



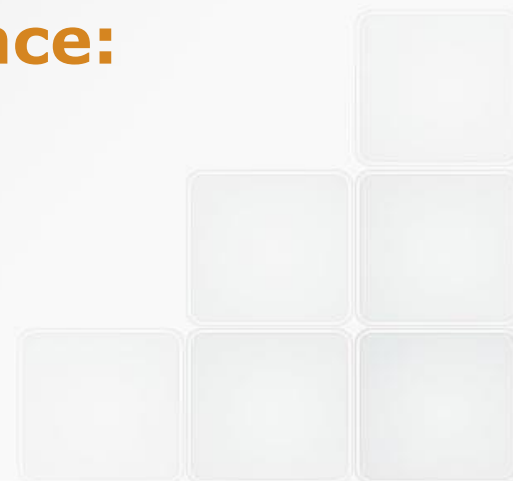
Critical Infrastructures and Urban Resilience in the Rome context

ENEA UTMEA activities

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Vittorio Rosato – ENEA
Maurizio Pollino - ENEA

**Critical infrastructures and urban resilience:
mapping assets, actors and data**

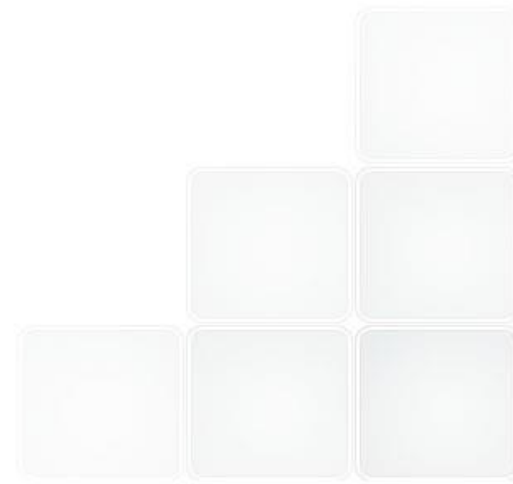
Rome, 21/04/2015



Summary



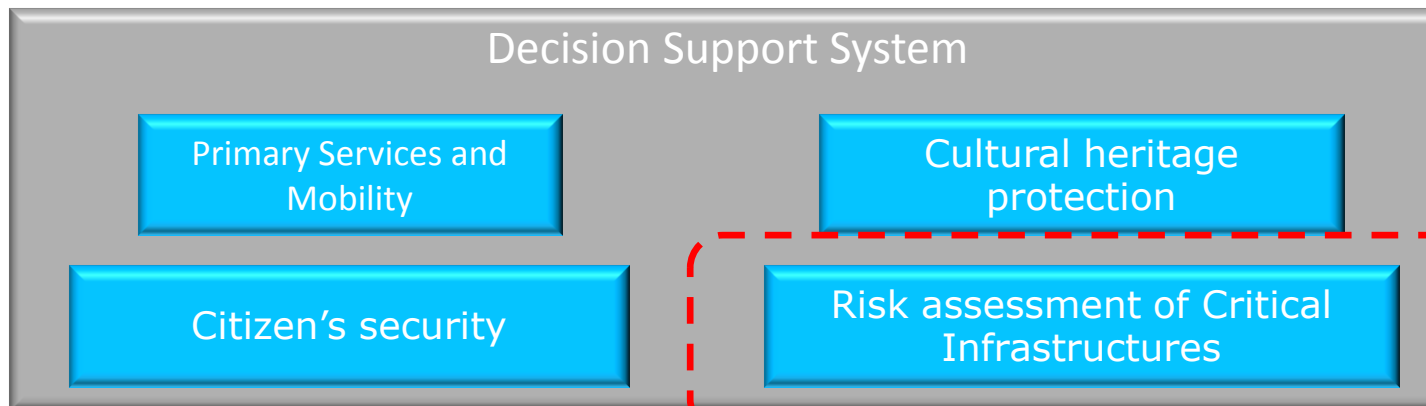
- Introduction
- RoMA project
 - CAPT: Territorial Protection and Analysis Centre
- CIPRNet project
 - The ENEA CI Risk Assessment Module
 - Architecture
 - Data Ontology
 - Data Flow
- Conclusion



