



## Verona: test site & C-ITS services infrastructures



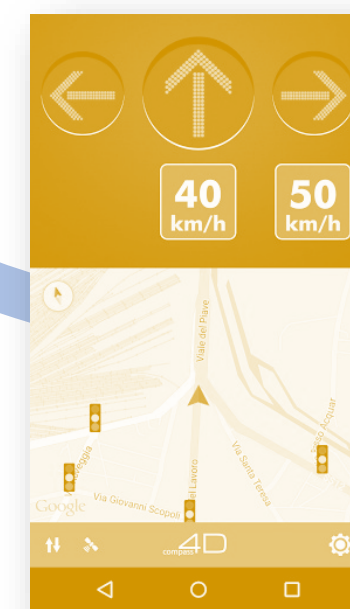
**Arch. Bruno Pezzuto**

Mobility Department

Traffic Control Head – Traffic Control Room

# Verona

## C-ITS services infrastructures: projects & developments



# Profile

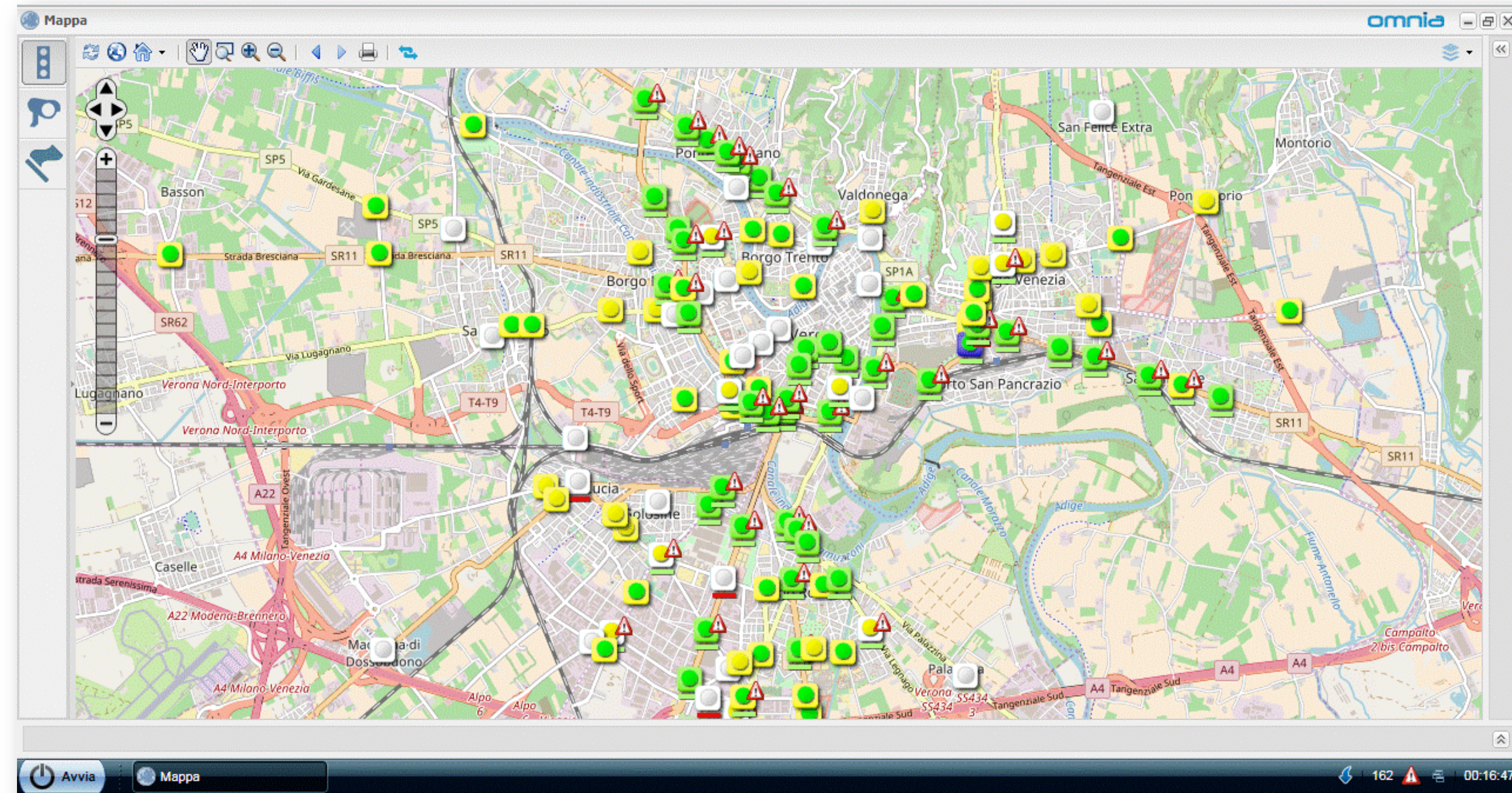
## City of Verona

- 258,000 inhabitants (2023)
- 212,070 vehicles (2022)
- 1,2 average daily trips per person
- 380,000 trips per day
  - is the first and so far the only Italian City where C-ITS have been tested on the field in a large scale demonstrator (GLOSA 62 Intersections with SWARCO using optical fiber channel and 70 