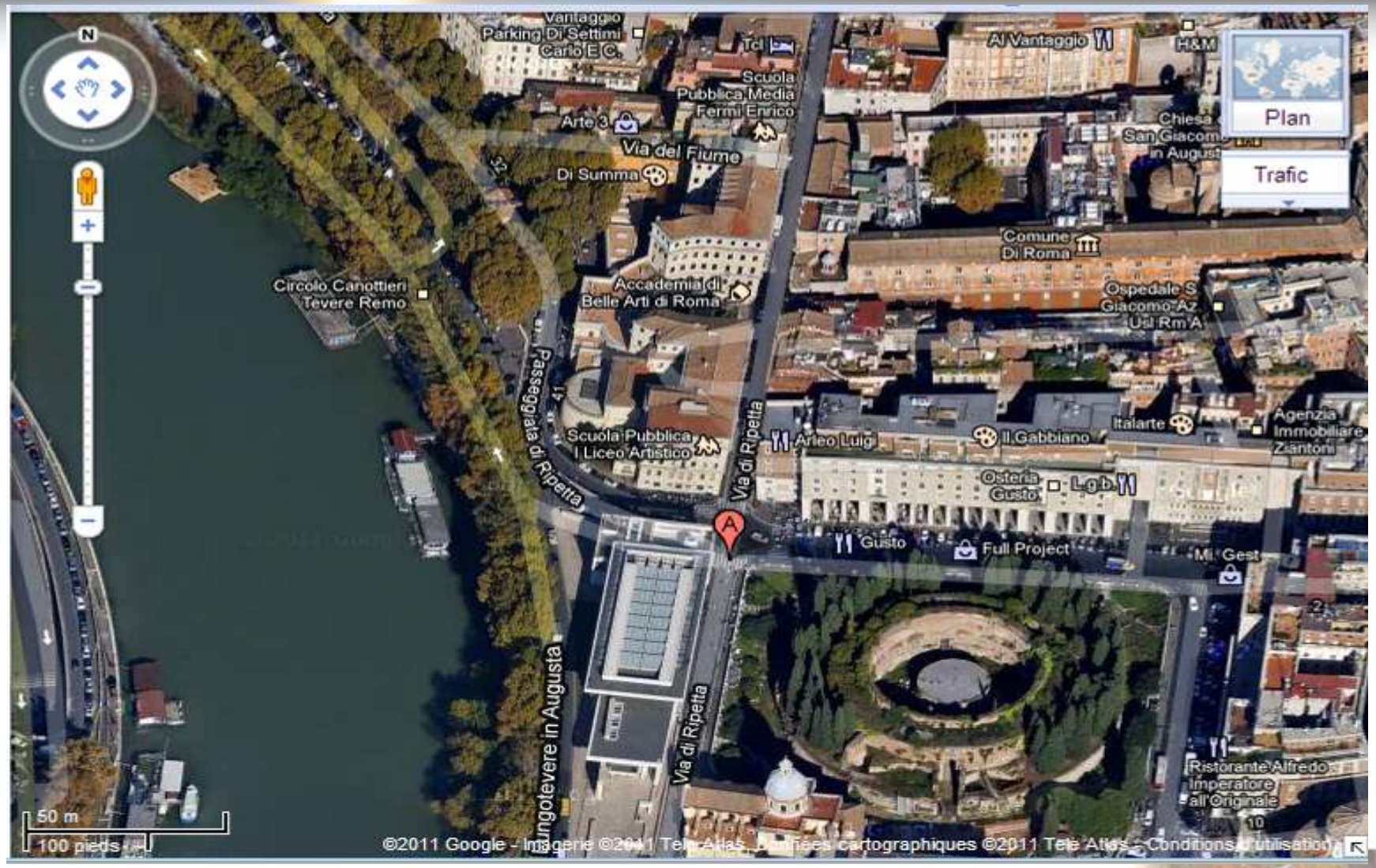
Trial campaign (2)

