ITS evolution in the Municipality of Bologna

Fabio Cartolano
### BOLOGNA: GENERAL DATA

<table>
<thead>
<tr>
<th>Area Description</th>
<th>Nº Inhabitants</th>
<th>Area (Km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian Areas</td>
<td>~ 12,000</td>
<td>0.88</td>
</tr>
<tr>
<td>Limited Traffic Zone - L.T.Z.</td>
<td>~ 45,000</td>
<td>3.20</td>
</tr>
<tr>
<td>City Centre</td>
<td>~ 53,000</td>
<td>4.51</td>
</tr>
<tr>
<td>Municipality Area</td>
<td>~ 373,000</td>
<td>140.85</td>
</tr>
<tr>
<td>Overall demographic size</td>
<td>~ 650,000</td>
<td></td>
</tr>
</tbody>
</table>
Daily movements ~ 2 million
- internal 45%
- exchange 28%
- crossing 27%
peak times ~ 200,000

**Hourly distribution of movements in and out of Bologna’s urban area**
Modal split

INTERNAL MOVEMENTS

- CARS (driver): 28%
- Pedestrian: 21%
- Public Transport: 26%
- Bicycle: 7%
- Motorbikes: 11%
- CARS (passenger): 7%

GENERAL MOVEMENTS

Modal split
PLANNING A CHANGE

Urban Traffic Plan
(approved on 2007)

Reduce environmental and acoustic pollution
More public transport less private vehicles
Accessibility for all citizens
Incentive less pollutant vehicles
Improve road safety
Save energy in transport sector

To achieve the goals of the traffic plan ITS are considered key factors
SIRIO: Enforcement system for access in LTZ - Launched in Feb. 2005

- **LTZ Area**: 3.2 km² (around the 80% of the city centre)
- **Restrictions**: from 7 AM to 8 PM, no restrictions on Saturdays
- **LTZ Access control**: 10 gates monitored by cameras
- **Number of LTZ Access Authorisations**: around 60,000
- **Road pricing scheme for occasional access**
- **The system automatically generates fines** for transgressors
RITA: Enforcement system for access to bus lanes and “T” and “U” Areas

- Access control to the “T” Area (3 main central roads) : 3 gates
- Access control to bus lanes : 8 gates
- Access control to the “U” Area (university zone) : 2 gates
- Control for cars and motorbikes
- Restrictions are effective 24 h a day
- The system automatically generates fines for transgressors
THE UNIVERSITY SEMI PEDESTRIAN AREA

UNIVERSITY AREA
~53,000 MQ
THE UNIVERSITY SEMI PEDESTRIAN AREA
access rules
- 2 cameras and some electronic pillars
- semi pedestrian area hh0-24
- enforcement system for motorbikes too
- access authorisation only for residents and freight operators
- free access ticket for guests...
**THE UNIVERSITY SEMI PEDESTRIAN AREA**

- Electronic pillars
- Access rules
  - 2 cameras and some electronic pillars
  - Semi pedestrian area hh0-24
  - Enforcement system for motorbikes too
  - Access authorisation only for residents and freight operators
  - Free access ticket for guests...
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OVERVIEW OF ENFORCEMENT GATES

SIRIO e RITA gates

**SIRIO** - 9 gates in LTZ

**RITA** - 3 gates in “T” area

**RITA** - 8 gates to control bus lanes

**UNIVERSITY “U” AREA**
2 gates to control semi pedestrian area
ITS results (since 2004)

- 25% of unauthorised cars in LTZ
- 30% in the 3 main roads in the centre
- 70% of unauthorised vehicles in “U” area
- 70% of unauthorised cars in PT dedicated lanes

Trend of access in LTZ: average day in Feb.
Trends for cars - 1999=100

Spreading of motorvehicles in Bologna

Fonte: ACI
ENFORCEMENT AGAINST ILLEGAL ON STREET PARKING

On board camera for automatic fine emission
• 24 enforcement cameras at traffic lights
• - 47% of accidents in last years
• - 48% of injured people
ITS in Bologna