intersections with SWARCO/DIGITRONICA using 3G/4G/LTE channel) and in COMPASS4D 7th Framework project with ETSI 4G RSU
  - is also a key node of the Italian TEN being at the junction of Autostrada del Brennero and Autostrada Brescia-Padova with several interactions.



# AUDIConnect (2011)

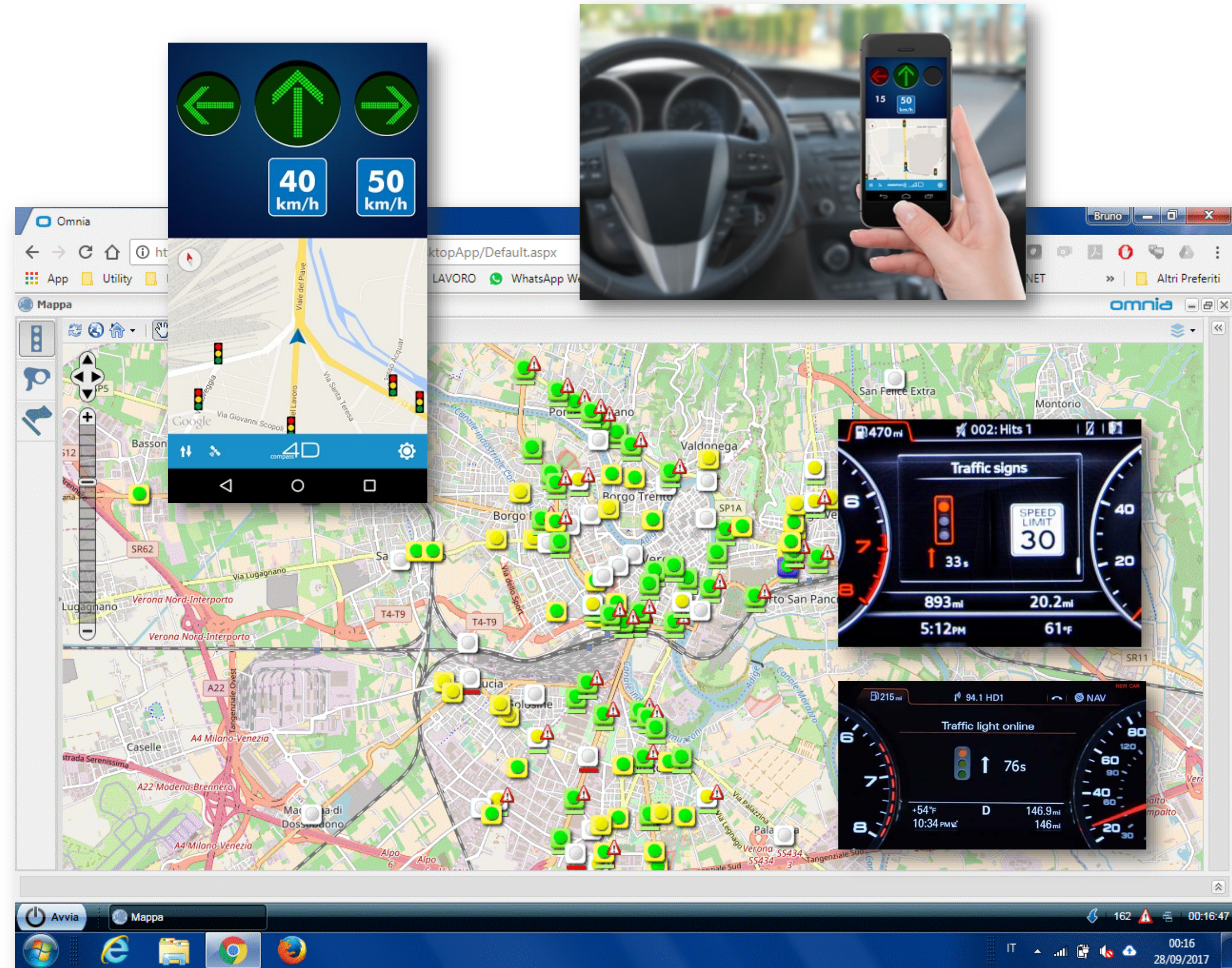
- **Compass4D: Energy Efficient Intersection Service (EEIS)**
  - **Green Light Optimal Speed Advisory (GLOSA)**
    - Individual vehicles and platoon progression
  - **Idling / stop support**
    - Engine control and engine turn off
  - **Start delay prevention support**
    - Minimize time loss at the start of green



