

ALPCHECK

WP 6 - Information System: Design and Implementation

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WP6-Objective

- Statement from ALPCHECK WP5:
 - *AlpCheck is undertaking the ambitious task of initiating a process which should eventually lead to the establishment of an **informative system** for transport through Alpine area. Such an informative system will only be created through close co-operation of all Alpine countries and the European Commission.*
- WP6 design and implementation – aims to:
 - Design system
 - Road map
 - system architecture
 - technology (peripheral, central)
 - Software (central)
 - Develop system
 - Implement (pilot projects)

WP6 – road map

- Road map (Datawarehouse DWH)
 - First step (data base) Data transformation
 - extraction from feeder systems (ad hoc interface)
 - Transformation / normalisation
 - Data preparation and storage
 - Data interpretation and analysis (query and analysis)
 - Intermediate step (Decision Support System)
 - Data interpretation and analysis (+ traffic model)
 - Data presentation (georeferenced user interface)
 - Final step (Infomobility)
 - Dynamic acquisition of traffic data (including real time events)

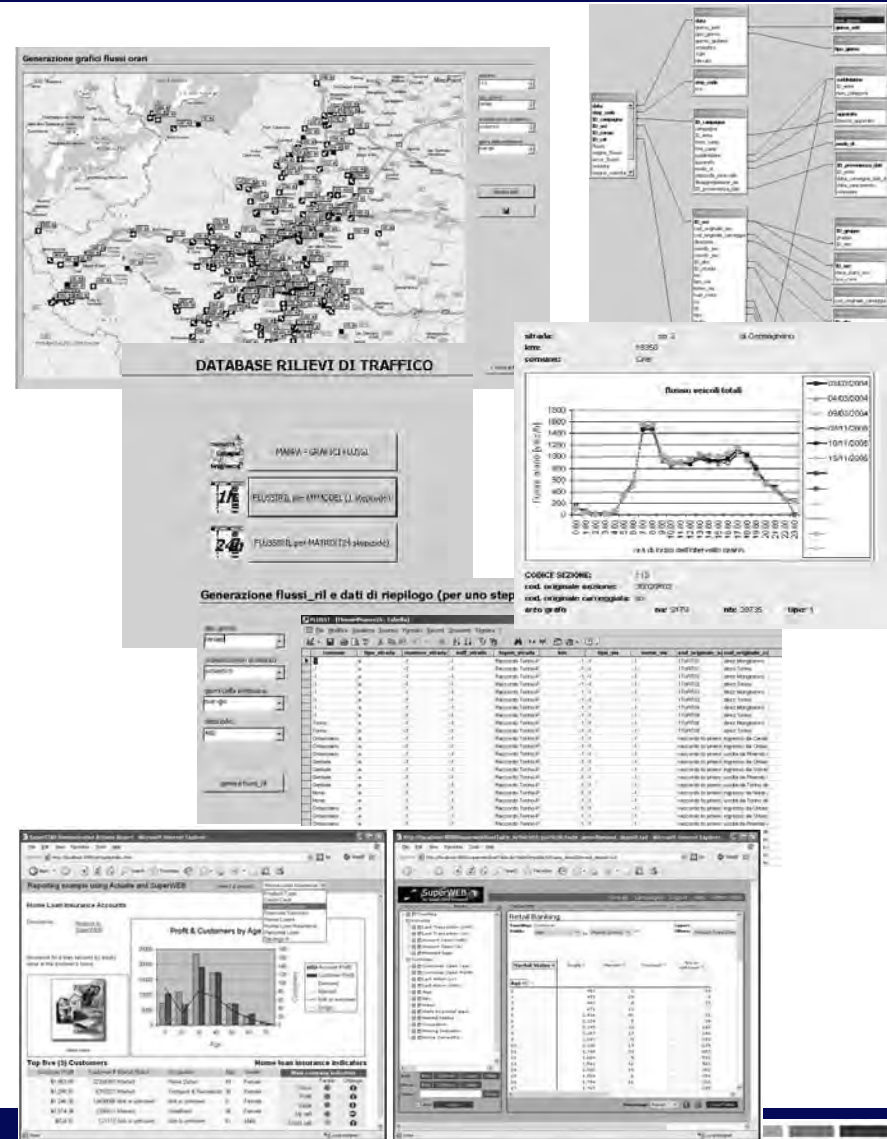


ALPCHECK

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WP6 – road map

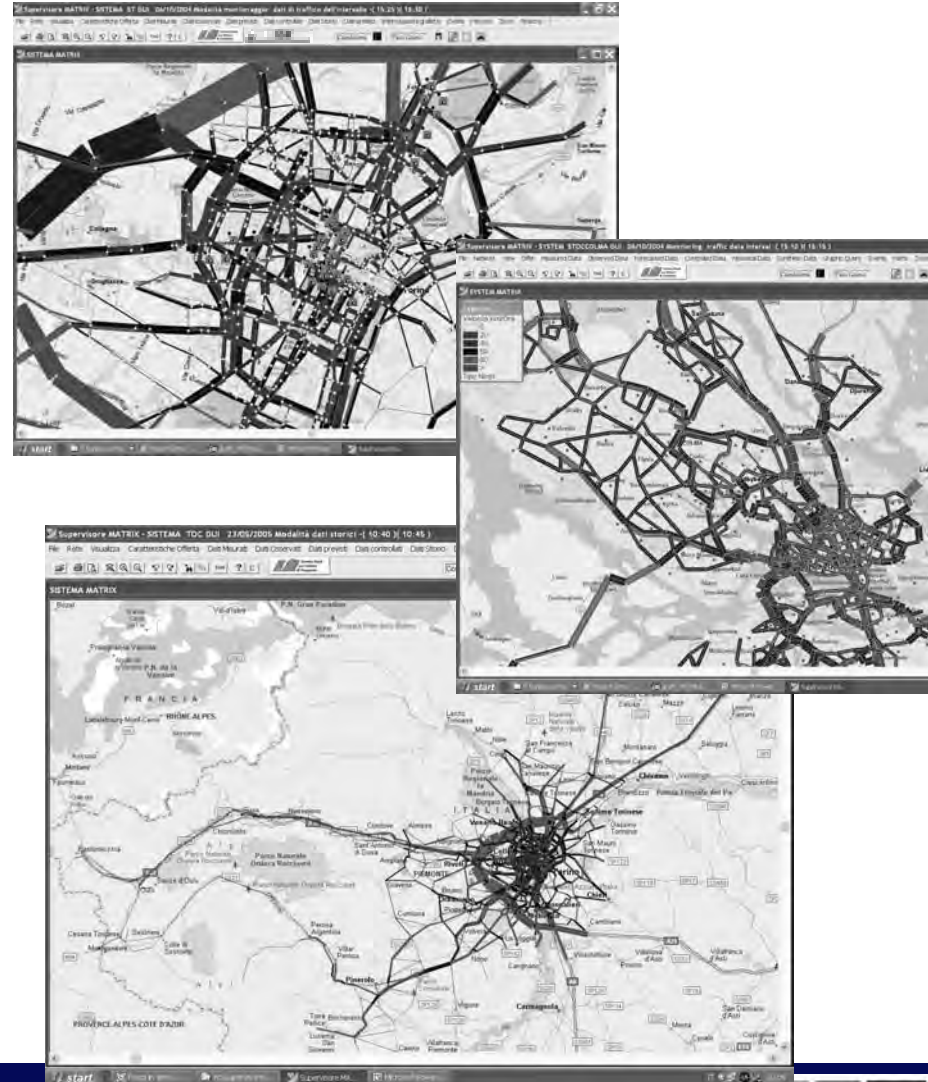
- Road map
 - First step (data base)
 - Collect traffic data from different sources
 - From data to information (Harmonize, normalize)
 - Information manipulation (query and analysis easy and flexible)
 - Data presentation (reporting)



Business intelligence
tools + web application

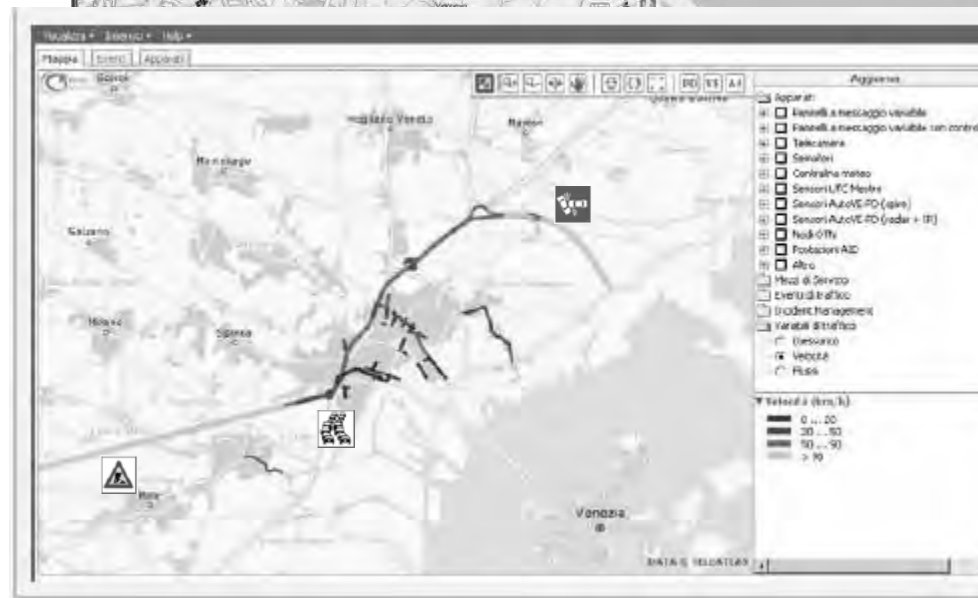
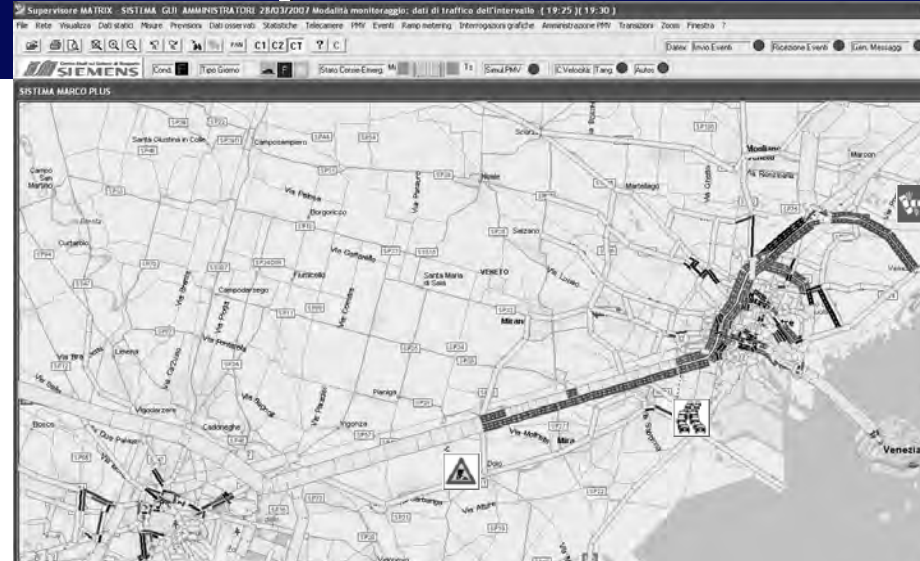
WP6 – road map

- Road map
 - intermediate step (DSS)
 - Build transport models chain
 - Offer (road network) model
 - Demand model (OD matrix time dependent)
 - Behavioural model (modal split and assignment DUE, SUE, etc)
 - Georeferenced GUI
- Model platform (dynamic)