Introduction



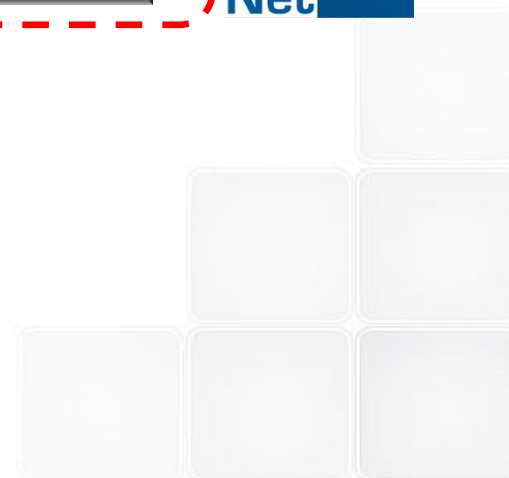
RESILIENCE ENHANCEMENT OF A METROPOLITAN AREA



Public Administration/Authorities



CI Operators

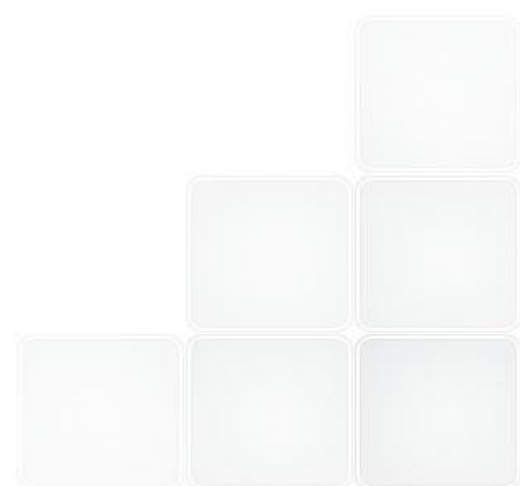


RoMA Project

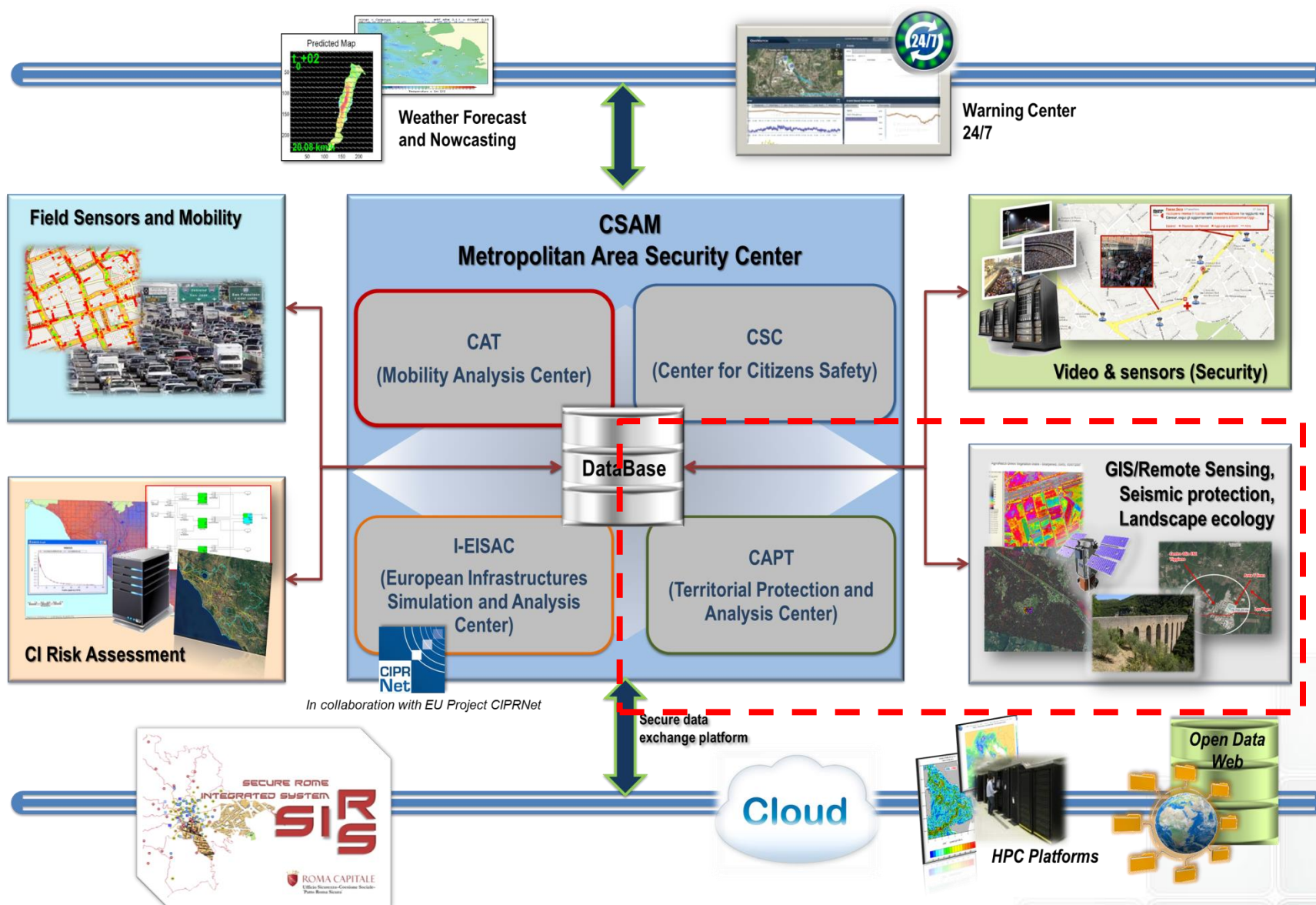


RESILIENCE ENHANCEMENT OF A METROPOLITAN AREA

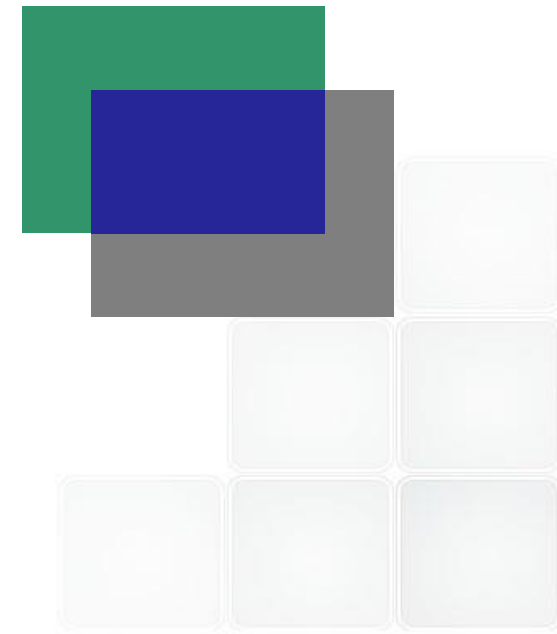
- RoMA is an Italian project
 - Funded by MIUR (Ministry of Education, Universities and Research)
 - Call "Smart Cities and Communities and Social Innovation"