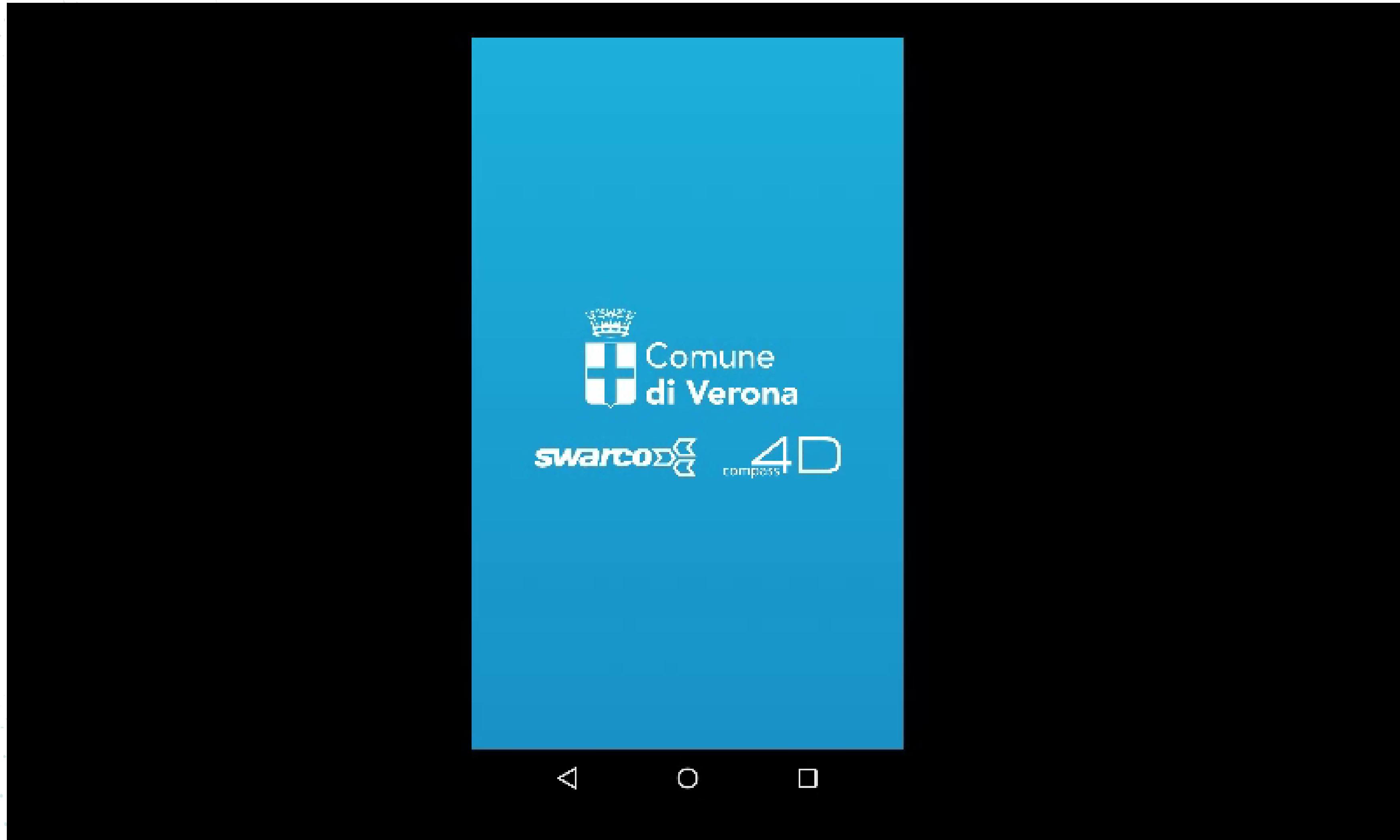
# Compass4D (2013-2015)

- **Compass4D: Energy Efficient Intersection Service (EEIS)**

- **Green Light Optimal Speed Advisory (GLOSA)**
  - Individual vehicles and platoon progression
- **Idling / stop support**
  - Engine control and engine turn off
- **Start delay prevention support**
  - Minimize time loss at the start of green
- **Green light priority**
  - Increase of speed of selected vehicles (i.e., Emergency, Public Transport, Heavy Goods Transport)
  - Increase safety, reduce stops