WP6 – road map

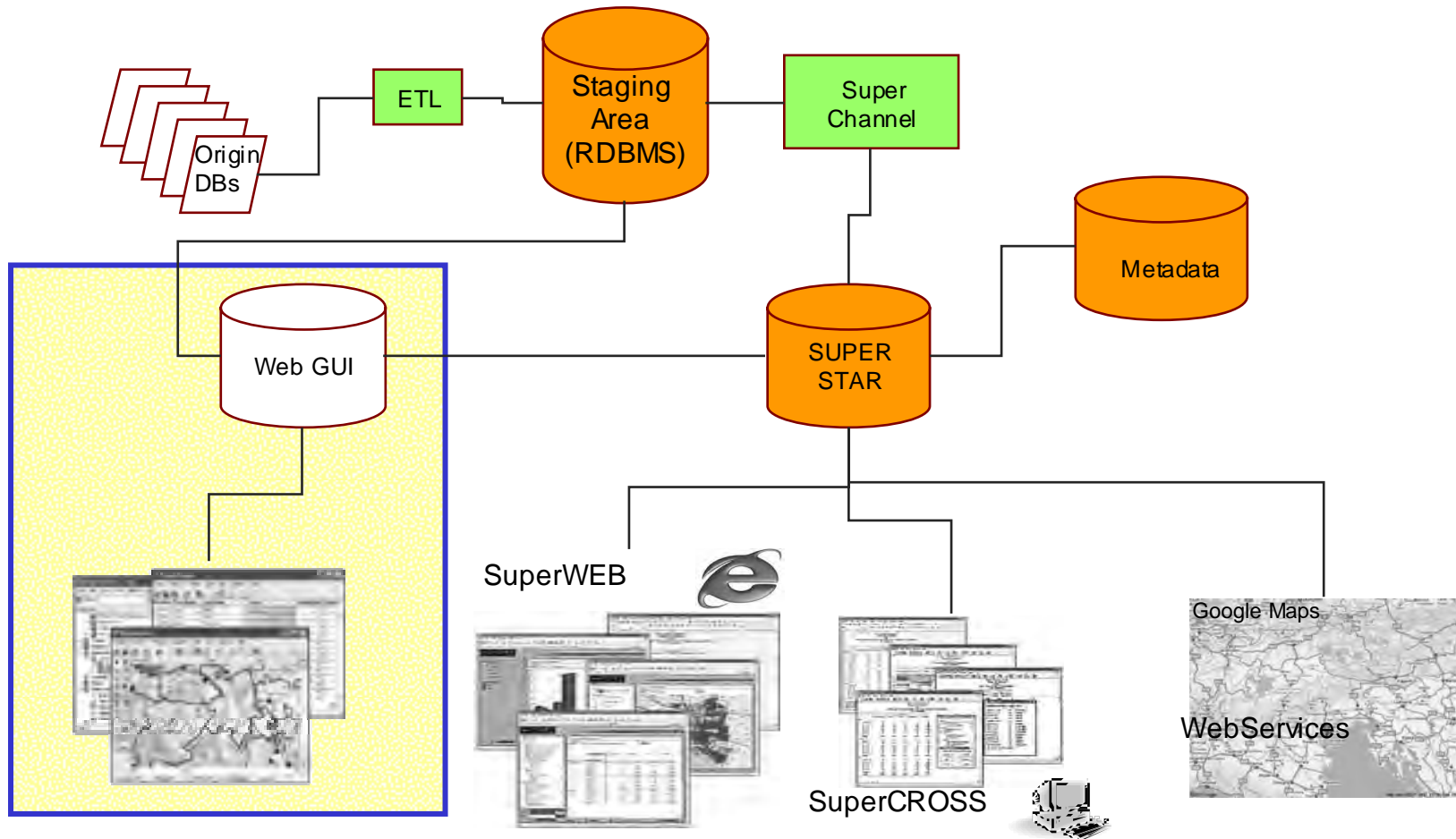
- Road map
 - Final step (infomobility)
 - Build tool working in real time
 - collecting traffic data and events,
 - making forecast on traffic evolution,
 - Generating suitable information for road users
 - Web interface
- Traffic Management & infomobility platform



WP6 – Develop System (I)

- Datawarehouse DWH (APV)
 - Selection of Tool
 - Super Star
 - Training course
 - Selection of sources
 - Traffic data so far identified
 - Pilot projects
 - Sources interfaces
 - Transformation / normalisation
- Web application (CSST)
 - Design
 - Traffic data model
 - GUI interface
 - development

System architecture



WP6 – data normalisation

- Data to be normalised
 - Road Traffic (section, stretch)
 - Flow
 - Speed/Travel time
 - Vehicle classification
 - OD (zone)
 - Intensity
 - Type
 - Passengers
 - Freight
 - Pilot project

WP6 – data normalisation

- normalisation
 - Have common view of data from different sources
 - Suitable organisation of data including “support” data = DB “tables”
- Critical issue in normalisation:
 - Time resolution
 - Vehicle classification
 - Freight classification
 - Approach:
 - “Minimum common” among data
 - Minimum level of details + common group