- Different types of GPS/EGNOS receivers/ antennas
- Different types of vehicles

Example of test configuration in Roma

Roma Via di Montserrato

Example of test configuration in Roma



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Roma Via di Ripetta

Example of test configuration in Roma

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Roma Via di Panico

EGNOS CS/EDAS processing

EGNOS msg

Positions and raw data

LCS

Corrected positions and Protection level

Measurements of:

- **Accuracy of the position** wrt to a reference trajectory (true path)
- **"Protection level"** providing the qualification/ level of confidence in the position (thanks to the processing of EGNOS integrity)

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EGNOS performances wrt GPS

EGNOS OS and EGNOS CS/EDAS key performance values (average) for horizontal accuracy and protection level

GPS (m)	EGNOS OS (m)	EGNOS CS (m)	EGNOS CS HPL (m)
2,0	1,4	1,1	9,1

EGNOS OS →higher accuracy wrt GPS

GPS (m)	EGNOS OS (m)
1,4	1,0

Extra-urban environment

GPS (m)	EGNOS OS (m)
7,4	3,4

Urban environment

EGNOS CS/EDAS → higher accuracy wrt GPS + qualification/ confidence on the position

EGNOS CS (m)	EGNOS CS HPL (m)
0,9	8,8

Extra-urban environment

EGNOS CS (m)	EGNOS CS HPL (m)
1,8	10,9

Urban environment

Availability
96,91%

Number of positions for EGNOS CS/EDAS processing

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EGNOS added value in extra-urban roads

True path ☎

GPS (m)	EGNOS OS (m)	EGNOS CS (m)	EGNOS CS HPL (m)
7,4	3,4	0,9	8,8

Enhanced accuracy and "protection level" provided with EGNOS allow to:

- Distinguish two close/ parallel roads of different networks, typically tolled and not-tolled stretches (e.g. motorway very close and parallel to secondary lane, motorway and secondary lane crossing each other)
- Distinguish the position of the vehicle just after/ before a motorway intersection or ramp near the gates

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EGNOS added value in urban roads

True path ☎

GPS (m)	EGNOS OS (m)	EGNOS CS (m)	EGNOS CS HPL (m)
8,5	6,0	1,8	10,9

Enhanced accuracy and "protection level" provided with EGNOS allow to:

- Distinguish close/ parallel roads in various LTZ areas where different rules/ pricing schemes are applied
- Distinguish roads in dense urban areas inside/ outside the LTZ areas
- Monitor in real-time vehicles itineraries and stops, in line with permits
- Have a reliable positioning of urban regulated fleets

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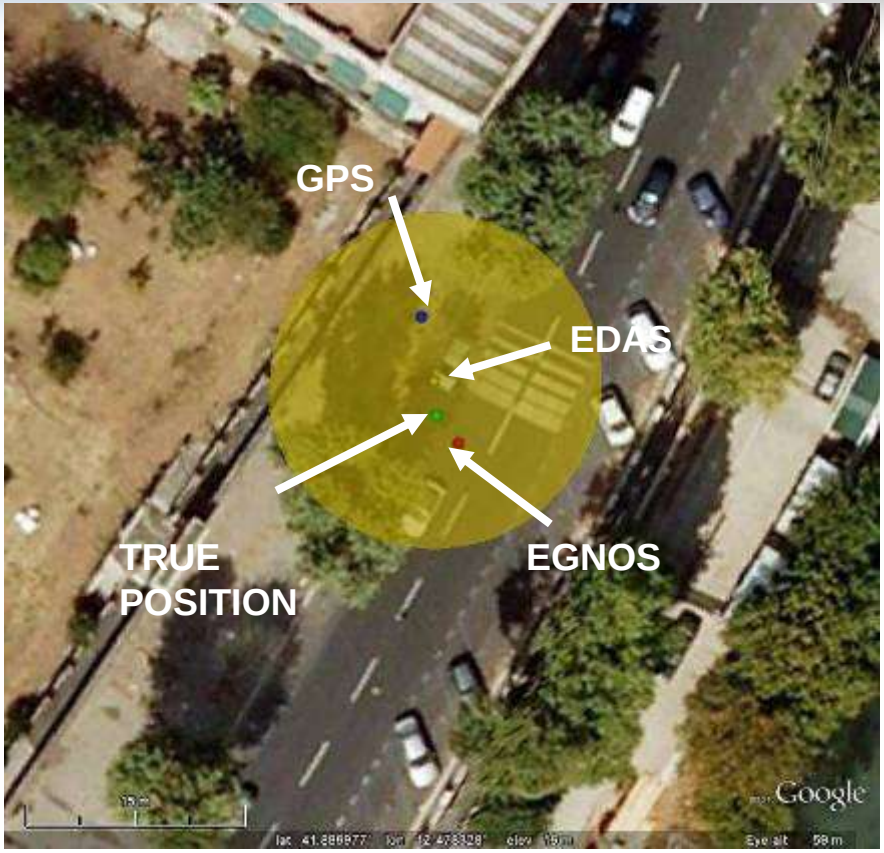
Roma : Lungotevere Ripa – standard antenna