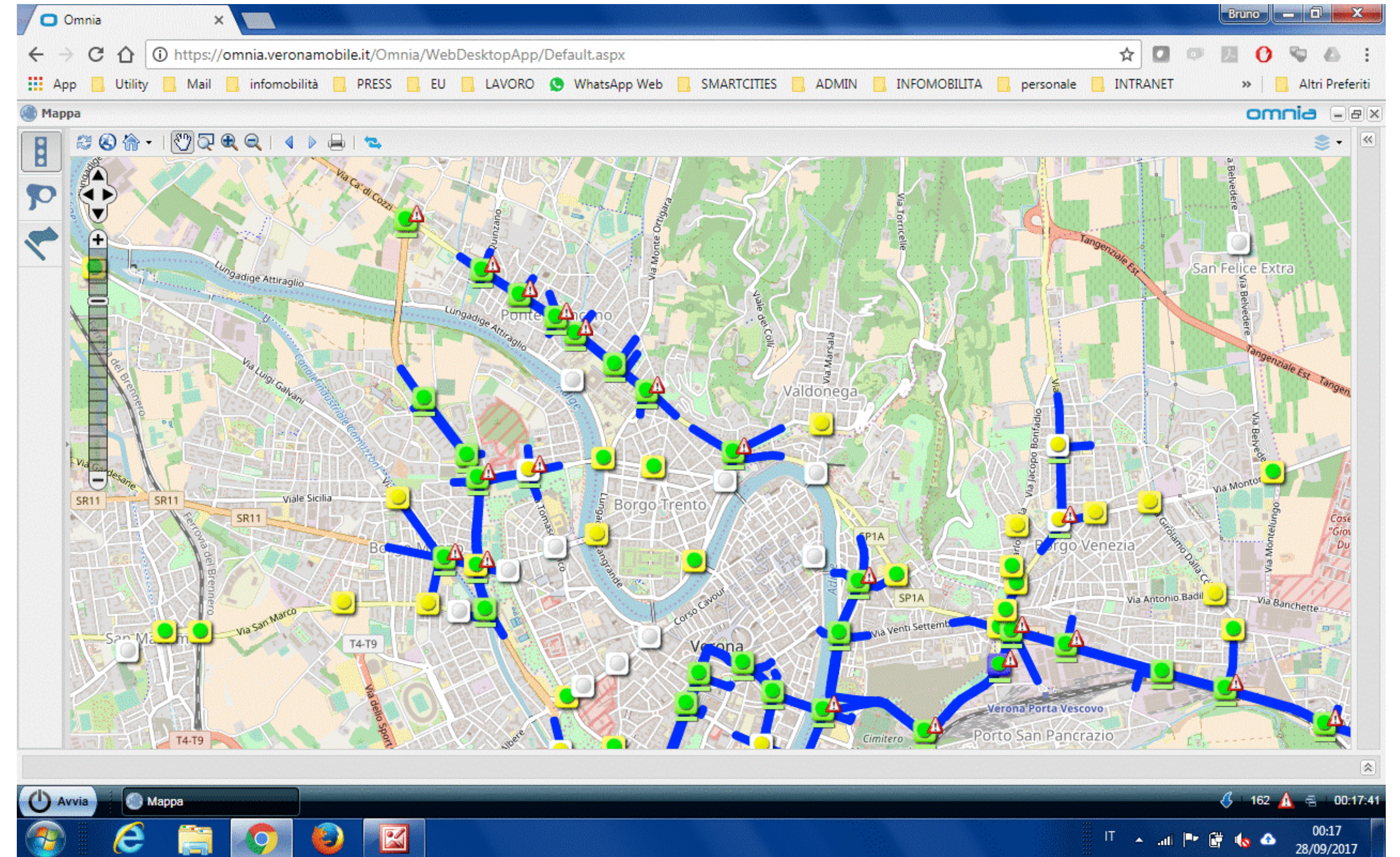


# Compass4D: test on an urban route



# 118 Vehicle emergency priority (2017)

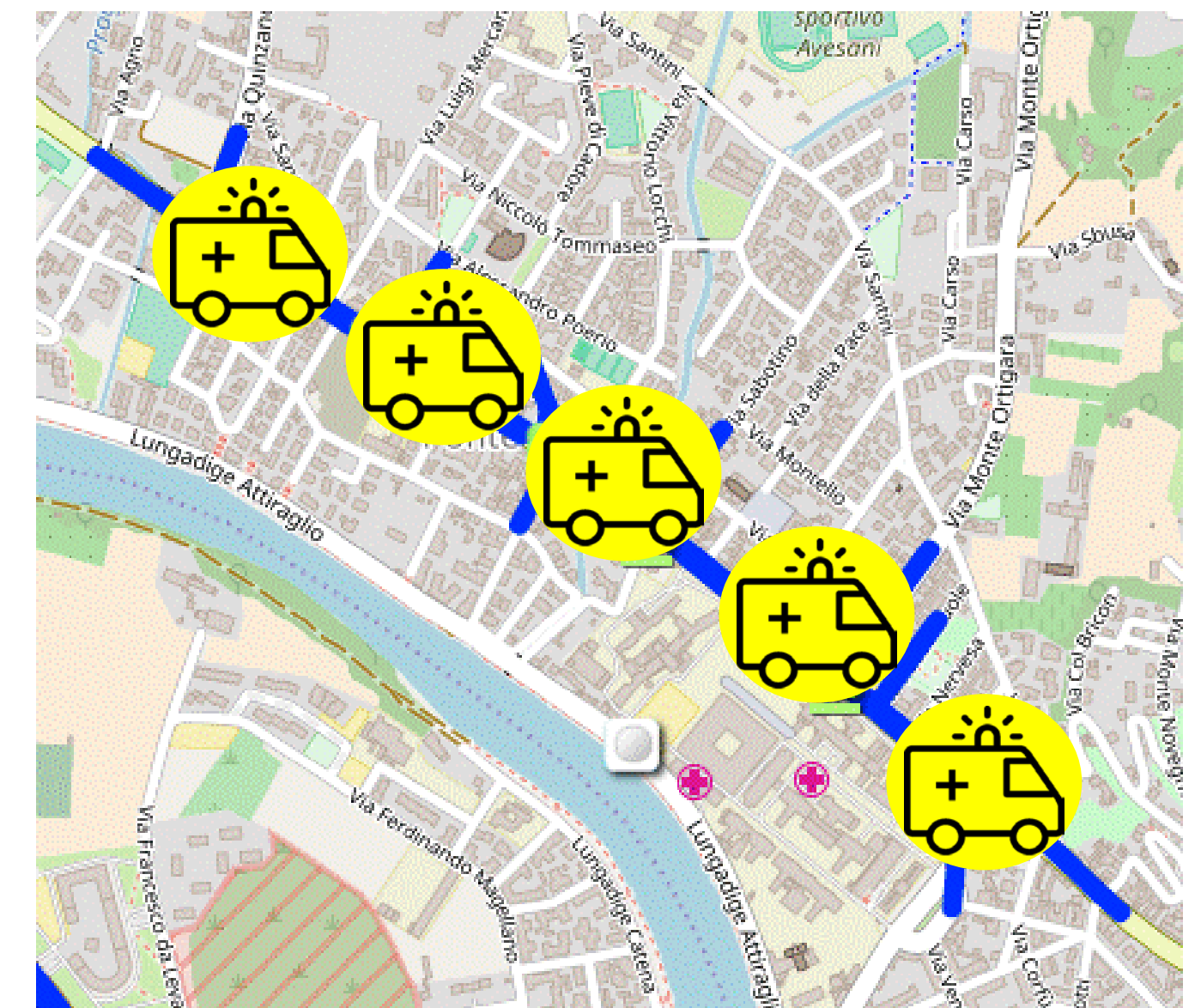
- Priority for emergency vehicles by traffic lights:
  - Green Streets (corridors)
  - Emergency vehicle position transmission: from 'SUEM 118' Control Center to UTC Control Center (Verona)
    - **CODE RED**
      - rescue mission activated
      - siren activated
      - flashing light activated
  - dynamic variation of traffic light phases



