COMUNE DI BOLOGNA

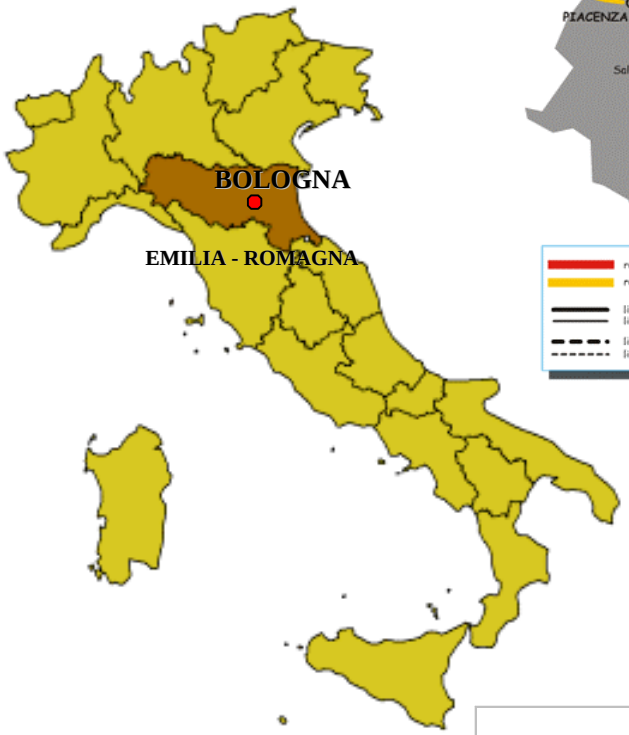
15th December 2011 - Bologna, Italy

ITS evolution in the Municipality of Bologna

Fabio Cartolano

COMUNE DI BOLOGNA

BOLOGNA: GENERAL DATA



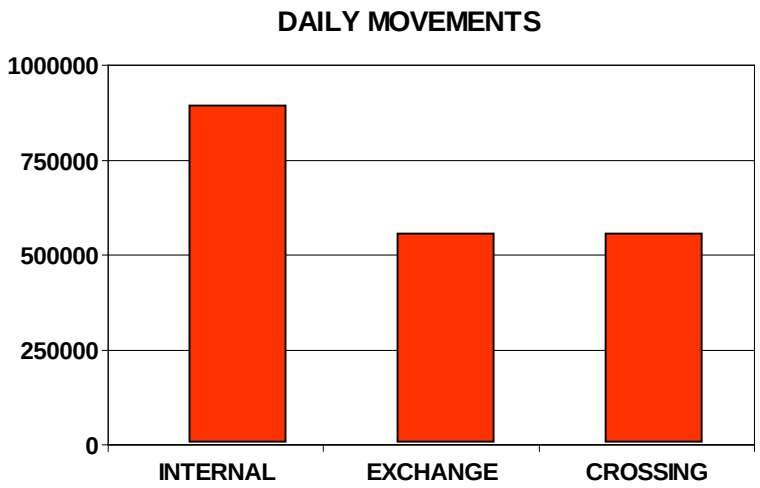
	N° Inhabitants	Area (Km^2)
Pedestrian Areas	~ 12,000	0.88
Limited Traffic Zone - L.T.Z.	~ 45,000	3.20
City Centre	~ 53,000	4.51
Municipality Area	~ 373,000	140.85
Overall demographic size	~ 650,000	

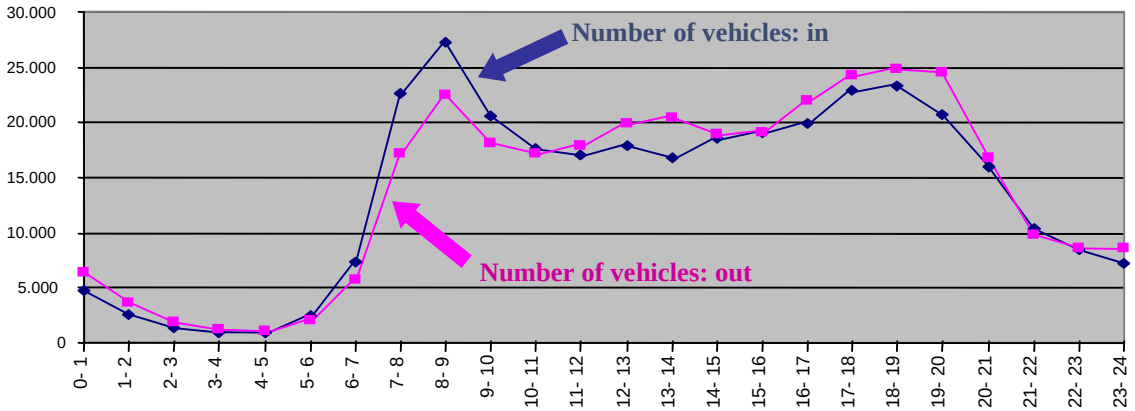
COMUNE DI BOLOGNA

GENERAL MOVEMENTS

Daily movements ~ 2 million
- internal 45%
- exchange 28%
- crossing 27%

peak times ~ 200,000

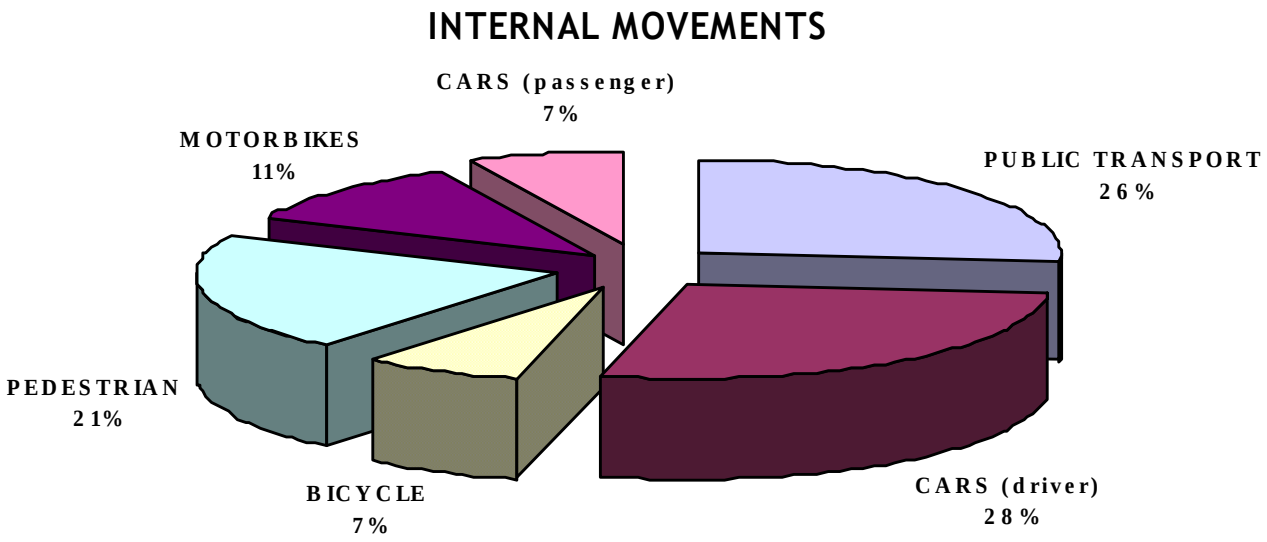




Hourly distribution of movements in and out of Bologna's urban area

GENERAL MOVEMENTS

Modal split



COMUNE DI BOLOGNA

PLANNING A CHANGE

Urban Traffic Plan
(approved on 2007)

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

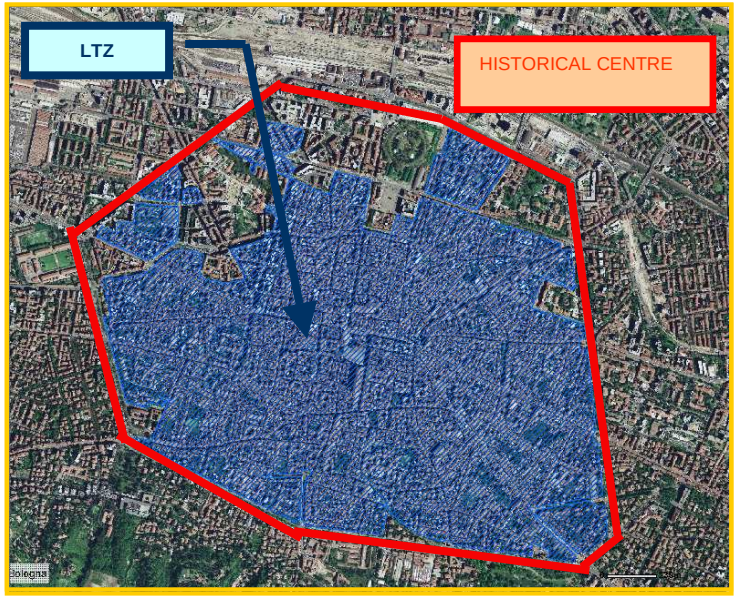
To achieve the goals of the traffic plan ITS are considered key factors