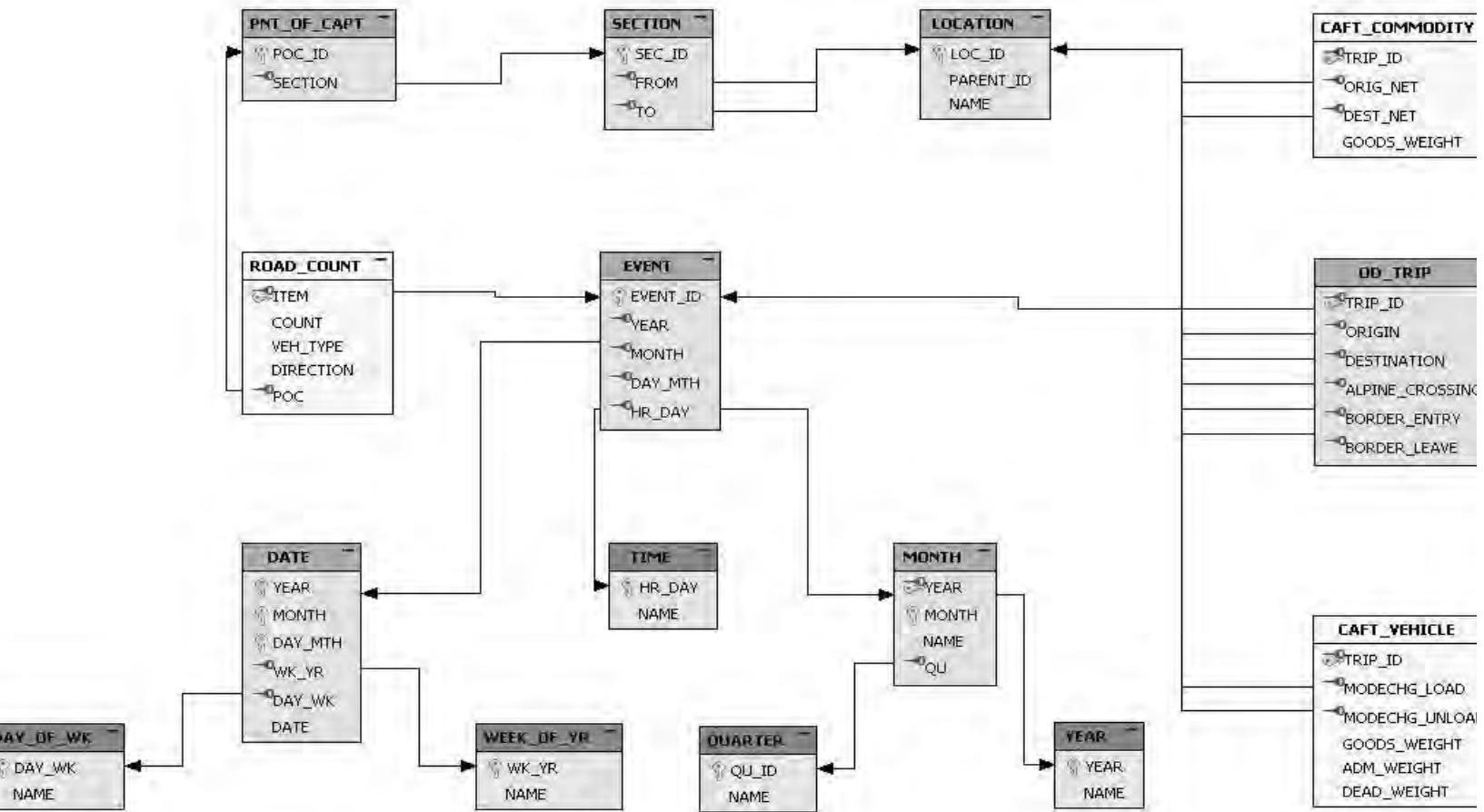
WP6 – data normalisation

- Tables
 - Static tables:
 - Source information
 - Data owner
 - Type of Vehicle classification
 - Type of freight classification
 - Time resolution
 - Data collection method
 - Traffic data
 - Section/stretch list (anagraphic info)
 - Road list
 - Calendar
 - Section group (user defined)
 - OD data
 - Zone list (NUTS, other)
 - Relation category (passenger, freight, vehicle/freight classification)