# 118 Vehicle emergency priority: overview

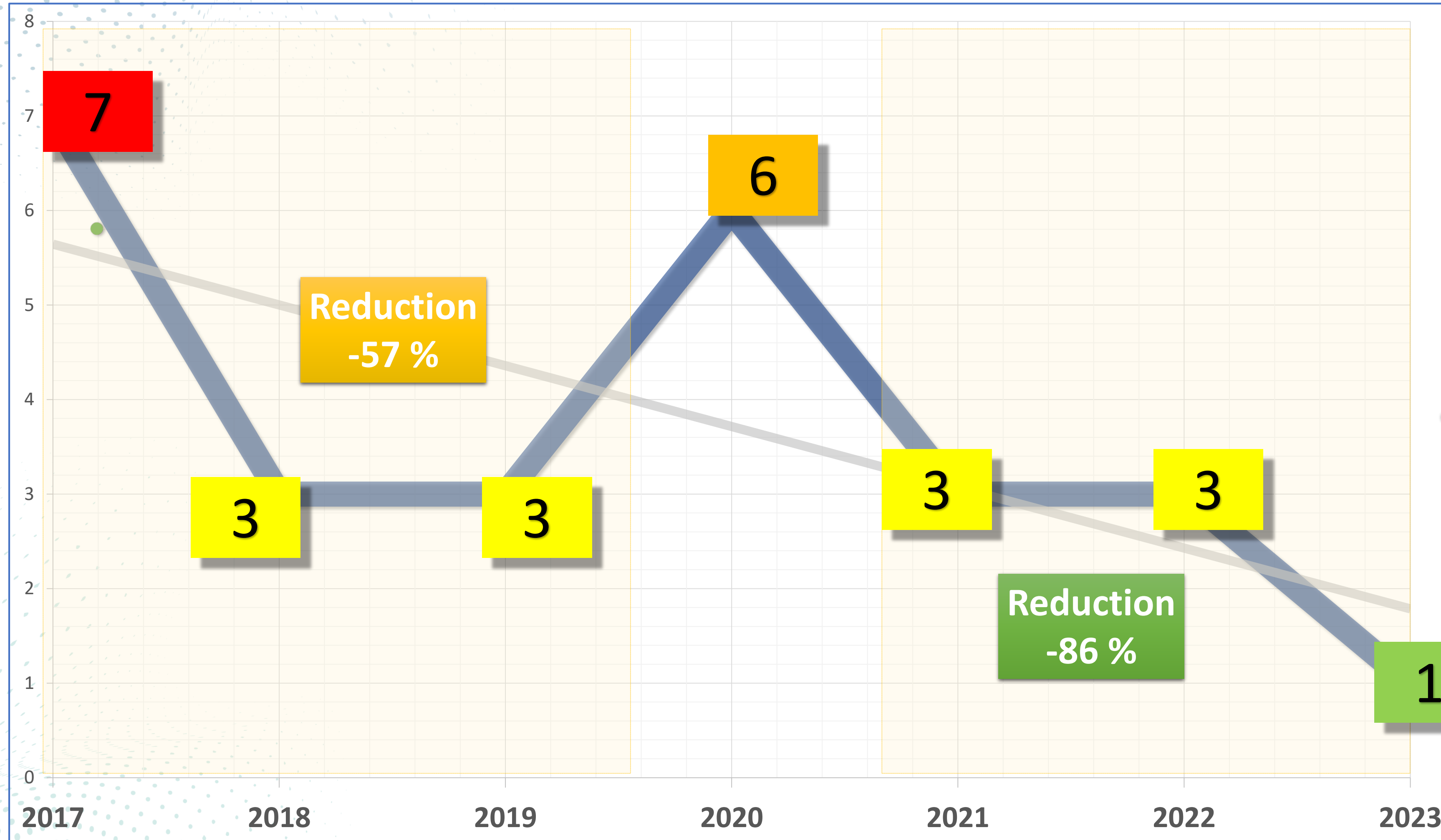


REGIONE DEL VENETO





# 118 Vehicle emergency priority: benefit evaluation

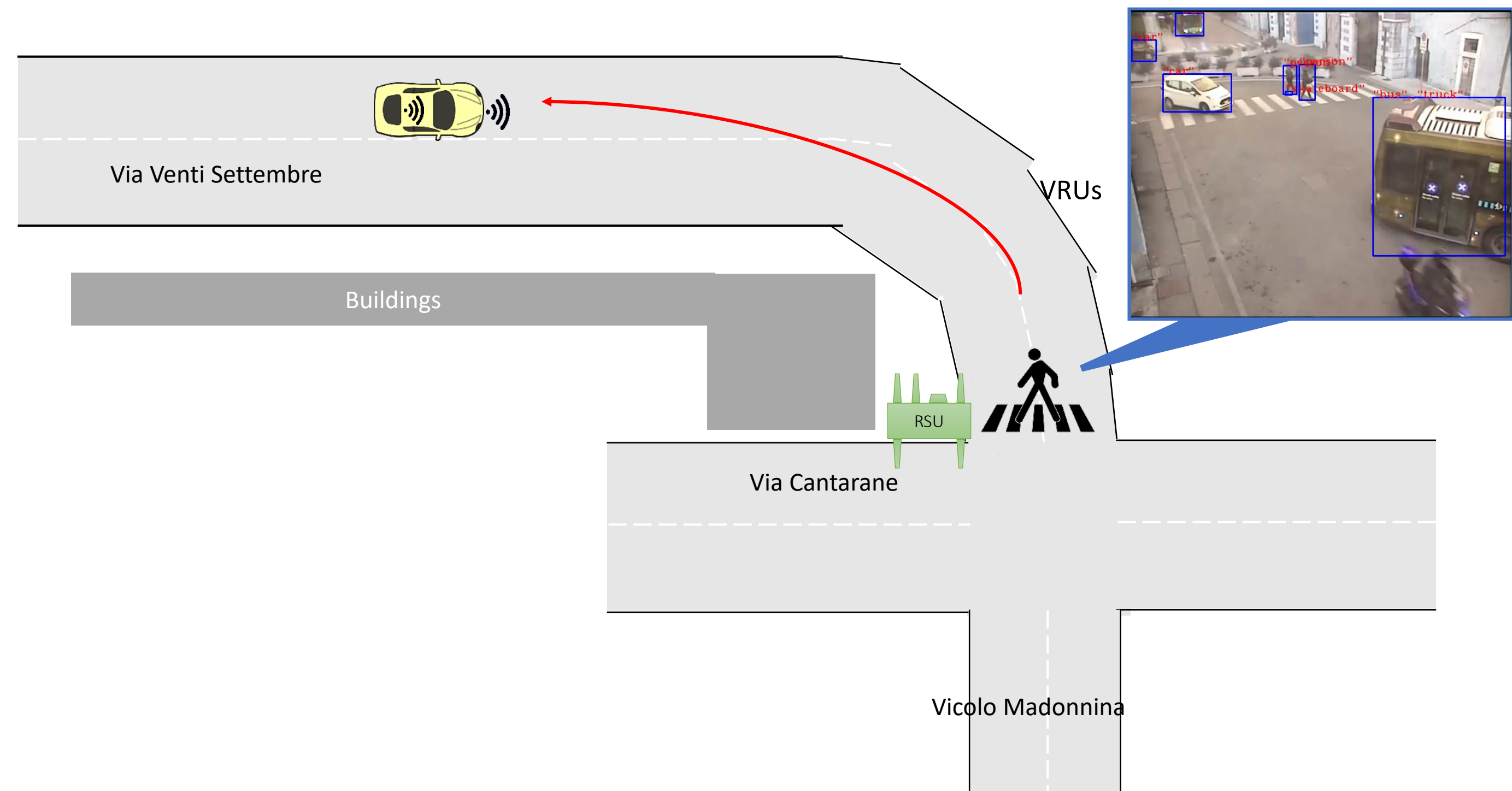


**Trend of accidents with ambulances involved**

# ICT4CART (2018-2019)

## Use cases and Scenarios: Verona TS

- **SCN1.2: Smart Parking and IoT management**
  - UC1 - Smart Parking & IoT services
- **SCN2.3: Dynamic adaptation of vehicle automation level**
  - UC2 - Dynamic adaptation of vehicle automation level based on infrastructure information
- **SCN3.1b: Virtual mirror to “see” surrounding traffic**
  - UC3 - Intersection crossing (urban) & lane merging (highway) – “virtual mirror”
- **SCN3.2: GLOSA (Green Light Optimized Speed Advisory)**
  - UC3 - Intersection crossing (urban) & lane merging (highway) – “virtual mirror”



# Verona

## C-Roads Italy 2: implementation of new services

# C-Roads Italy 2 – Verona test site: overview

## Use cases di Verona:

1. RWW – Lane Closure
2. RWW – Road Closure
3. HLN – Traffic jam ahead warning
4. SI - Green Light Optimal Speed Advisory (GLOSA)
5. SI - Signal Phase and Timing Information (TTG)
6. Smart Routing (IVIM-based)
7. HLN - Emergency or prioritized vehicle approaching

# Use Cases: RWW-LC, RWW-RC, HLN-TJA

Messaggi relativi al nodo Nodo\_Verona

Tipo rotta	Data inizio	Data ultimo messaggio	Totale	Attivi	Stato	Azioni