Equipped vehicles

Bus control centre

Enforcement cameras

SMS for info

Web Maps

Traffic light control

Cartography

Parking Info

VMS

Accident detection

Inductive loops

A set of instruments for traffic planning, control, monitoring
- 47 VMS in the urban and metropolitan area
- Information about traffic rules, events
- 15 VMS for Parking Info
- 7 Car Park connected to the centre
- 8 controlled pedestrian area
- 22 electronic pillars
- 27,000 m² in the inner city
- Vectorial cartography of the urban area
- Road graph
- All mobility layers georeferenced (traffic lights, inductive loops, VMS, cameras…)

GEOGRAPHIC INFORMATION SYSTEM
- 180 intersections controlled by UTOPIA Urban Traffic Control System
- About 1000 inductive loops
- Dynamic phase optimisation
- Analyse and diagnostic tools
- Prioritisation of Bus
The goal: to create an integrated system able to collect data, analyse problems and elaborate strategies in order to decrease congestion, inform citizens in real time and provide tools for traffic planning.
AN INTEGRATED PLATFORM

Cisium

- Equipped vehicles
- Bus control centre
- Enforcement cameras
- Web Maps
- SMS for info
- Traffic light control
- VMS
- Parking Info
- Cartography
- Accident detection
- Inductive loops
ARCHITECTURE OF THE CENTRE

Integration

Dynamic data

Static data

Cartography and mobility layers

Cisium

AVM Inductive loops

Utopia

VMS Parking info

Diagnostic and planning tools

Regulation and Monitoring functions

Basic layer
- Real time info on traffic situation, parking availability, congestion events
- Info available on SMS, email, Web, VMS, DATEX
- Travel planner integrated with P&R services, bus and private traffic prediction services
Inductive loops

- Flows (vehicles/h)
- Density
- Speed
- Road capacity
- Queues
- Green %

Congestion level
SOURCES OF DATA: BUS INFORMATION

- ATC
- Advanced vehicle monitoring
- Time tracking each 5 min

Detecting delays variation

By bus control centre information it is possible to individuate congestion that generate delays in PT

Cisium
Road Graph and travel timetables
Delay variation
Cisium elaborate:
Traffic lights data
Bus travel times

traffic congestion level
MONITORING AND CONTROL MODULES

Monitoring Mobility System

Traffic Congestion level

Real time traffic, information prediction

• Traffic forecast

CISIUM

Mobility Control System

• Elaboration of solution

• Manual solution

• Automatic solution
Manual data entry
- accidents
- public works
- traffic deviations
communication to users
- SMS
- E-Mail
- VMS

automatic information:
- traffic level
A new way for Public Administration to produce services

- Open Source
- Open Government
- Open Data

Saving value for the community and sharing information to make progress

“focus on improving data and metadata accessibility and overall quality in support of research, policy making, and transparency”

source Open Data Foundation
A closed market produces inefficiency for all

avoid
- Duplication of analysis, software, databases
- (Re)development of unnecessary tools
- Lack of interoperability

promote real co-operation between
- Public administrations
- Universities/research institutes
- Private companies
Protect data leads to decrease the value of a market

while

introducing standards and sharing concepts, vision and processes would

- save money
- optimise efforts
- create a community of specialised users
- Cartography
- Enforcement systems
- Traffic Monitoring and Management
- AVM of fleets
- V2V and V2I Communication
- Parking information
- Card, badges, smart id
- Useless applications
- Poor Documentation
- Lack of knowledge
- Money consumption for Integration

and

interfaces, interfaces, interfaces…
Traffic Monitoring

- Traffic condition
- Parking availability
- Road works
- Variable message signs

Open format:
- Webservices
- xml
- csv

Infomobility

- Access permission
- Enforcement gates
- Car Pooling/sharing

Open format:
- Webservices
- xml
- csv
FUTURE STEPS

- Join Traffic Monitoring and Infomobility contents
- Create a free Open Data repository
- Promote research and third-part development for citizens (apps, mash-up applications, new services…)

mobi
UNA MOBILITÀ PULITA COMMIGA DA NOI
OPEN QUESTIONS

- evolution of ITS is slower than other ICTs
- weak dialogue between demand and offer
- is the potential of ITS well exploited?
Thank you!

Fabio Cartolano

Municipality of Bologna

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