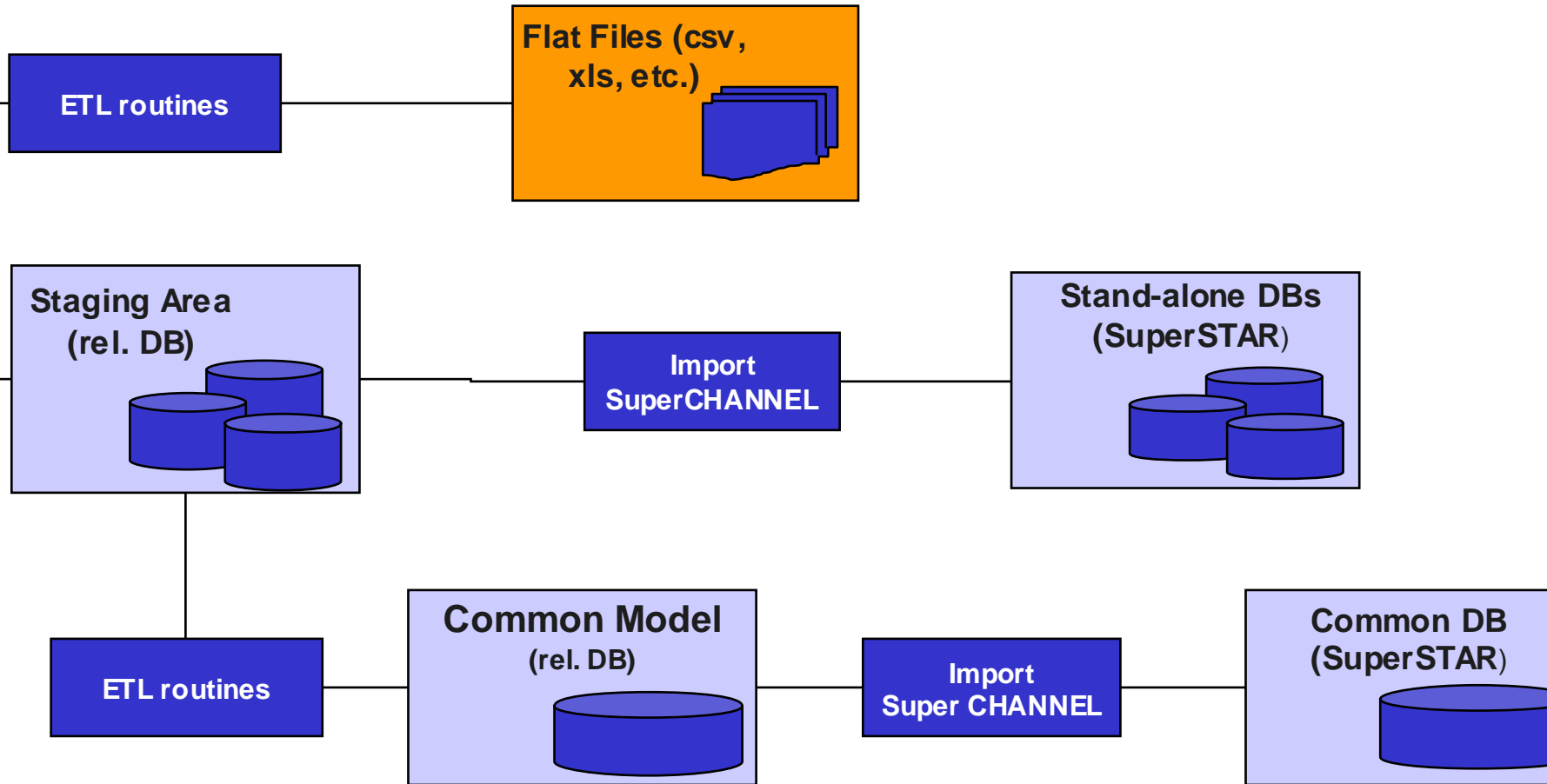
WP6 – data normalisation

- Tables
 - Dynamic table
 - Traffic data (5min/hour Resolution, per direction)
 - Flow (per vehicle category)
 - Speed (Harmonic average)
 - Type of data (measured, estimated)
 - Accuracy
 - OD data (hour/day resolution)
 - Flow (passenger/freight)
 - accuracy

WP6 – common Data model



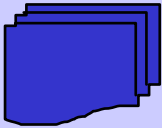
WP6 – ETL and load process design



data sources – status

Flat Files

(csv, xls, etc.)



| | |
|--|------------------|
| Cross Alpine Freight-Transport/BMVIT | loaded |
| ASFINAG | loaded |
| Frejus tunnel | loaded |
| Mont Blanc | loaded |
| Gran San Bernardo | loaded |
| Autostrade per l'Italia | loaded |
| Veneto Region | work in progress |
| Permanent automatic counting stations in Germany | loaded |
| Ventimiglia | loaded |
| Slovenia Pilot Project | loaded |
| Venice/Stuttgart Pilot | work in progress |
| IREALP - SLALA Pilot Project | work in progress |
| Vienna Pilot Project | no data |
| Val d'Aosta Pilot | no data |

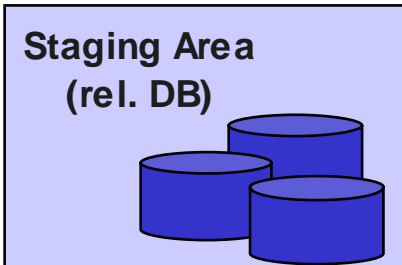
data sources

Flat Files (csv,
xls, etc.)



- Flat files
 - different formats (csv, MS Access, MS Excel)
 - Mostly well-documented
 - Some improvement in documentation possible

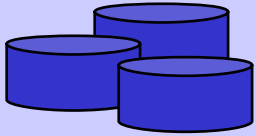
Staging Area



- One DB for each data source
- Intermediate storage for source data
- Starting point for:
 - Loading the Common Design
 - Generating separate SuperSTAR databases
- Relational databases

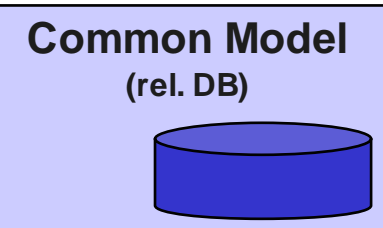
SuperSTAR databases

Stand-alone DBs
(SuperSTAR)



- One DB for each data source
- User-accessible databases
- Used to create reports for stand-alone data sources
- Registered with SuperSTAR server

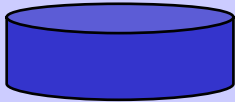
Common Model



- One DB design combining the different data sources in the dimensions
 - Time
 - Location (counting stations, O/D)
 - Vehicle type
- Intermediate storage for common SuperSTAR DB
- Relational database

Common Database (SuperSTAR)

Common DB
(SuperSTAR)



- User-accessible database containing the common model
- Used to create reports across and combining several data sources
- Registered with SuperSTAR server

Common Database (SuperSTAR)



- Estimated goods distribution
Brenner 2004-06

| | Annual No. of Vehicles | Estimated No. of Vehicles 2004 | Estimated No. of Vehicles 2005 | Estimated No. of Vehicles 2006 | Annual Goods Weight | Estimated Goods Weight 2004 | Estimated Goods Weight 2005 | Estimated Goods Weight 2006 | % Diff of Vehiclecount 2004 |
|--|------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Agricultural products and live animals | 271.982 | 279.876 | 283.437 | 294.185 | 4.922.025 | 5.064.892 | 5.129.338 | 5.323.832 | 2,9 |
| Foodstuffs and animal fodder | 369.590 | 380.318 | 385.157 | 399.762 | 7.247.737 | 7.458.110 | 7.553.008 | 7.839.403 | 2,9 |
| Solid mineral fuels | 1.965 | 2.022 | 2.048 | 2.126 | 46.424 | 47.772 | 48.380 | 50.214 | 2,9 |
| Petroleum products | 5.991 | 6.165 | 6.243 | 6.480 | 119.001 | 122.455 | 124.013 | 128.715 | 2,9 |
| Ores and metal waste | 26.981 | 27.764 | 28.117 | 29.183 | 538.510 | 554.141 | 561.192 | 582.471 | 2,9 |
| Metal products | 151.272 | 155.663 | 157.643 | 163.621 | 3.115.545 | 3.205.977 | 3.246.770 | 3.369.881 | 2,9 |
| Crude and manufactured minerals, building materials | 141.675 | 145.787 | 147.642 | 153.241 | 2.941.815 | 3.027.204 | 3.065.722 | 3.181.968 | 2,9 |
| Fertilizers | 5.888 | 6.059 | 6.136 | 6.368 | 131.193 | 135.001 | 136.718 | 141.902 | 2,9 |
| Chemicals | 155.198 | 159.703 | 161.735 | 167.868 | 2.872.562 | 2.955.941 | 2.993.553 | 3.107.062 | 2,9 |
| Machinery, transp. equip., mfg articles, misc. and unknown | 807.402 | 830.837 | 841.409 | 873.313 | 10.780.573 | 11.093.490 | 11.234.645 | 11.660.640 | 2,9 |
| unknown | 140.960 | 145.052 | 146.898 | 152.468 | 69.331 | 71.343 | 72.251 | 74.991 | 2,9 |
| Total | 2.078.904 | 2.139.246 | 2.166.466 | 2.248.614 | 32.784.716 | 33.736.325 | 34.165.590 | 35.461.080 | 2,9 |