- Start date: November 2013
- Duration: 36 months
- Partners: 11



RoMA Project



- Activities
 - Environmental analysis
 - Environmental impact assessment & planning
 - Biodiversity risk assessment
 - Water resources management
 - Agricultural Production Risk Assessment
 - GIS/Remote Sensing
 - Risk analysis and mapping
 - Scenario analysis
 - Cultural heritages protection
 - Seismic Sensor networks



CAPT activities



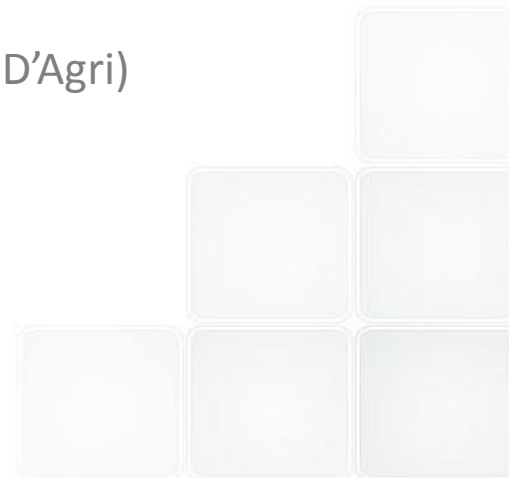
Regione Lazio (Parco Di Veio)