GPS

EGNOS CS/EDAS

EGNOS OS

True Position

GPS HNSE (m)	EGNOS OS HNSE (m)	EGNOS CS/EDAS HNSE (m)	EGNOS CS/EDAS HPL (m)
6.6	2.4	2.3	11.2

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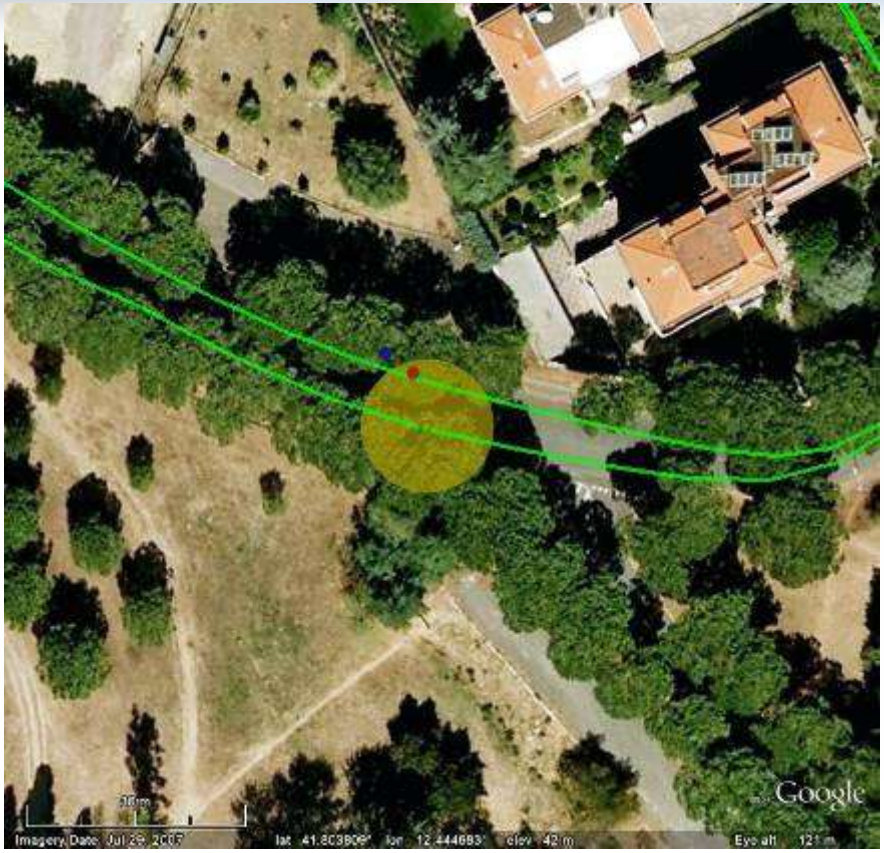
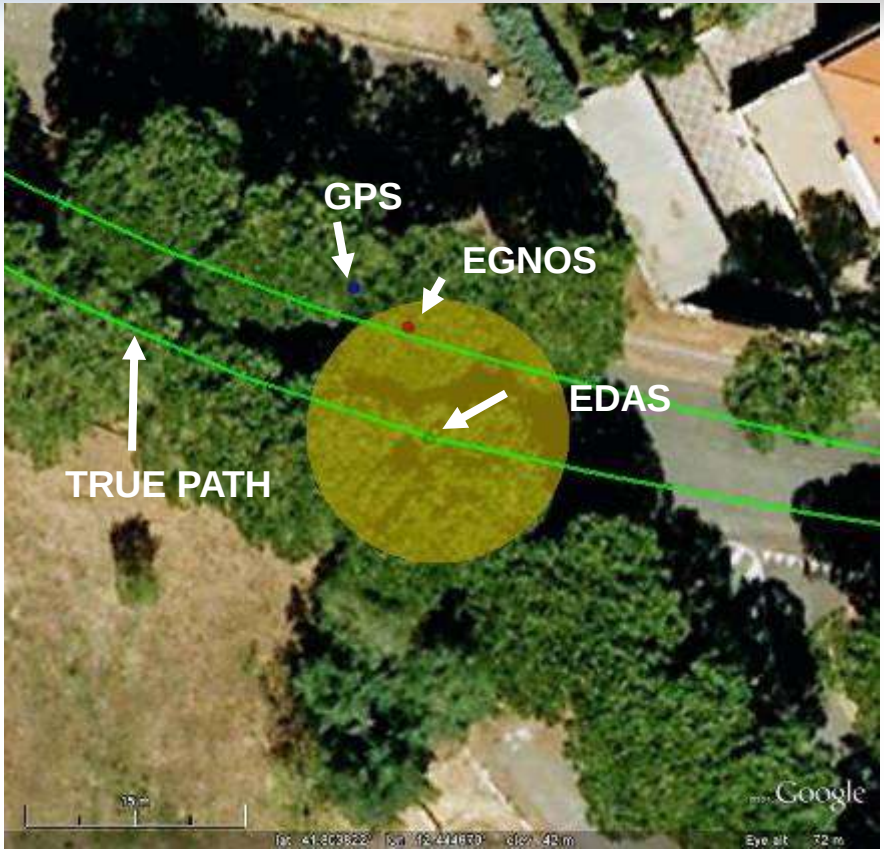
Roma : Via I. Vivanti