COMUNE DI BOLOGNA

REGULATION SCHEME IN THE HISTORICAL CENTRE

SIRIO: Enforcement system for access in LTZ - Launched in Feb. 2005

- **LTZ Area: 3.2 km^2 (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**

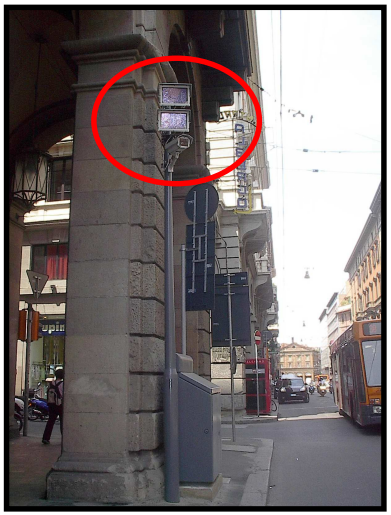


COMUNE DI BOLOGNA

REGULATION SCHEME (2)

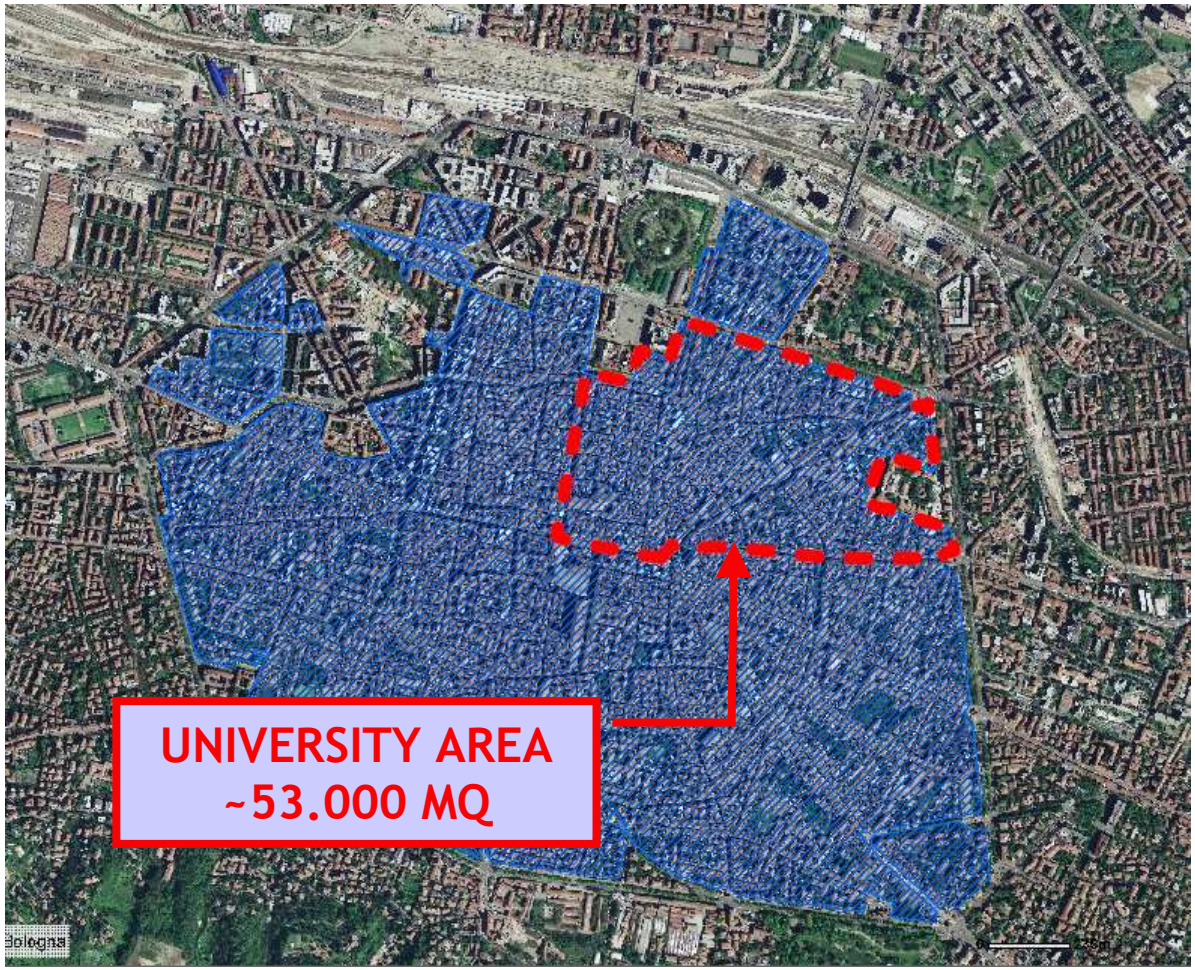
RITA: Enforcement system for access to bus lanes and "T" and "U" Areas