Import process (I)

Import
SuperCHANNEL

- Relational source database
- SuperSTAR target database
- Definition of facts (counting variables)
- Definition of classifications (category variables)
- Defined with SuperCHANNEL

Import process (II)

Import
SuperCHANNEL

commodity.xml - SuperCHANNEL

File View Source Target Tools Help

New Open Save Source Attributes Logs Type Map Preferences Target Grouping Build All Update All Results

Source View

Source Attributes

Database

Label: .

Name: .

Location: jdbc:db2://dementia:50000/caft

Username: db2inst1

Driver: IBM DB2 JDBC Universal Driver Ar

Target View

Commodity Records

Fact Tables

Classifications

Plain Tables

ALPCRO

AXLCEC

AXLCF

BODYVEH

COMMOD

COMMODITY

DANG_T

DANGOO

FURALP

MODALP

MODINL_TERM

NUTS0

NUTS1

NUTS2

NUTS3

COMMOD

ALPCRO

COMMOD

FURALP

LAU2

MODALP

MODINL_TERM

NUTS0

NUTS1

NUTS2

NUTS3

```
<TABLE NAME="COMMOD" LABEL="COMMOD" USAGE="CLASSIFICATION">
<COLUMN NAME="CODE" LABEL="CODE" USAGE="CODE" KEYSEQ="1" VISIBLE="Y"
<COLUMN NAME="NAME" LABEL="NAME" USAGE="NAME" VISIBLE="Y" PRIMARYKEY
</TABLE>
<TABLE NAME="ALPCRO" LABEL="ALPCRO" USAGE="CLASSIFICATION">
<COLUMN NAME="CODE" LABEL="CODE" USAGE="CODE" KEYSEQ="1" VISIBLE="Y"
<COLUMN NAME="NAME" LABEL="NAME" USAGE="NAME" VISIBLE="Y" PRIMARYKEY
</TABLE>
<CLASSIFICATION NAME="VERSION" LABEL="VERSION" TABLE="COMMODITY" COL
</DATABASE>
```

ETL process

ETL routines

- Relational source database or flat files
- Relational target database
- Extraction of data from source format (file formats, DB design)
- Transformation in target design (stand-alone, common designs)
- Loading of data to the target
- Defined with KETTLE

WP6 – Web application

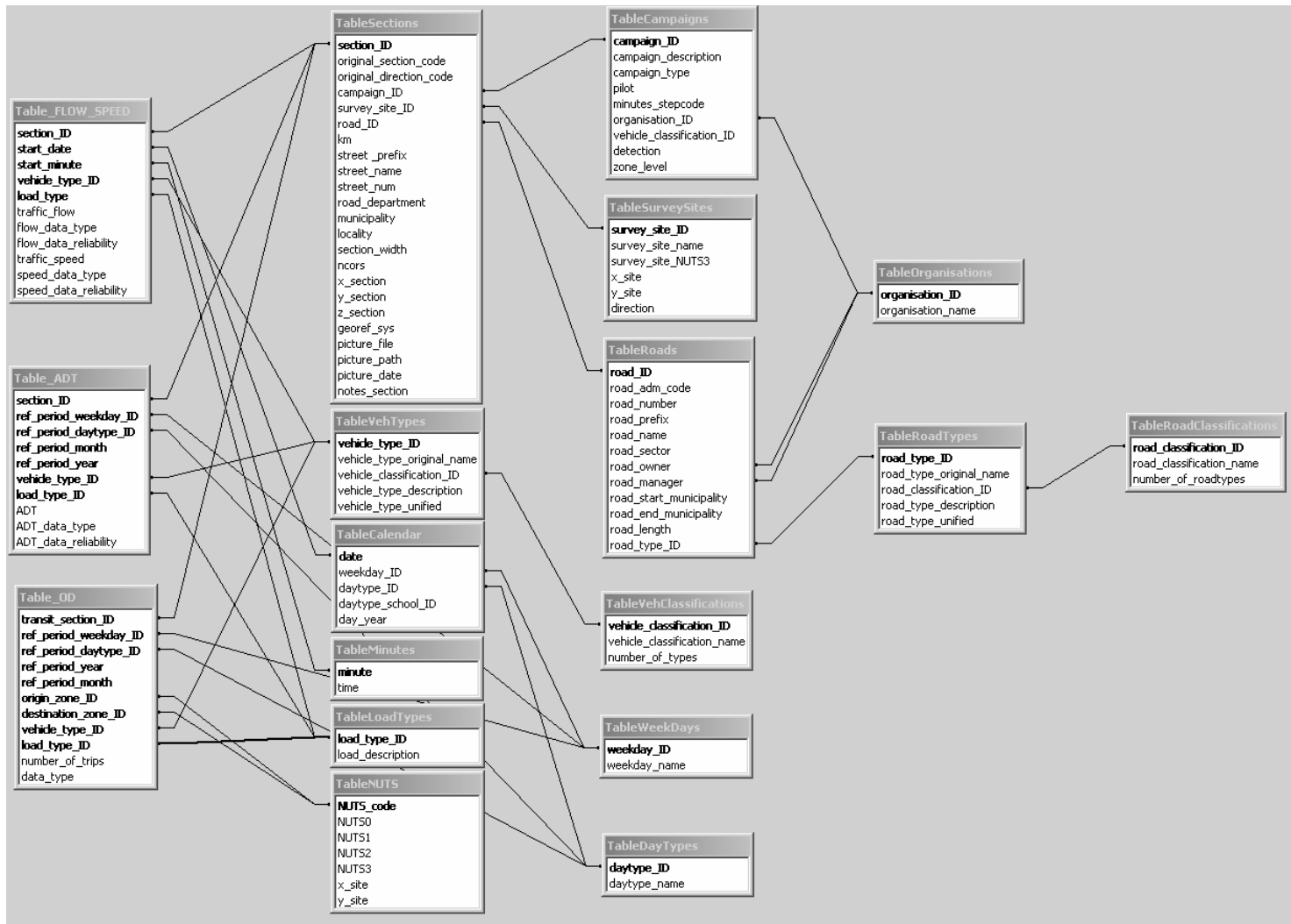
- Objective:
 - Develop a tool which allow user to see (on a map) and offer possibility to extract (download) normalised data from DWH using Internet.
- Main requirements:
 - Data have to be georeferenced (suitable map)
 - user profile:
 - Very simple representation of data, few interaction with the system

