A CTS for the New Rome Exhibition

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Summary

- Overview of Rome Demonstration;
- The CTS;
- Problems met;
- Future developments;
- Conclusions.
Rome Demonstration

Rome Demonstration is a Cybernetic Transport System linking the New Rome Exhibition car park with the main gates of the Exhibition. The Rome Demo is one of the most important demos within CityMobil and the local partnership is composed by:

- IT “Ingegneria dei Trasporti”;
- Municipality of Rome;
- ATAC;
- Robosoft.
- Located 5 km from International airport
- And about 20 km from Rome centre.
CTS layout

- Track round trip length of 1.617 m;
- 11 stops (2 close to the main entrances);
- 2 Cybercars (6 with the extension)
Est entrance view
P1 car park
The CTS

A CTS is designed to provide an on-demand service on a dedicated network in a mixed environment at least with pedestrians and bikes.

The Rome Demonstration is composed by three main components:

• The Cybercars (the vehicles);
• The fleet management system;
• The Civil works.
Cybercars

- Robosoft has produced two Cybercars for the Rome Demo and one is already in Rome.
- Robosoft has also developed the fleet supervision system.
Cybercar main data

- Max speed 24 km/h;
- Max acc./dec. 0.5 m/s$^2$ (in case of emergency deceleration is about 2.2 m/s$^2$);
- Capacity up to 30 passengers;
- Autonomy about 70-80 km;
- Hybrid navigation system: data fusion of: odometer, gyroscope and Differential GPS (no need of infrastructure). Lateral error from trajectory at 24 km/h under 3 cm;
- Two obstacle detection systems:
  - Laser scan decelerating the Cybercar according to obstacle distance;
  - Emergency bumper activating emergency break in case of contact with any obstacle.
Type of services in Rome

- CTS can provide a on-demand service in a mixed environment;
- Passengers will be able, through the HMI to select the destination stop;
- The on demand service will be elevator like, passengers will arrive to the station and call for a vehicle and select destination on board.
Fleet Supervision system

- Located in the control room, with personnel supervising it;
- Connected to stations and station doors by LAN and Modbus;
- Supervision of vehicles and coordination in on-demand mode (3G connection with the vehicles);
- In case of any malfunction can stop automatically vehicles... but to restart personnel intervention is needed.
Civil Works main data

Civil works design was heavily affected by the certification process.

- The track will have a round trip of 1.6 Km and will be totally segregated:
  - Fences of 1.4 m height around the track;
  - Station doors that open when the vehicle stop at the station.
- A depot for 6 cybercars plus room for cybercar maintenance operations;
- A control room hosting the fleet supervision system and surveillance personnel.
The certification process

- Early discussion with Ministry of Transport (MoT) to define the certification legal framework and strategy and the main CTS requirements (Sep. 2007-Jul. 2009);
- Official delivery of the CTS design and delivery of further documentation to clarify different aspects to MoT (July 2009 – Dec. 2010);
- Certification of the CTS by the interministerial committee (15th December 2010);
- Start of the official tests with the MoT to verify that the CTS behaves according to designs provided (starting soon).
Certification Strategy

- Italian Ministry of Transport (MoT) asked for railway certification (EN50126):
  - CTS totally segregated from vehicles and pedestrians;
  - CTS certified as a whole (civil works, control system and vehicles).
- A step by step certification strategy was agreed:
  1. Fixed frequency service;
  2. On demand service;
  3. Insertion of pedestrian crossing in the track.
Rome Demo certification

- A first version of the CTS final design officially provided to MoT in July 2009;
- The Failure Mechanism Effects Criticality Analysis (FMECA) was run on the CTS design and coordinated by TNO. Provided to MoT in September 2009.
- Two further rounds of documents were provided to MoT in May 2010 and November 2010.
MoT Approval of CTS

On 15\textsuperscript{th} of December 2010 the interministerial committee approved the CTS providing a fixed frequency service and specifically:

- the civil works, as proposed in the design, are fully certified;
- Technological systems (vehicles and control system) have been preliminarily certified waiting for the official test results for a full certification.
**MoT requirements**

The MoT defined three requirements:

- Vehicle and station platforms should have the same height. Met;
- Horizontal distance between vehicle and station platforms during the stop should be 5 cm. Met;
- Vehicle should be able to scan or detect obstacles in a volume in front of it. Met.
Cybercar shipment in Rome

- The first Cybercar was shipped in Rome in July 2010 and stored in a ATAC bus depot;
- From the end of August 2010 ITR personnel is doing “training on job” testing the Cybercar in the ATAC depot.
Cybercars and training

Since ITR is in charge of the CTS management and maintenance ITR personell attended:

- A training course in Robosoft place (19th-23rd of April 2010);
- Training course in Rome (23rd-27th of August 2010);
- “Training on job” of ITR personnel during the testing of Cybercar in Rome
**Problem met**

Despite the results achieved on the certification process and on the personnel training, the civil works have been suspended because of ATAC financial problems.

Both ATAC and Municipality of Rome are trying to find possible solutions to solve the situation.

When implementing these systems economical or political related problems can arise.

In the meanwhile MoT has accepted to go on with certification process:

- Defining official list of tests to be run on CTS;
- Starting the tests on the vehicle in ATAC bus depot.
Rome candidate for Olympics 2020

The New Exhibition will host the minor sports and Rome Municipality thinks that CTS implementation and extension will strengthen its candidacy.
Extension of the system

Fleet extension from 2 to 6 vehicles
Results

- CTS certification “on paper” achieved;
- Personnel trained;
- List of official tests for a fixed frequency service will be defined and some tests will be run on the vehicles;

With MoT will be also investigated:

- If it is possible to define an official tests list to be run on CTS for “on-demand service”;
- If it is possible to define official requirements and tests to insert a pedestrian crossing in the track.
Conclusions

Despite the problems encountered the Rome Demo has demonstrated that:

- A CTS providing a fixed frequency on a segregated environment can be certified according to EN50126;
- Together with official list of tests it makes available a framework for CTS certification at least for Europe.
- If other list of tests and requirements for on-demand service and for pedestrian crossings could be defined the framework will be broader.

**BUT.....**
This framework requires:

- CTS to be totally or partially segregated:
  - High implementation costs;
  - Problems of community severance.
- Long time;
- Relevant costs.

In this framework it is possible to implement CTS in high visibility sites with specific needs; in order to reduce implementation costs, the design of CTS must be integrated in the design of the site.
THANK YOU

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