- 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



COMUNE DI BOLOGNA

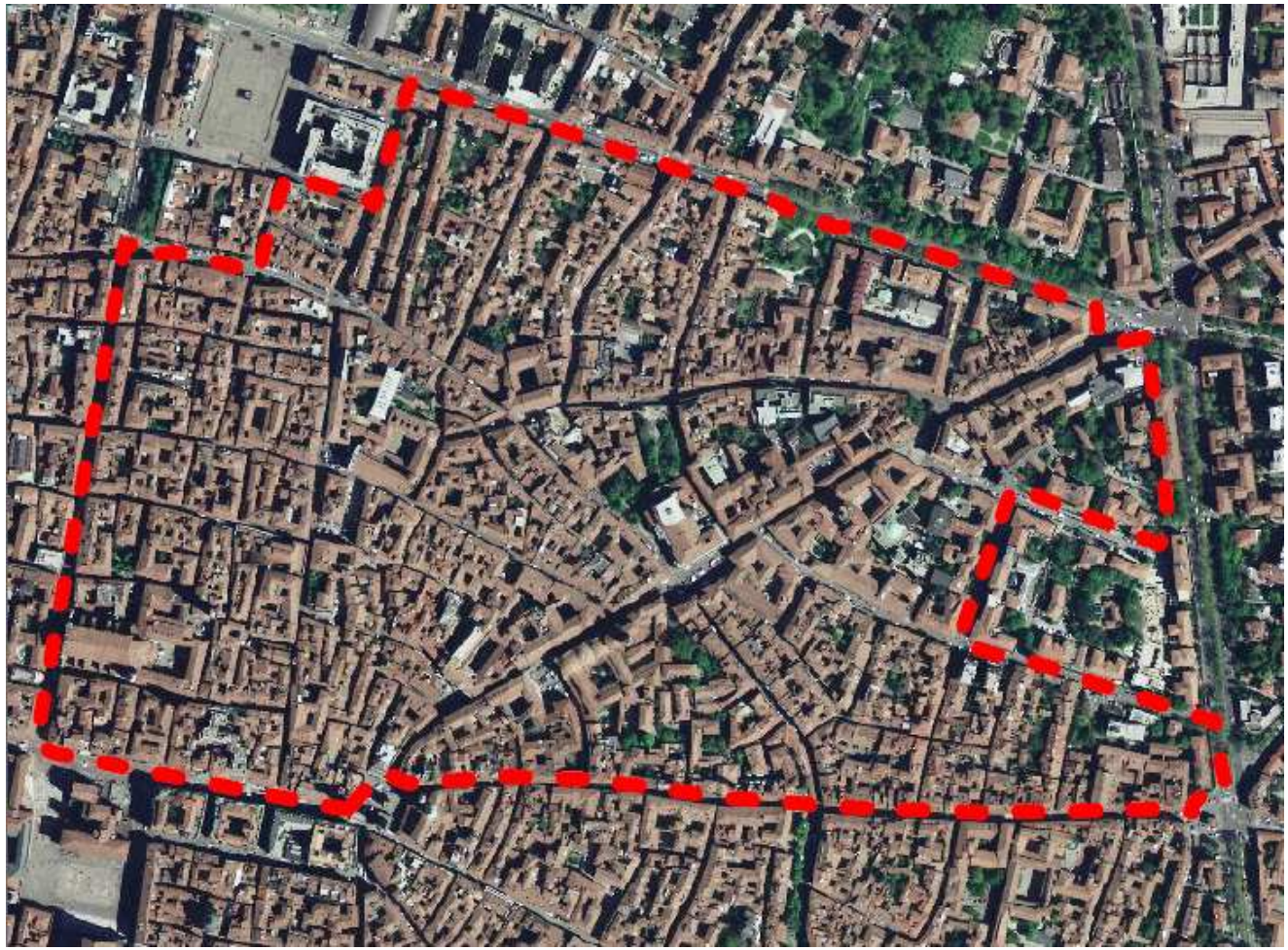
THE UNIVERSITY SEMI PEDESTRIAN AREA



THE CIVITAS INITATIVE IS CO-FINANCED
BY THE EUROPEAN UNION

COMUNE DI BOLOGNA

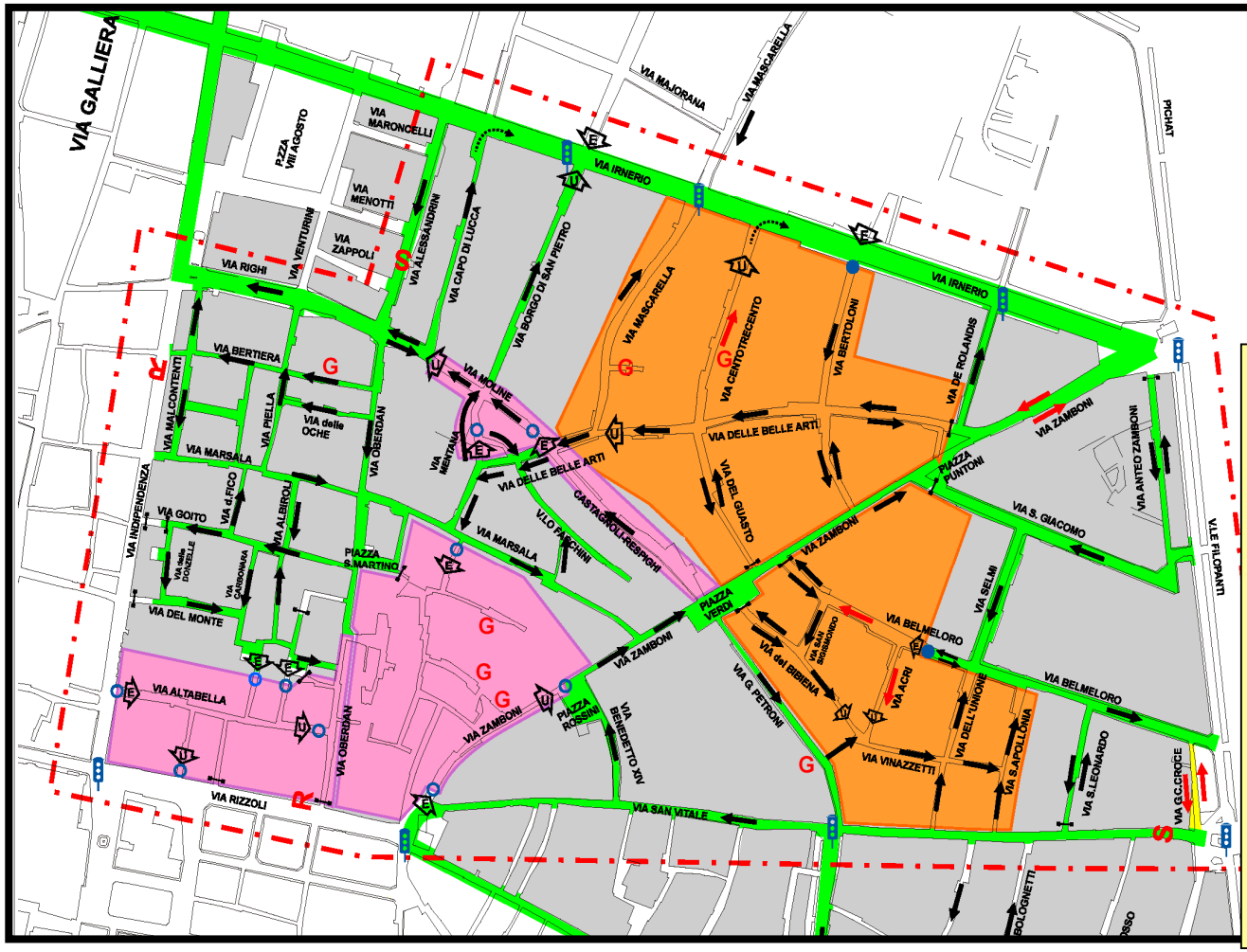
THE UNIVERSITY SEMI PEDESTRIAN AREA



THE CIVITAS INITATIVE IS CO-FINANCED
BY THE EUROPEAN UNION

COMUNE DI BOLOGNA

THE UNIVERSITY SEMI PEDESTRIAN AREA



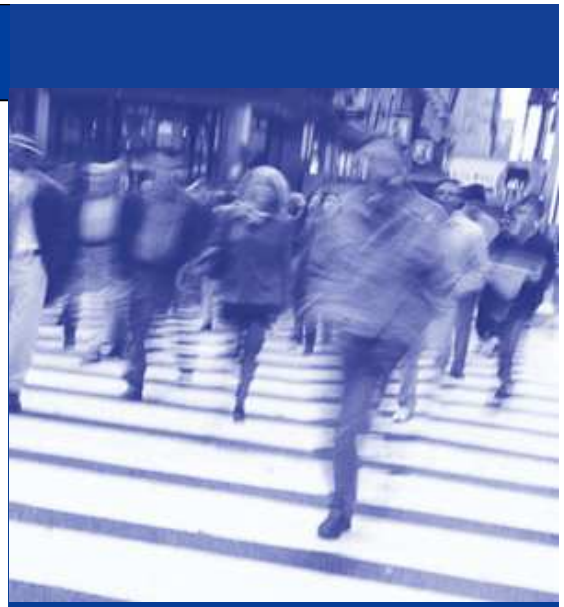
access rules

- 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 CIVITAS INITATIVE IS CO-FINANCED BY THE EUROPEAN UNION

COMUNE DI BOLOGNA

THE UNIVERSITY SEMI PEDESTRIAN AREA



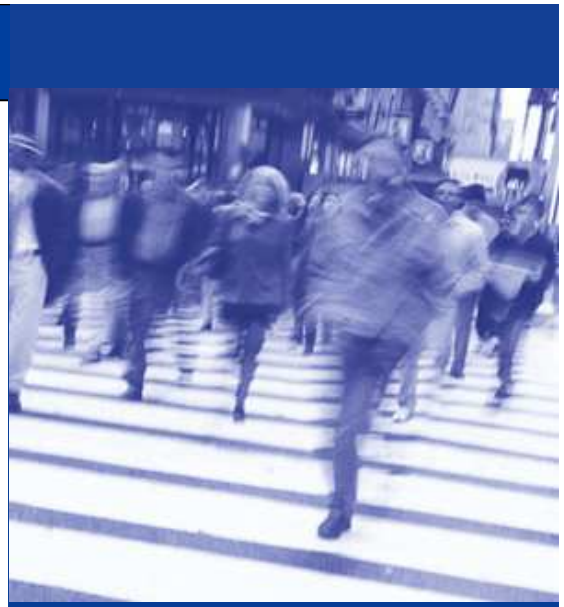
access rules

- 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 CIVITAS INITATIVE IS CO-FINANCED BY THE EUROPEAN UNION

COMUNE DI BOLOGNA

THE UNIVERSITY SEMI PEDESTRIAN AREA



camera placed on area's gates

access rules

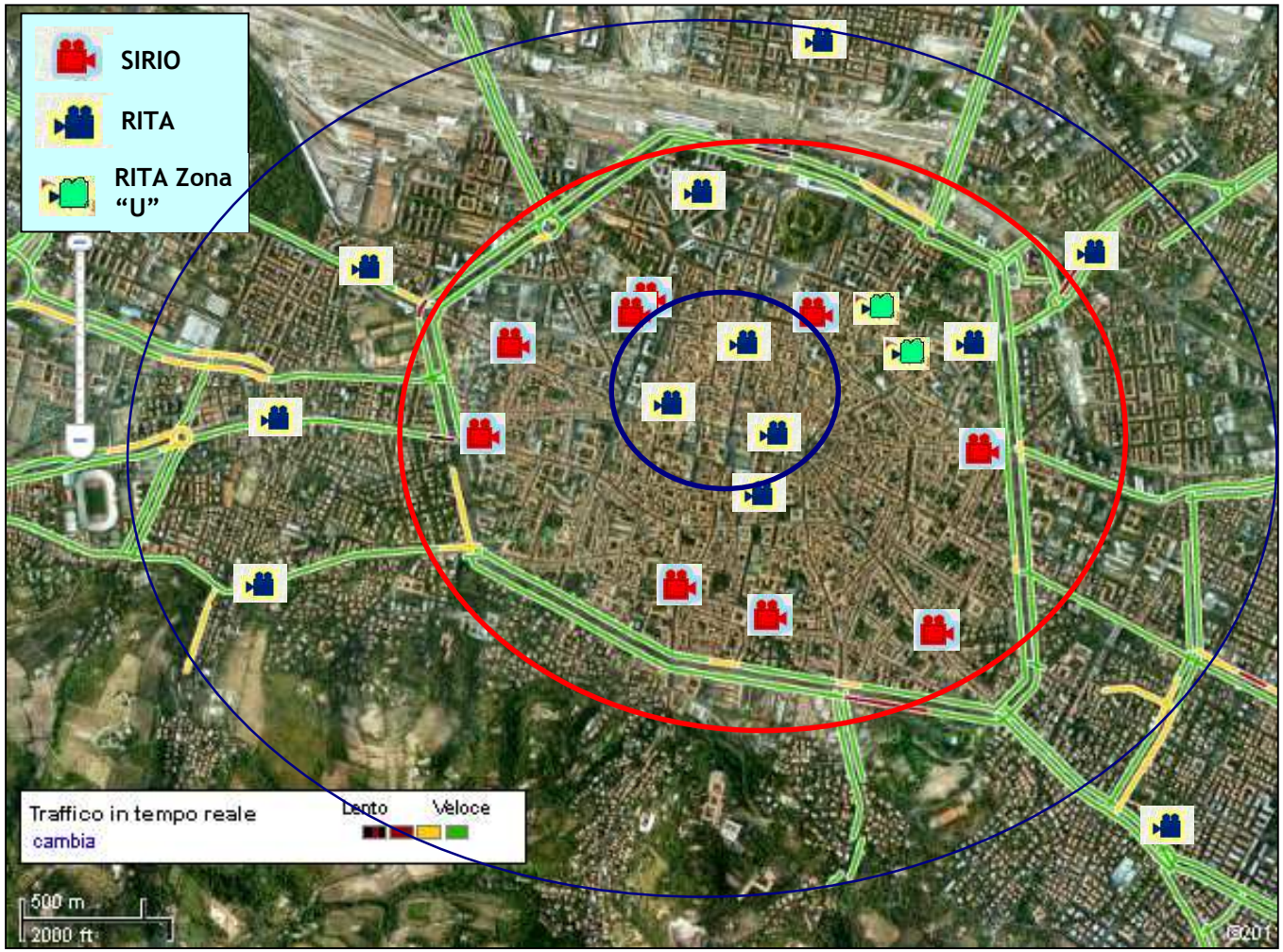
- 2 cameras and some electronic pillars
- semi pedestrian area hh0-24
- enforcement system for motorbikes too
- access authorisation only for residents and freight operators
- free access ticket for guests…