Main characteristics of the web GUI database (1/2)

- Microsoft Access format (possibly converted to db2 format)
- ready for encompassing any type of traffic information databases
- 18 tables hosting information on:
 - georeferenced OD relations and traffic measures at different time steps
 - sections of measurement
 - vehicle types and classifications
 - load types
 - measurement campaigns and responsible entities
 - road types and classifications
- feeded through dedicated procedures for data conversion from Alpcheck DWH (according to the fields correspondence resulted from the origin DBs analysis)



Main characteristics of the web GUI database (2/2)



Main characteristics of the web GUI (1/3)

- Web application with map interface based on Google Maps (Javascript - PHP)
- Data extraction based on combo boxes and "cascade" selections
- Four data families:
 - day-based traffic
 - year-based traffic
 - ADT along years
 - OD matrices (NUTS0 to NUTS3 level based)

Main characteristics of the web GUI (2/3)

The screenshot shows a Mozilla Firefox browser window displaying the AlpCheck website. The browser's address bar shows the URL `http://www.torino.csst.it/guiweb/index.htm`. The website features a navigation menu with tabs for "Traffic Counts(day profile)", "Traffic Counts(year profile)", "AADT", and "AADT per Origin/Destination". A map of the Alpine region is displayed, with various cities and countries labeled. Below the map, there are several selection boxes for filtering data, including "Site", "Campaign", "Day Type", "Weeks Day", "Vehicle type", and "Load Type". The browser's status bar at the bottom shows the taskbar with icons for Start, Mozilla Firefox, Presentazioni, Microsoft PowerPoint, and a floppy disk icon.

Data families (one sheet each)

Map interface

Selection boxes

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Community Initiative Programme funded by the European Regional Development Fund

Main characteristics of the web GUI (3/3)

- Selectable parameters:
 - measurement site
 - data origin (measurements campaign)
 - day type (working day / holiday, etc.)
 - day of the week
 - vehicle type (aggregated according two macro types “light” and “heavy” vehicles)
 - load type (where available)
- Only the choices with available data are proposed to the user, avoiding “no data” results from the query
- Results request can be launched at any stage of the selection

Output (1/3)

- The results of the data inquiry are shown to the user in form of:
 - tables
 - graphs
 - map-based representations
- The result data series are disaggregated according to the available combinations of the selectable parameters
- The “dimension” of the results (number of time series, rows and columns of the OD matrices) varies according to selection stage at which the inquiry is launched

Output (3/3)

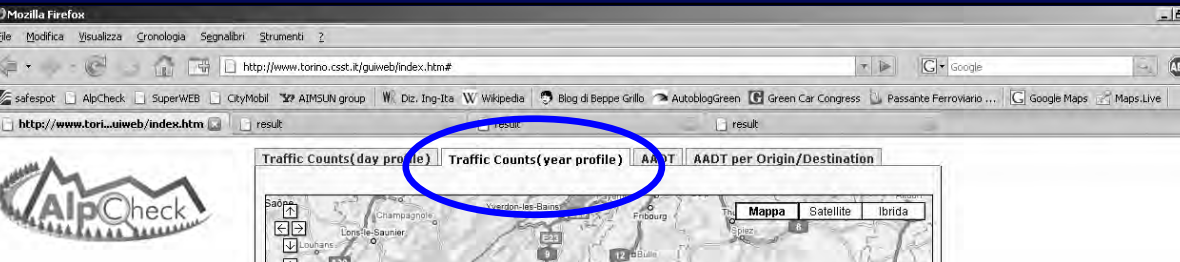
Results map

Results table (OD matrix)

| | Isère | Loire | Rhone | TOT_RIG |
|----------|-------|-------|-------|---------|
| Cuneo | 1.0 | 5.0 | 2.0 | 7 |
| Torino | 2.0 | 7.0 | 3.0 | 12 |
| Vercelli | 1.0 | 3.0 | 3.0 | 7 |
| TOT_COL | | | | |