Incidenti	29/4/2022, 12:35:05	Nessun messaggio ricevuto	0	0	<span style="color: green;">●</span>	
Attività	29/4/2022, 12:35:05	Nessun messaggio ricevuto	0	0	<span style="color: green;">●</span>	
Condizioni atmosferiche, stradali e pubbliche	29/4/2022, 12:35:05	Nessun messaggio ricevuto	0	0	<span style="color: green;">●</span>	
Ostruzione della carreggiata	29/4/2022, 12:35:05	Nessun messaggio ricevuto	0	0	<span style="color: green;">●</span>	
Parcheggi - dati dinamici	29/4/2022, 12:35:05	11/11/2023, 21:38:57	9	9	<span style="color: green;">●</span>	
Parcheggi - dati statici	29/4/2022, 12:35:05	11/11/2023, 21:39:17	15	15	<span style="color: green;">●</span>	
Lavori stradali	29/4/2022, 12:35:05	18/5/2023, 09:24:17	4	4	<span style="color: green;">●</span>	
Livello di servizio	29/4/2022, 12:35:05	Nessun messaggio ricevuto	1	0	<span style="color: green;">●</span>	
Tempo di viaggio	29/4/2022, 12:35:05	20/11/2023, 18:30:00	1	1	<span style="color: green;">●</span>	

# Use Cases: SI-GLOSA, SI-TTG

The screenshot displays a monitoring interface for infrastructure services in Verona. On the left, a sidebar lists control areas (Area1 to Area6). The main map shows the Adige river and surrounding urban areas with several location markers. Three markers are circled in red, and two are circled in yellow. On the right, a table titled 'swarco CCAM-CS' provides details for each marker, including name, IP address, coordinates, status, and last update time.