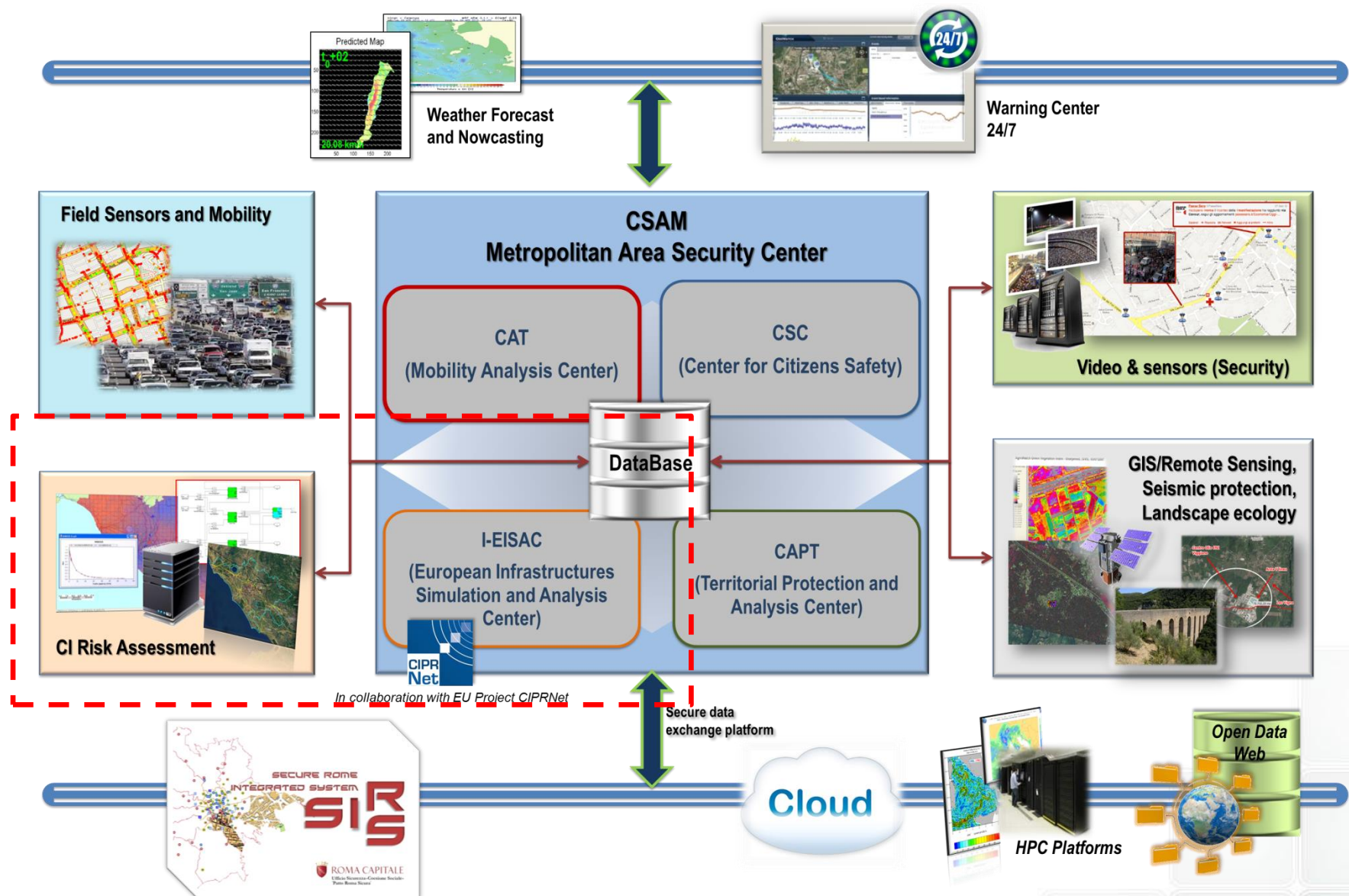
Spoleto (Ponte delle Torri)



Regione Basilicata (Centro Oli Val D'Agri)



RoMA Project



CIPRNet Project



- Critical Infrastructures Preparedness and Resilience Research Network is a FP7 funded project
 - Network of Excellence in Critical Infrastructure Protection (CIP)
- Start date: March 2013
- Duration: 48 months
- Partners: 12

To build a Virtual Centre of Competence and Expertise in CIP (VCCC)

- Network of facilities to offer support from research to CI stakeholders
 - (multi)national emergency management, CI operators, policy makers, and the society
- It will form the foundation for the European Infrastructures Simulation & Analysis Centre (EISAC) by 2020