THE CIVITAS INITATIVE IS CO-FINANCED BY THE EUROPEAN UNION

COMUNE DI BOLOGNA

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

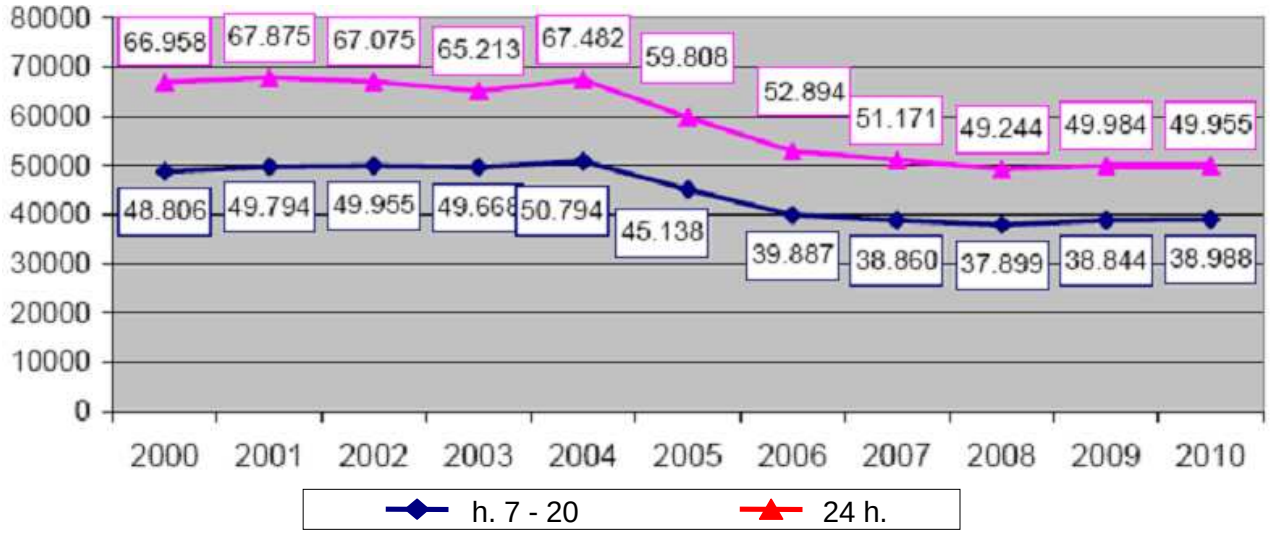
COMUNE DI BOLOGNA

RESULTS

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

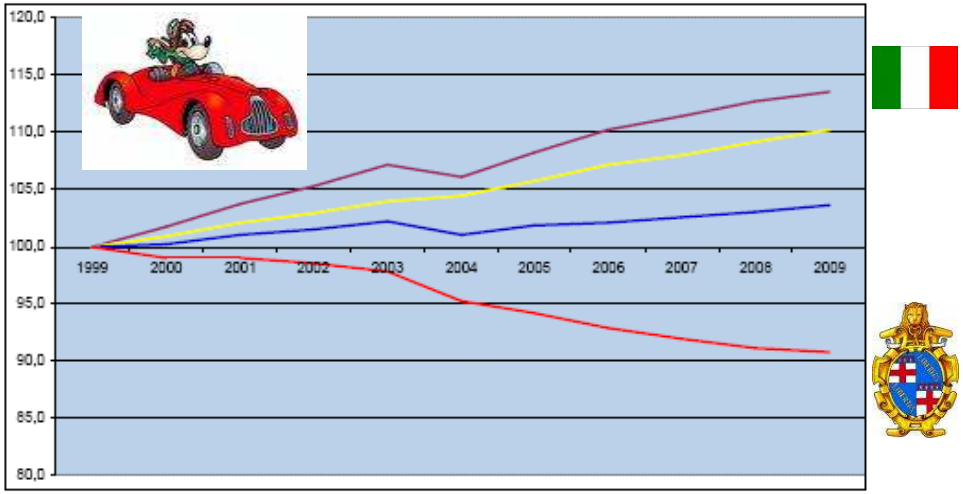
Trend of access in LTZ : average day in Feb.



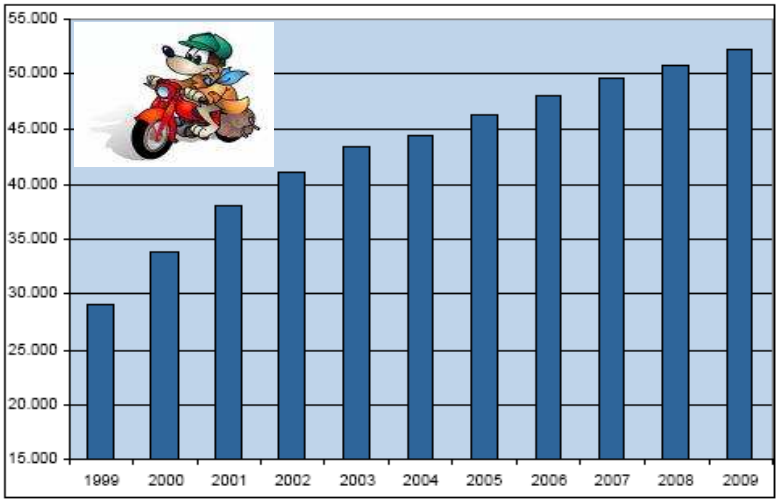
COMUNE DI BOLOGNA

REGULATION SCHEME: DOWNSIDE

Trends for cars - 1999=100



Spreading of motorvehicles in Bologna



Fonte: ACI

COMUNE DI BOLOGNA

ENFORCEMENT AGAINST ILLEGAL ON STREET PARKING

On board camera for automatic fine emission

COMUNE DI BOLOGNA

ENFORCEMENT AT TRAFFIC LIGHT

- 24 enforcement cameras at traffic lights
- - 47% of accidents in last years
- - 48% of injured people

COMUNE DI BOLOGNA

ITS in Bologna

Cartography

Equipped vehicles

Parking Info

Bus control centre

A set of instruments for traffic planning, control, monitoring

VMS

Enforcement cameras

Accident detection

SMS for info

Inductive loops

Web Maps

Traffic light control

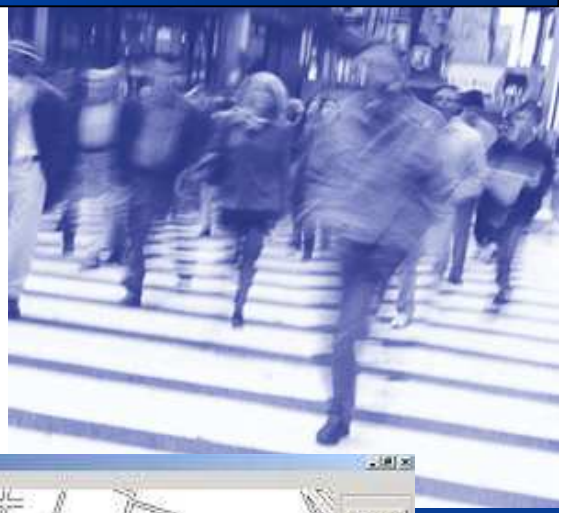
COMUNE DI BOLOGNA

VIDEO MESSAGE SIGNS NETWORK

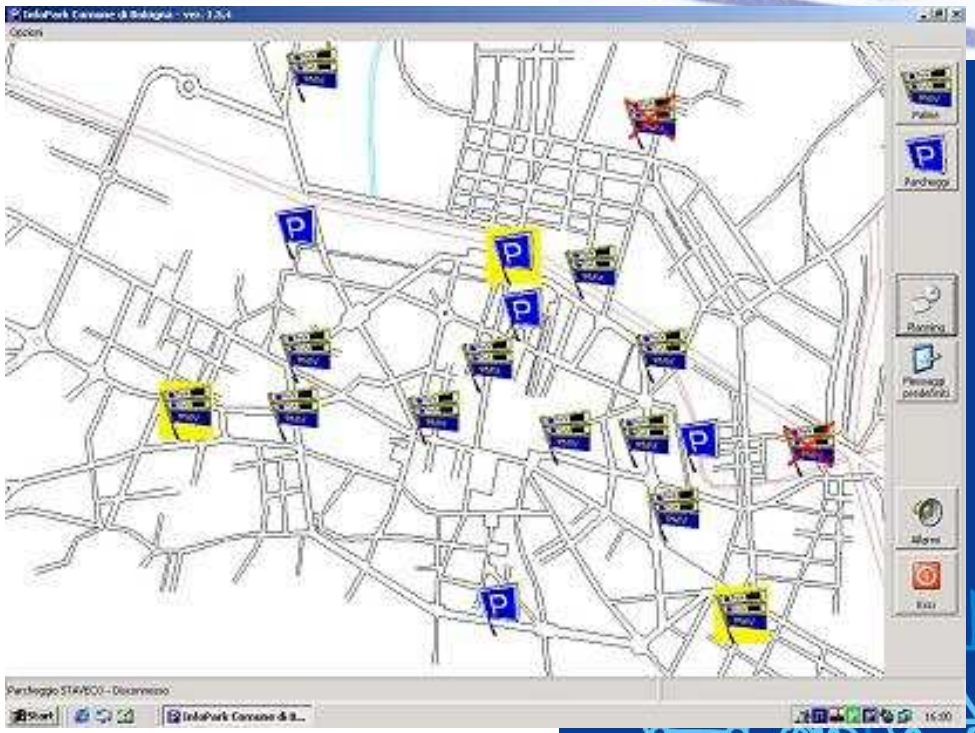
- 47 VMS in the urban and metropolitan area
- Information about traffic rules, events