Nome	Indirizzo IP	Coordinate	Stato	Ultimo aggiornamento	Messaggio di errore
1066-NIMES	192.168.210.20	10.983028, 45.431372	avvertimento	10:46:34, 31/05/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
4089-CAMUZZONI	192.168.210.21	10.985052, 45.430236	avvertimento	16:32:39, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
1025-PORTANUOVA	192.168.210.22	10.987869, 45.430183	avvertimento	16:33:54, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
1023-RAGGIODISOLE	192.168.210.23	10.988571, 45.431657	avvertimento	16:33:35, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
1019-BATTISTI	192.168.210.24	10.990033, 45.435415	avvertimento	12:08:30, 25/05/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
1016-PAGLIERI	192.168.210.25	10.990867, 45.437007	avvertimento	16:34:18, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
1001-PASUBIO	192.168.210.26	10.99522, 45.437137	avvertimento	16:33:43, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
1005-NAVI	192.168.210.27	11.002161, 45.43906	avvertimento	16:34:07, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
2141-VENEZIA	192.168.210.28	11.01535, 45.439467	avvertimento	16:33:29, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service
2138-BARANA	192.168.210.29	11.015829, 45.44065	avvertimento	16:33:21, 21/06/2023	Hardware status is "OK", software status is "OK", network facilities status is "OK", certificate issue - for further information please review the log file from monitoring service

# Use Case: SMART ROUTING (IVIM-based)

The screenshot displays the ACR Authority Control Room interface. On the left, a sidebar menu includes 'Rete Stradale', 'Gestione mobilità', and 'Gestione impianti'. The main area shows a map with a blue route and various icons. A 'Pannelli (23)' panel is active, displaying details for 'Via Torbido'.

**ACR Authority Control Room**  
26 Nr. cose in programma  
0 Allarmi 4 Eventi

**Pannelli (23)**  
Via Torbido

**DETTAGLI**

Nome	Via Torbido
Tipologia	Sfiera
Strada	Via Torbido
Stato Diagnostico	Normale
On Air	

**LAVORI FILOBUS: VIABILITA' MODIFICATA NIMES POSSIBILI CODE IN ORA DI PUNTA**

Nome Messaggio	PARK-TORBIDO
Livello Esposizione	Scena

Scale 1: 21708,248 127 m  
Lat: 45,433994 Lon: 10,995635

**Comune di Verona**  
POR  
FIERA / FRANGI DEL VENETO

**ZTL APERTA SOLO AUTO E AUTORIZ.**

ParkCENTRO	255
Park ISOLO	86
CITTADELLA	282
Park ARENA	707

**INFO PARCHING: ARENA 282 CITTADELLA 282**

# Use Case: EPVA

The screenshot displays the MapCluster interface with several overlapping windows. The main map shows a geographic area with traffic control points and emergency alerts. Three pop-up windows provide details for specific alerts:

- 20135 - inserted on em...:**

Stato	Allarmi	Em
Codice	20135	
Descrizione	inserted on	
Tipo	Non definito	
Stato	Emergenza	
- 6991121 - inserted on ...:**

Stato	Allarmi	Ei
Codice	6991121	
Descrizione	inserted on	
- 20114 - inserted on e...:**

Stato	Allarmi
Codice	20114
Descrizione	inserted on

The interface also includes a sidebar with a tree view of traffic control areas (Area1 to Area6) and a bottom status bar showing the current page (1 di 11) and a list of vehicles.

Veicolo	Codice	Stato
Veicolo	6991031	Non definito
Veicolo	20108	Non definito



# C-ITS Server: Verona messages

The screenshot displays the C-ITS Server interface. On the left is a navigation menu with options: Dashboard (highlighted in orange), VR Verona, and Logout. The center panel shows a list of messages under the heading 'ALL', including HLN-EPVA, HLN-OR, HLN-SV, HLN-TJA, HLN-WCW, IVI-DTT, IVS-DSLI, IVS-EVFT, PI-OFFSTR..., RWW, and SPATEM (highlighted in orange). A Logout button is at the bottom of this list. On the right, a map of Verona shows a selected message (3945|10005) highlighted in yellow along a road. The map includes labels for streets like Via San Fermo, Via Leonino, and Via Museo, and landmarks like Chiesa di San Fermo Maggiore.



**Thank for your attention**

Arch. Bruno Pezzuto