GPS

EGNOS OS

EGNOS CS/EDAS

True Position

GPS HNSE (m)	EGNOS OS HNSE (m)	EGNOS CS/EDAS HNSE (m)	EGNOS CS/EDAS HPL (m)
11.3	7.5	0.5	8.9

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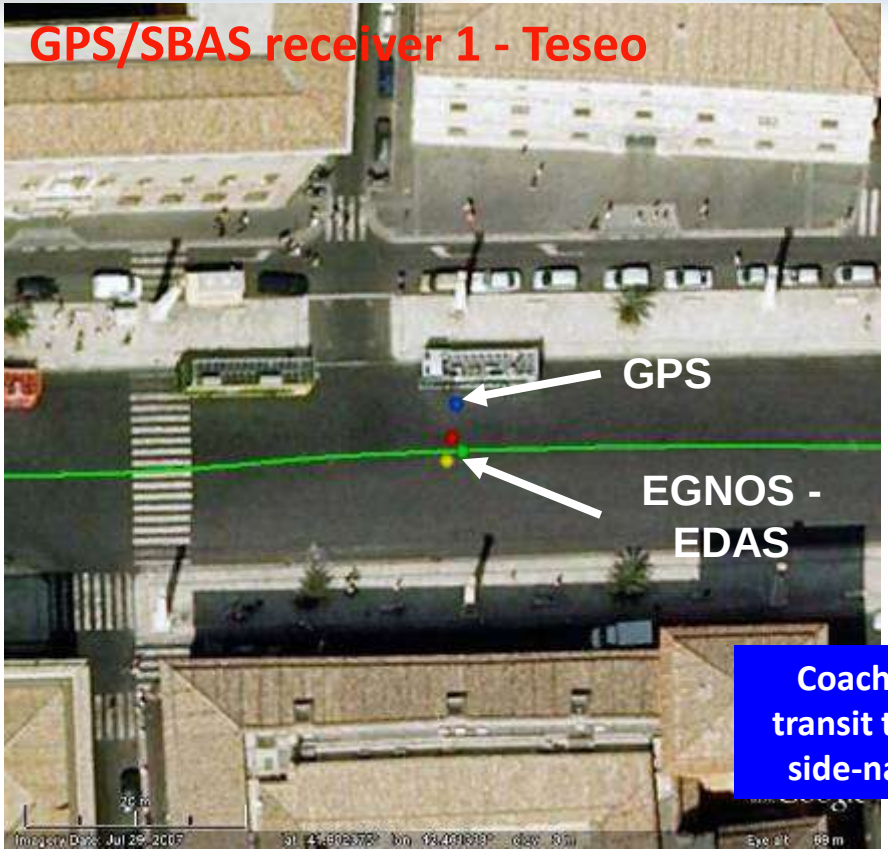
Case of close / parallel roads