COMUNE DI BOLOGNA

PARKING AVAILABILITY INFO SYSTEM



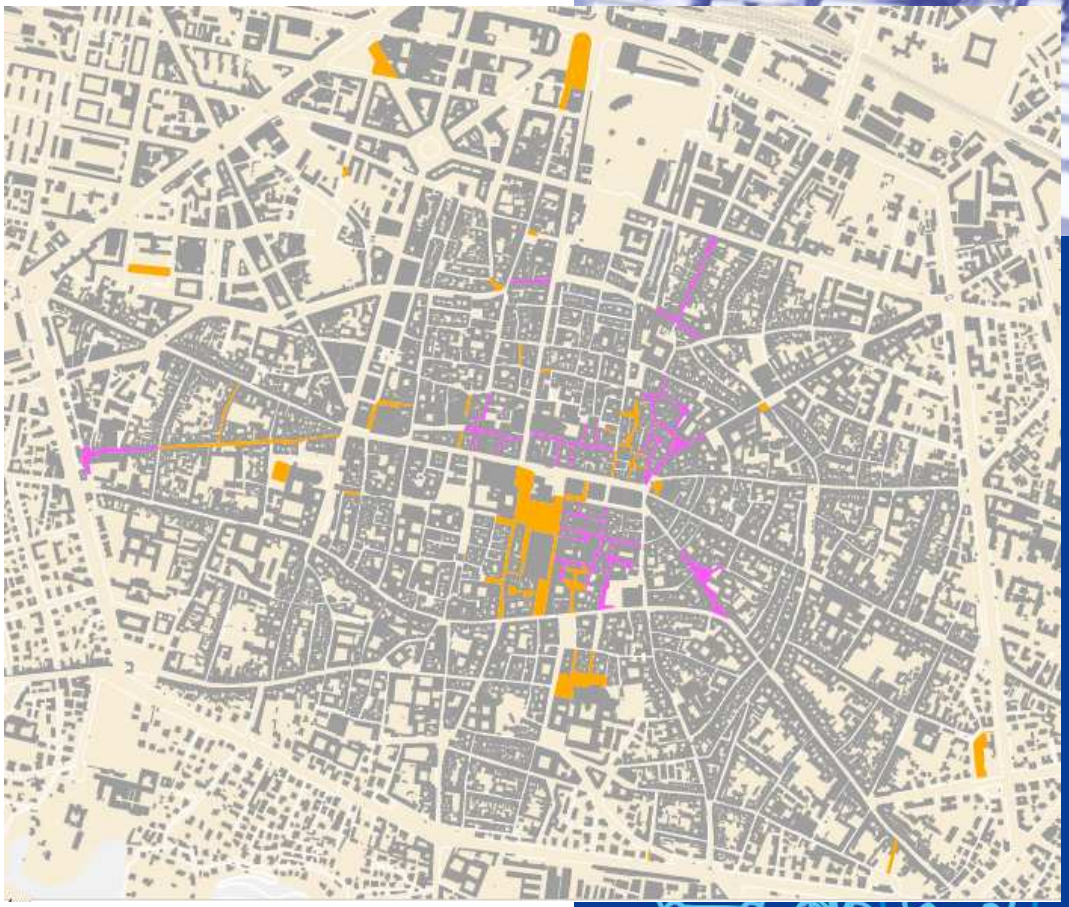
- 15 VMS for Parking Info
- 7 Car Park connected to the centre



COMUNE DI BOLOGNA

ELECTRONIC PILLARS FOR PEDESTRIAN AREA CONTROL

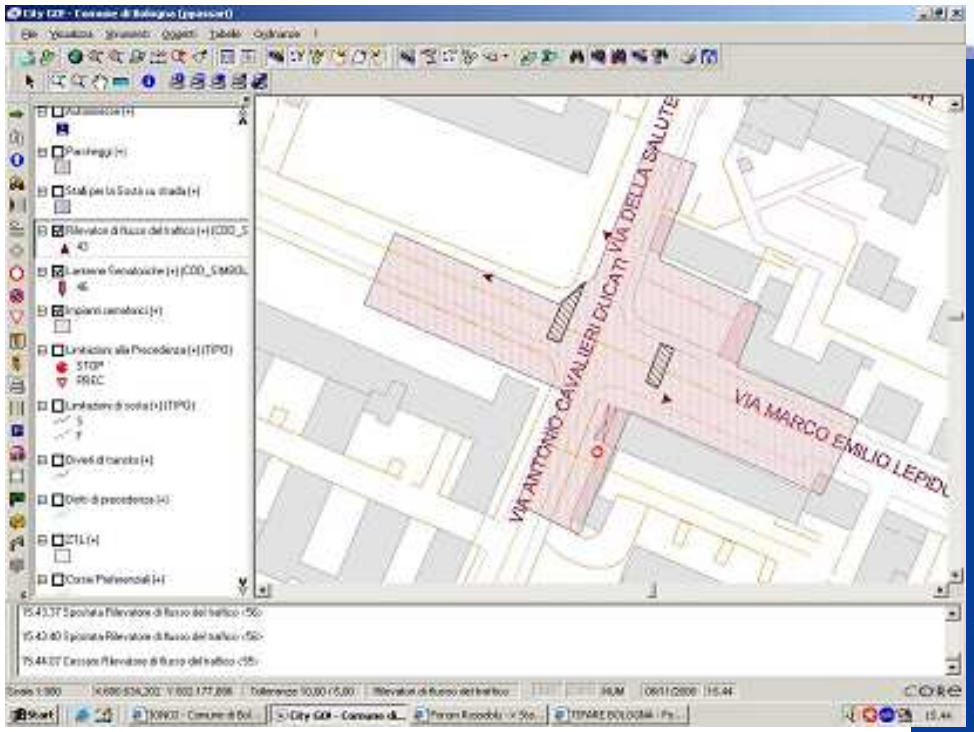
- 8 controlled pedestrian area
- 22 electronic pillars
- 27.000 m² in the inner city



COMUNE DI BOLOGNA

GEOGRAPHIC INFORMATION SYSTEM

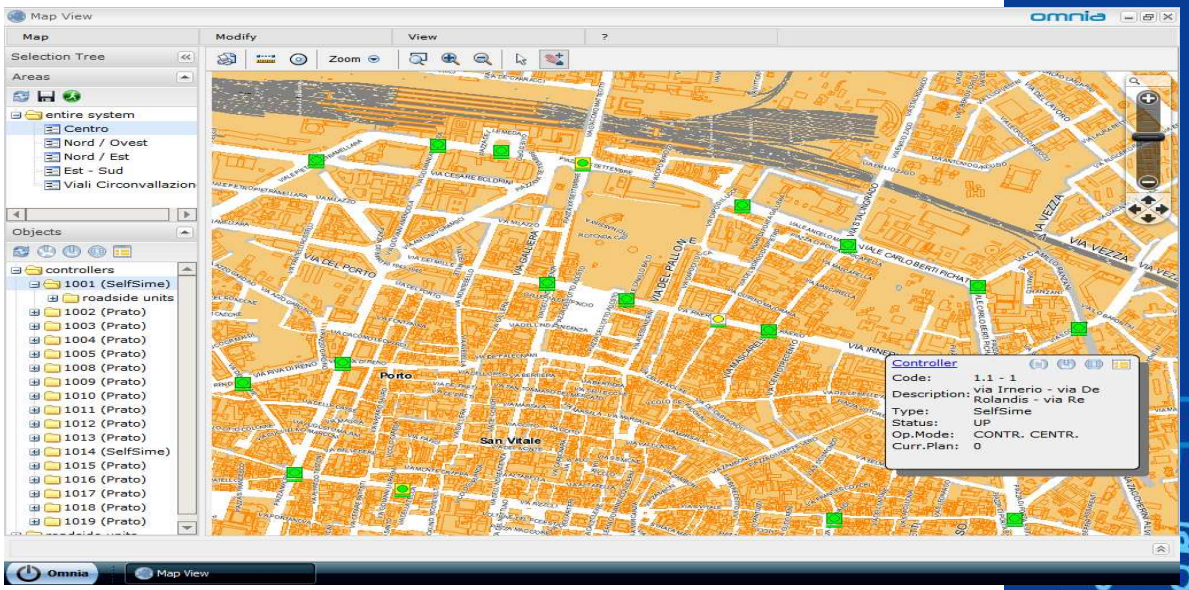
- Vectorial cartography of the urban area
- Road graph
- All mobility layers georeferenced (traffic lights, inductive loops, VMS, cameras…)



COMUNE DI BOLOGNA

TRAFFIC LIGHT DYNAMIC REGULATION

- 180 intersections controlled by UTOPIA Urban Traffic Control System
- About 1000 inductive loops
- Dynamic phase optimisation
- Analyse and diagnostic tools
- Prioritisation of Bus



COMUNE DI BOLOGNA

CO-ORDINATION?