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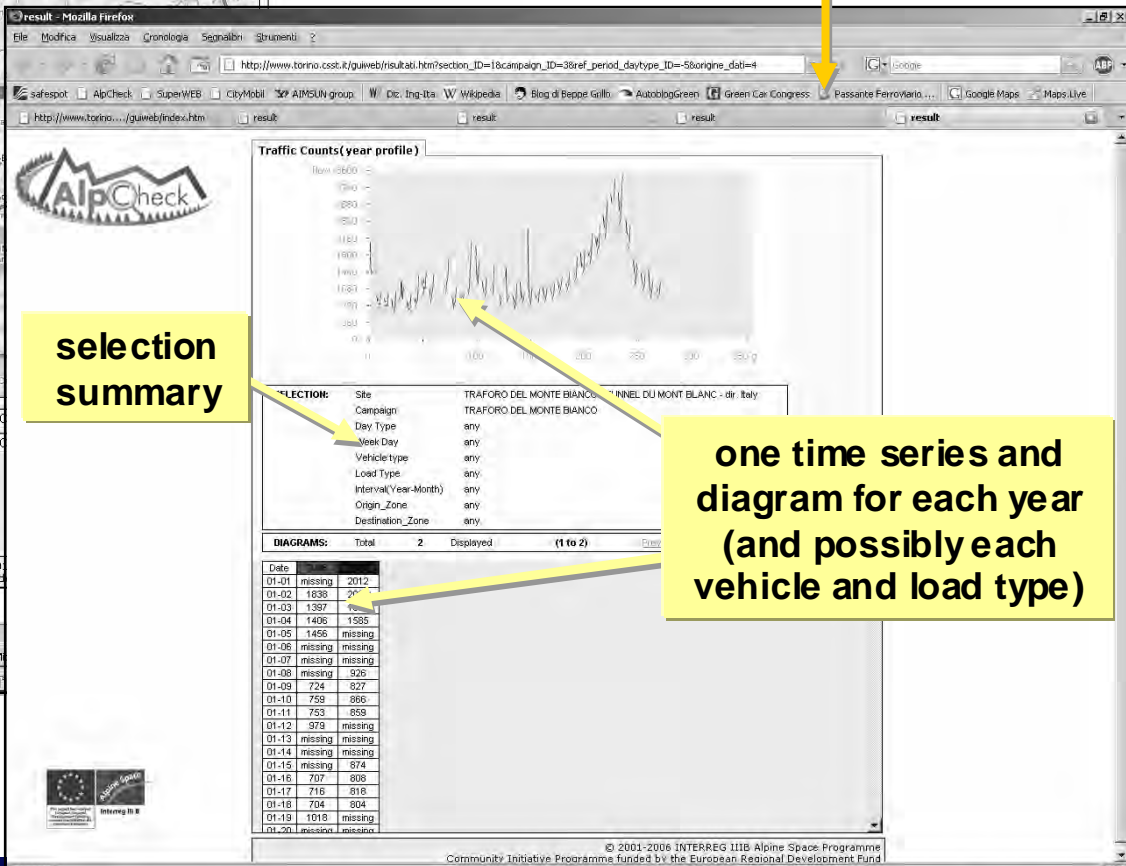
Selection example: day-based traffic (vehicles per hour)



Results window

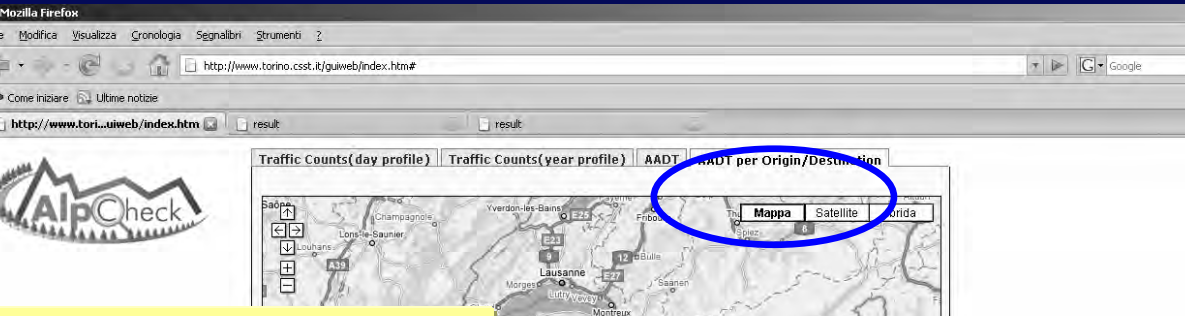
selection by:

- section and direction
- data origin (campaign)
- vehicle and load type



Selection window

Selection example: OD Matrices



Selection by:
 Selection
 Data origin (campaign)
 Vehicle and load type
 Origin and destination zone
 High versatility for NUTS
 Level choice)

Site: Mont-Blanc tunnel

Campaign: CAFT

Vehicle type: 2

Load Type: generic not dangerous

Interval (year-month): 2004

Origin Zone: ITALIA

NUTS0: NORD-OVEST

NUTS1: Piemonte

NUTS2: Any

Dest. Zone: FRANCE

NUTS0: CENTRE_EST

NUTS1: RHONE_ALPES

NUTS2: Any

NUTS3: Any

result

Selection window

result - Mozilla Firefox

http://www.torino.csst.it/guivweb/result.htm#section_ID=26&campaign_ID=1&ref_period_daytype_ID=0&ref_period_weekday_ID=...

AlpCheck

AADT per Origin/Destination

Mappa Satellite Ibrida

selection summary

SELECTION:

- Site: Mont-Blanc tunnel
- Campaign: CAFT
- Day Type: undefined
- Week Day: Monday to Sunday
- Vehicle type: 2
- Load Type: generic not dangerous
- Interval (Year-Month): 2004
- Origin_Zone: IT1
- Destination_Zone: IT1

DIAGRAMS: Total 3 Displayed (1 to 3)

| | is Ore | Loire | Rhone | TOT_R02 |
|----------------|--------|-------|-------|---------|
| Alessandria | 2.0 | 5.0 | 3.0 | |
| Cuneo | 1.0 | 4.0 | 2.0 | |
| Torino | 2.0 | 7.0 | 3.0 | |
| Vercelli | 1.0 | 3.0 | 3.0 | |
| TOT COL | | | | |

Map representation of total origins (red) and total destinations (blue) per zone

OD relations according to selected NUTS level

Results window

WP6 Web Application - Remarks

- a. The selection scheme is thought as a “cascade selection”, where the selection options for a certain category (scroll-down window) include only those for which the dat base effectively contains data. This assumes that for every selectin a query is automatically launched in order to extract the available items for the following selection in the sequential “selection tree”.
- b. The selection options (windows and buttons) in step 2 and 3 may be activated or inhibited according to the chosen display mode, for representation clearness or conceptual reasons. For example: the “distinct category” option for the data source selection is not selectable for the ADT per Origin/Destination display mode; the ADT survey month, day and day type windows are inhibited if the ADT per year or per Origin/Destination has been selected.

WP6 – Web Application

- WB application now available on ALPCHECH Server for ALPCHECK community at:

<http://dh.alpcheck.eu/guiweb/index.htm>

Thank You for attention