Coaches cannot transit through the side-narrow lane

GPS | EGNOS CS/EDAS | EGNOS OS | True Position

GPS HNSE (m)	EGNOS OS HNSE (m)	EGNOS CS/EDAS HNSE (m)
4,3	1,5	1,5

GPS HNSE (m)	EGNOS OS HNSE (m)	EGNOS CS/EDAS HNSE (m)
4,2	2,3	0,9

HNSE gives the horizontal accuracy of the measured position wrt true position

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EGNOS opportunities in extra-urban business cases

EGNOS OS:

- Road charging
- Tracking & tracing of third-party service fleets

Added value is the enhanced accuracy

Zero costs in new systems

EGNOS OS suggested in new systems by the both road operators

EGNOS CS/EDAS:
Road charging

Added value: enhanced accuracy and guarantee/ qualification of position

Potential to bring economical benefits generated by claims reduction

Potential interest for a European Tolling Service Provider

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EGNOS opportunities in urban business cases (1/2)

EGNOS Open Service:

- Tracking & tracing of touristic coaches
- Tracking & tracing/ monitoring of access/ circulation in LTZ zones
- Tracking & tracing of Local Public Transport fleets
- Management / monitoring of vehicles for goods delivery

Added value is the enhanced accuracy

Zero costs in new systems

EGNOS OS suggested in new systems

For the Local Public Transport fleets, RSM is also evaluating its adoption in existing systems

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EGNOS opportunities in urban business cases (2/2)

EGNOS Commercial Service/EDAS:

- Tracking & tracing of touristic coaches
- Tracking & tracing/ monitoring of access/ circulation in LTZ zones
- Management / monitoring of vehicles for goods delivery

Added value: enhanced accuracy and guarantee/ qualification of position

Potential for a regulated use that brings economical benefits generated by revenues increase (thanks to new subscribers and correct behaviour of present subscribers, claims reduction and efficient personnel operations, social benefits)

Regulated use requiring type approval for legal value

- Tracking & tracing of Local Public Transport fleets

Position guarantee perceived interesting value by RSM, enabling to qualify position data from the different Local Public Transport Service Providers

Summary of Key findings

Positive feedbacks on EGNOS use from both road operators:

EGNOS OS added value is the enhanced accuracy at zero costs in new systems → EGNOS Open Signal is recommended in new systems for all extra-urban and urban business cases

EGNOS CS/EDAS added value is the enhanced accuracy and guarantee/ qualification, that has the potential to:

- **bring economical benefits**
- **give service robustness for starting a type approval (i.e. legal use)**

EGNOS CS/EDAS enabled solutions are proven for road applications and ready to use.

EGNOS CS/EDAS economical benefits depend on the business case (e.g. network extension, number of vehicles, etc.)

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Thank
you