Equipped vehicles

Cartography

Parking Info

Bus control centre

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 e provide tools for traffic planning

VMS

Enforcement cameras

Accident detection

SMS for info

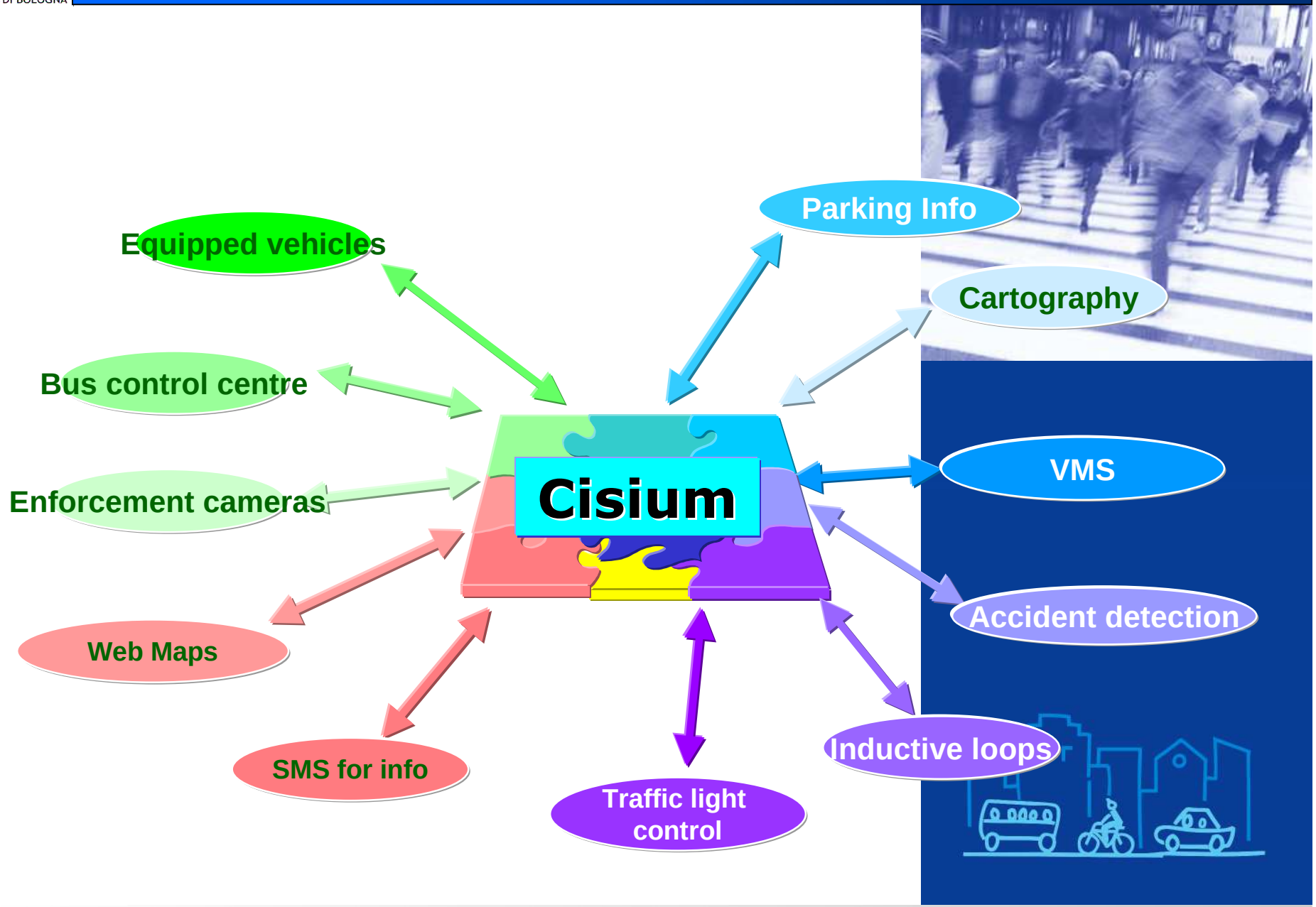
Inductive loops

Web Maps

Traffic light control

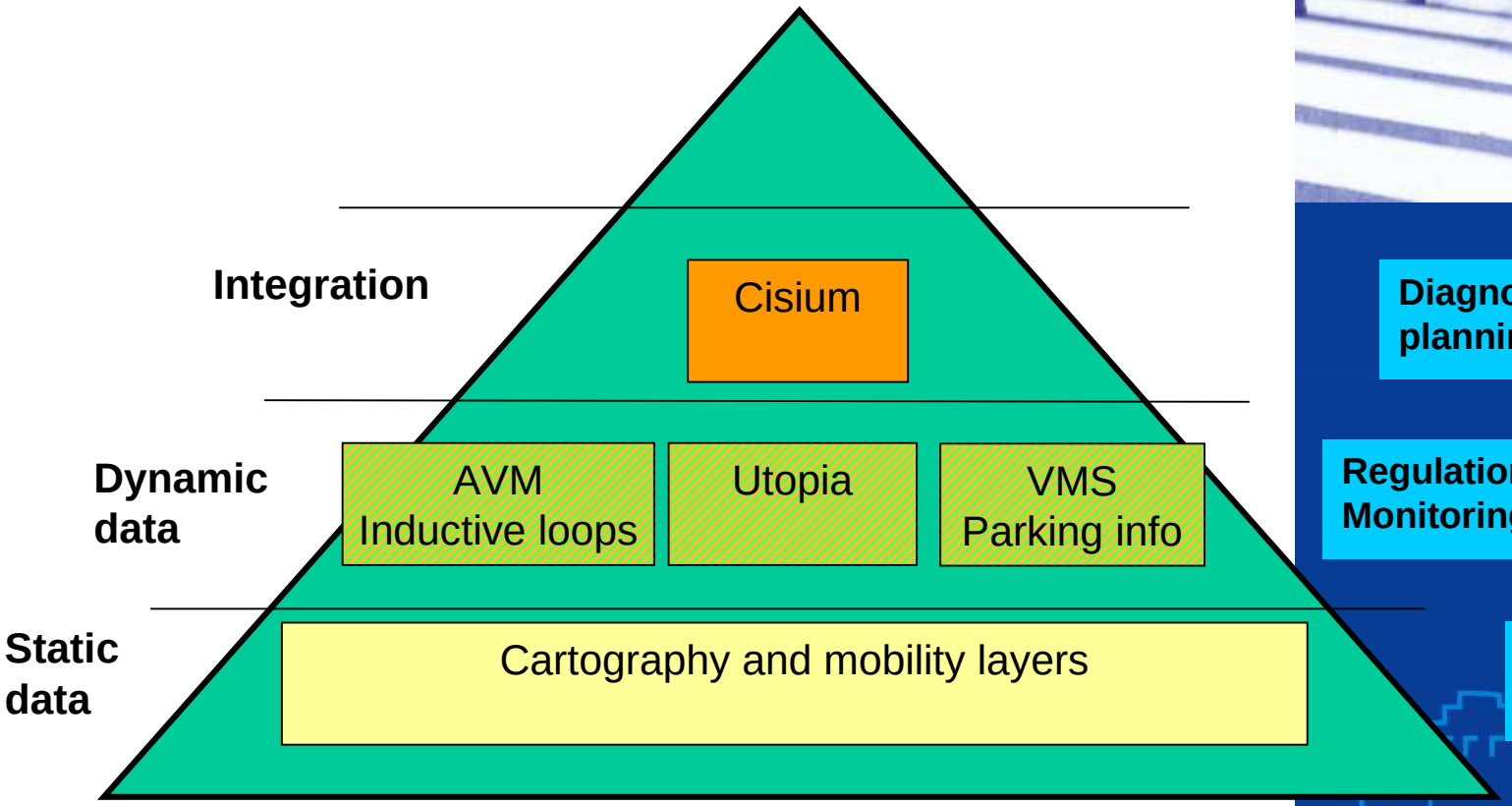
COMUNE DI BOLOGNA

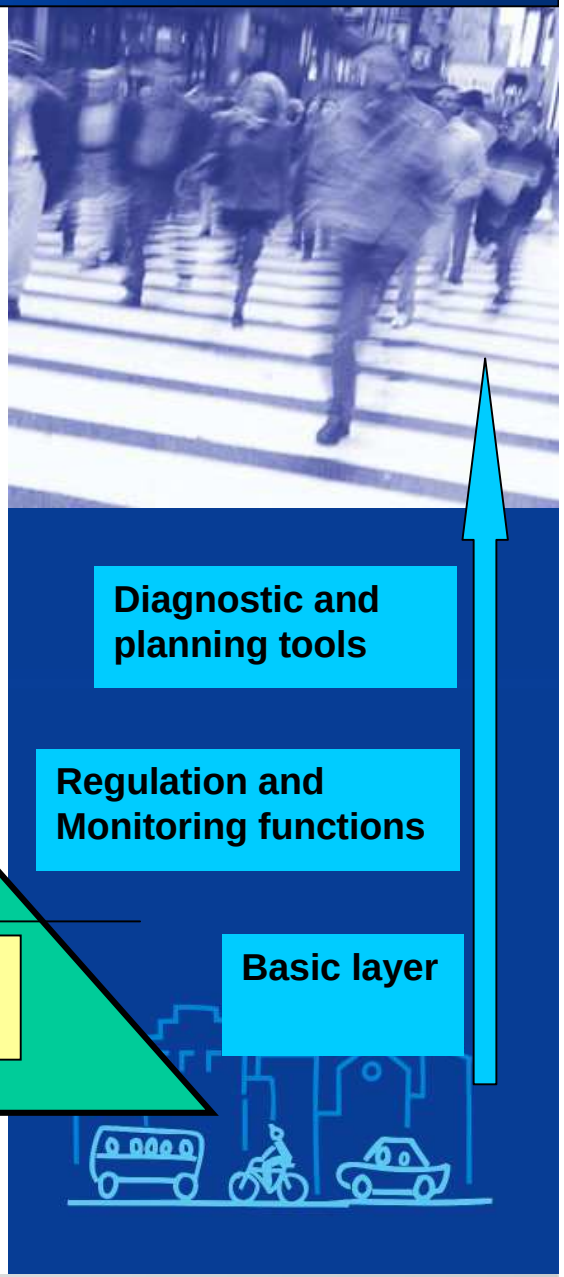
AN INTEGRATED PLATFORM



COMUNE DI BOLOGNA

ARCHITECTURE OF THE CENTRE

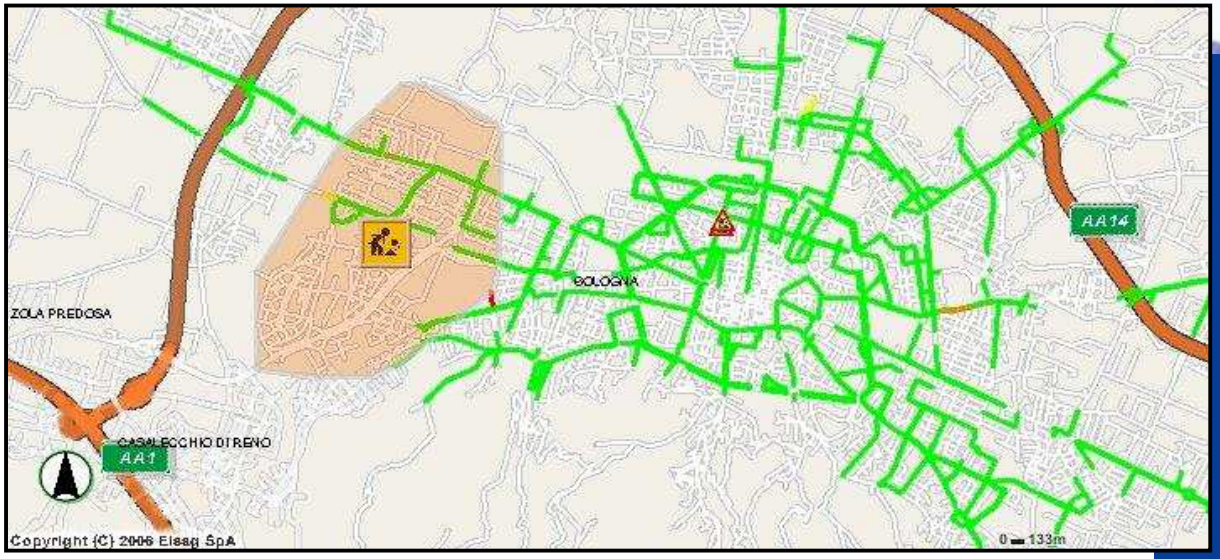




COMUNE DI BOLOGNA

CISIUM

- 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



COMUNE DI BOLOGNA

SOURCES OF DATA: UTOPIA

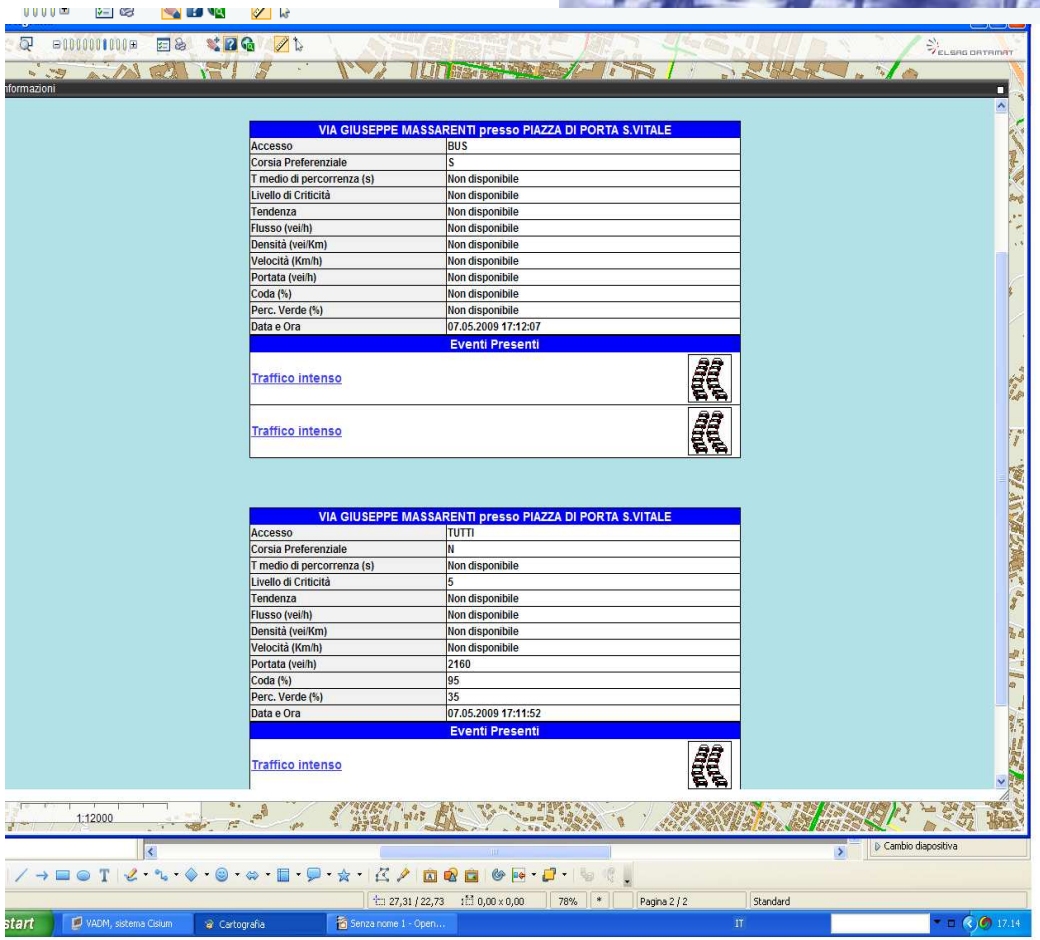
Inductive loops

⇩

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

⇩⇩

Congestion level



VIA GIUSEPPE MASSARENTI presso PIAZZA DI PORTA S.VITALE	
Accesso	BUS
Corsia Preferenziale	S
T medio di percorrenza (s)	Non disponibile
Livello di Criticità	Non disponibile
Tendenza	Non disponibile
Flusso (vei/h)	Non disponibile
Densità (vei/Km)	Non disponibile
Velocità (Km/h)	Non disponibile
Portata (vei/h)	Non disponibile
Coda (%)	Non disponibile
Perc. Verde (%)	Non disponibile
Data e Ora	07.05.2009 17:12:07
Eventi Presenti	
Traffico intenso	
Traffico intenso	

VIA GIUSEPPE MASSARENTI presso PIAZZA DI PORTA S.VITALE	
Accesso	TUTTI
Corsia Preferenziale	N
T medio di percorrenza (s)	Non disponibile
Livello di Criticità	5
Tendenza	Non disponibile
Flusso (vei/h)	Non disponibile
Densità (vei/Km)	Non disponibile
Velocità (Km/h)	Non disponibile
Portata (vei/h)	2160
Coda (%)	95
Perc. Verde (%)	35
Data e Ora	07.05.2009 17:11:52
Eventi Presenti	
Traffico intenso	

COMUNE DI BOLOGNA

SOURCES OF DATA: BUS INFORMATION

ATC

Advanced vehicle monitoring

Time tracking each 5 min

Detecting delays variation

Cisium

Road Graph and travel timetables

Delay variation

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

COMUNE DI BOLOGNA

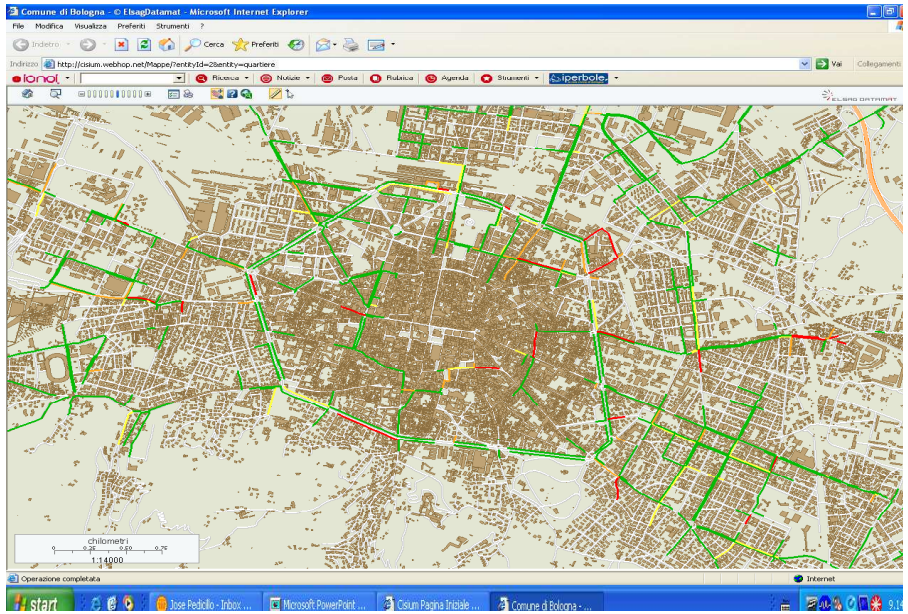
REAL TIME INFORMATION

Cisium elaborate:

Traffic lights data

Bus travel times

traffic congestion level



COMUNE DI BOLOGNA

MONITORING AND CONTROL MODULES

Monitoring Mobility System

Traffic Congestione level

Real time traffic, information prediction

CISIUM

•Traffic forecast

• manual solution

Mobility Control System

•Elaboration of solution

• automatic solution

COMUNE DI BOLOGNA

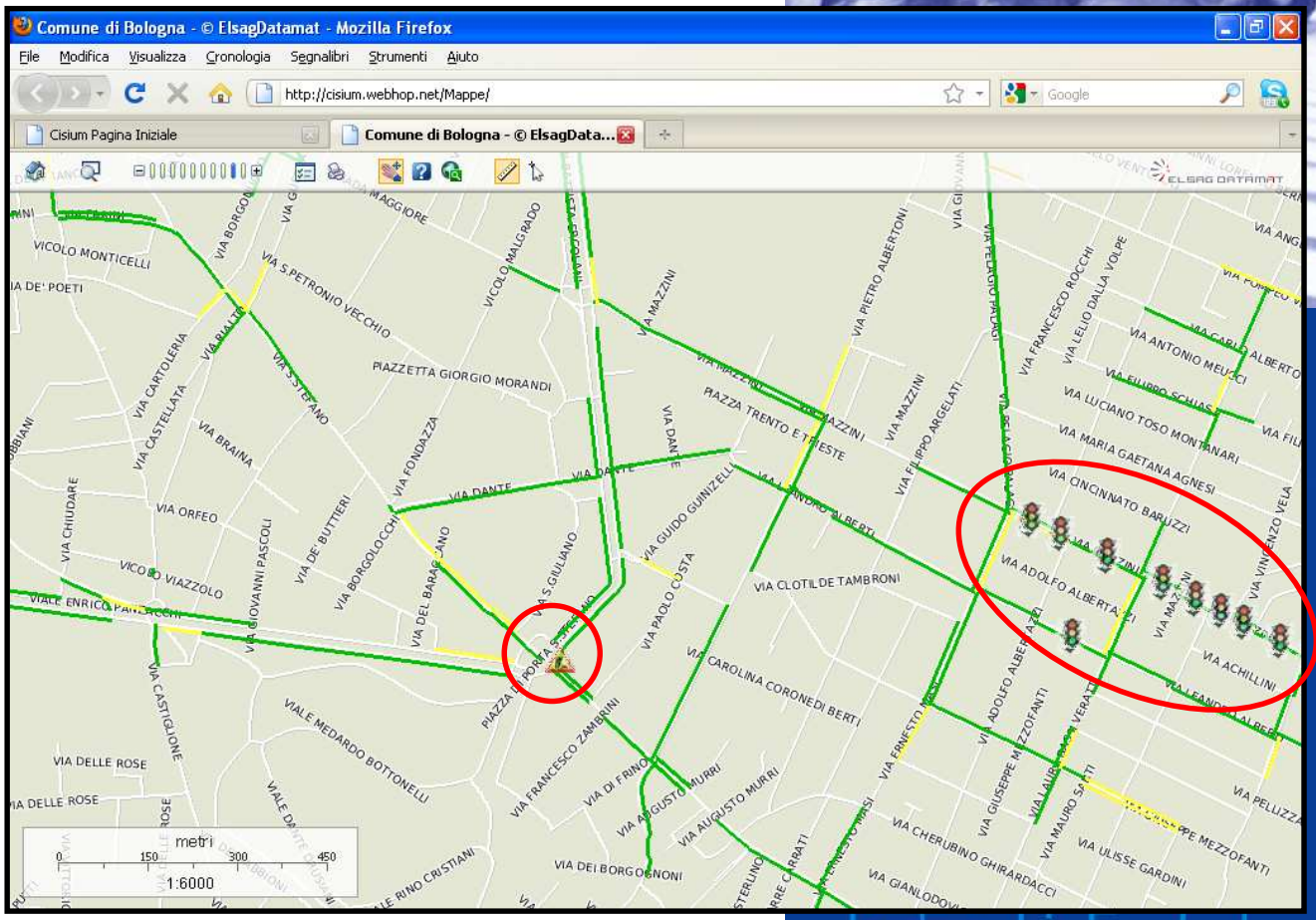
CRITICAL EVENTS

Manual data entry

- accidents
- public works
- traffic deviations

communication to users

- SMS
- E-Mail
- VMS



automatic information:

- traffic level

COMUNE DI BOLOGNA

ITS AND OPEN DATA: A NEW GENERATION OF TECHNOLOGIES

COMUNE DI BOLOGNA

SHAING KNOWLEDGE

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

Open Data Foundation

COMUNE DI BOLOGNA

WHY OPENING ITS

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

WHY OPENING ITS

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

Transparency
Accessibility
Accuracy

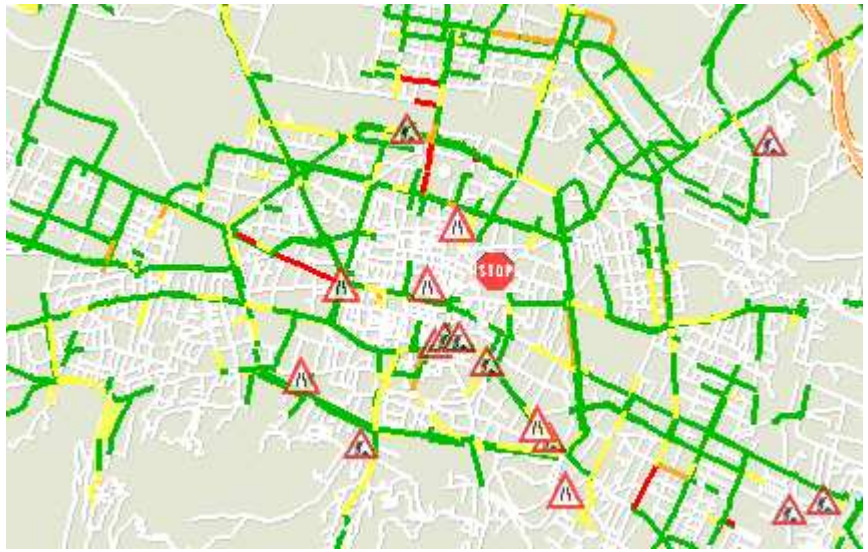
→

Diffusion
Preservation
Improvement

COMUNE DI BOLOGNA

WHY OPENING ITS

- Cartography
- Enforcement systems
- Traffic Monitoring and Management
- AVM of fleets
- V2V and V2I Communication
- Parking information
- Card, badges, smart id



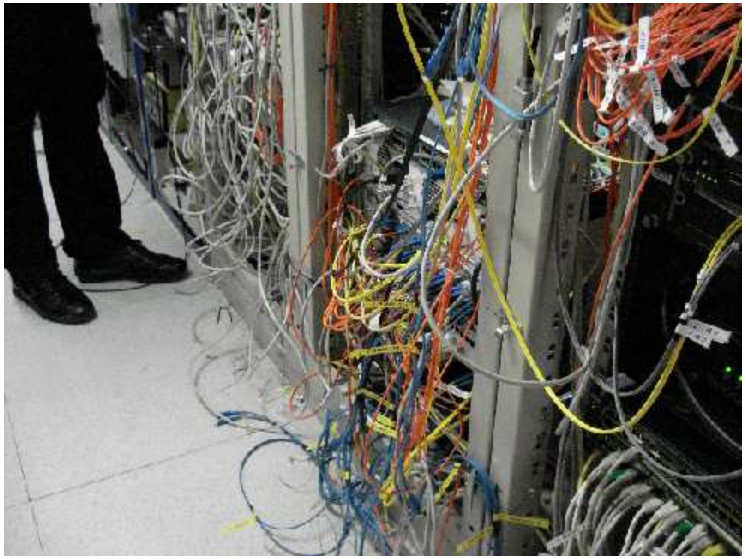
COMUNE DI BOLOGNA

PREVIOUS SITUATION IN BOLOGNA

- Useless applications
- Poor Documentation
- Lack of knowledge
- Money consumption for Integration

and

interfaces, interfaces, interfaces…



COMUNE DI BOLOGNA

OPEN SERVICES

Traffic Monitoring

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

Open format:

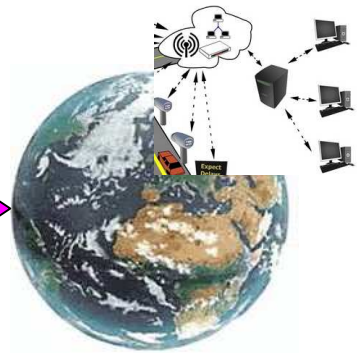
- Webservices
- xml
- csv

Infomobility

- Access permission
- Enforcement gates
- Car Pooling/sharing

Open format:

- Webservices
- xml
- csv



COMUNE DI BOLOGNA

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 COMINCIA DA NOI

COMUNE DI BOLOGNA

OPEN QUESTIONS

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

mobi

UNA MOBILITÀ PULITA COMINCIA DA NOI

COMUNE DI BOLOGNA

Thank you!

Fabio Cartolano

Municipality of Bologna

Fabio. Cartolano@comune.bologna.it

CiViTAS

Cleaner and better transport in cities

THE CIVITAS INITIATIVE
IS CO-FINANCED BY THE
EUROPEAN UNION