EISAC: European Infrastructures
Simulation and Analysis Centre

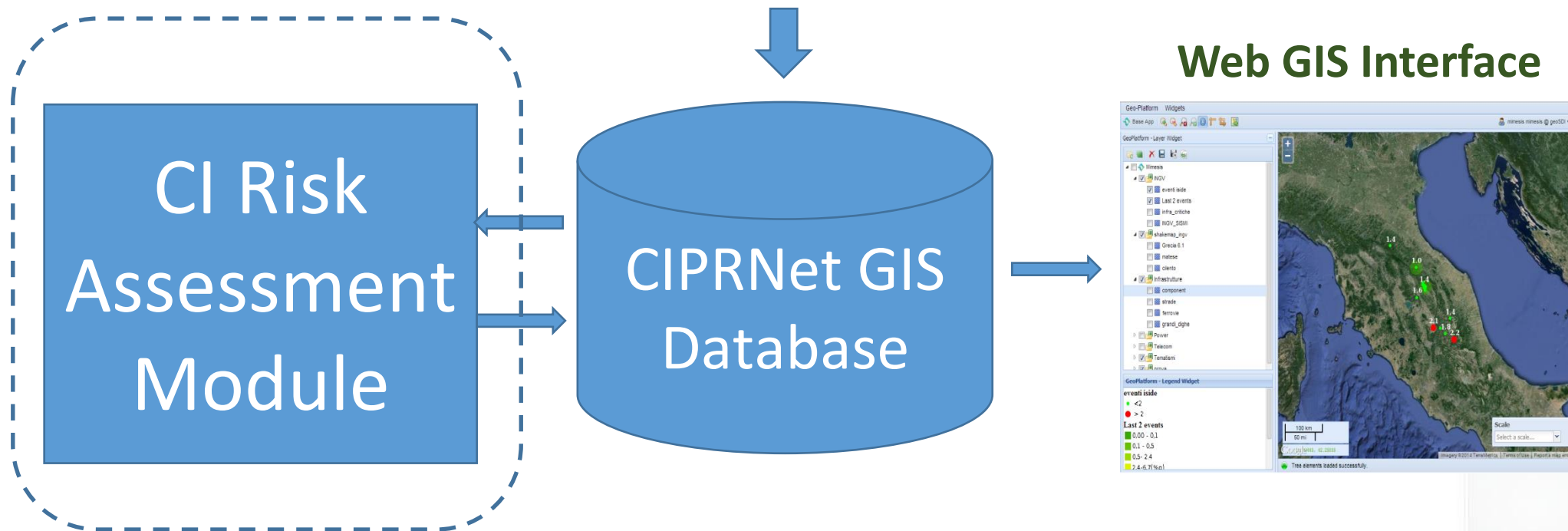
VCCC capabilities

- Virtual laboratories with newly developed capabilities, based on modelling, simulation and analysis of complex systems and multiple critical infrastructures:
 - tools and models for what-if analysis,
 - tools and models for decision support;
- A repository of
 - realistic scenarios of critical events
 - simulation models (infrastructure simulation, climatic change predictions, short term weather forecast), and analytical tools
 - literature of the CIPRNet and beyond, training material for different audiences
- A scheme for consulting experts within the CIPRNet consortium
- an online-glossary for CIP terms (CIPedia).

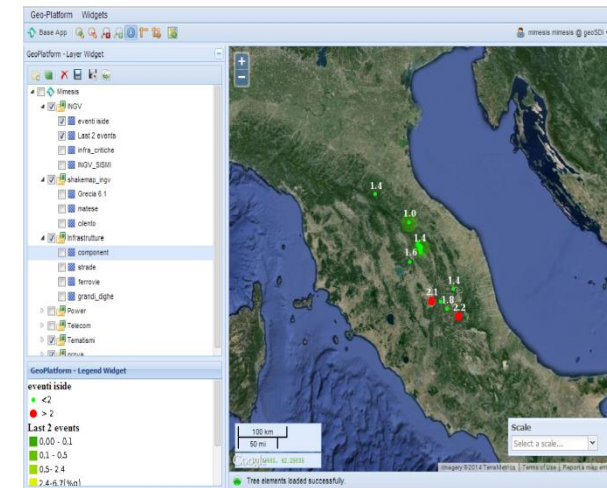
- Objective: to design a new technological tool implementing a CI Risk Assessment Module
 - to increase the resilience of CI by predicting impact scenarios produced by natural hazards and by estimating the impact of CI components failures on the infrastructure's services (in terms of service loss or reduction) and the consequences that these services perturbations might have on population and environment.
 - to provide what-if capabilities
 - to improve the management options for mitigating the risks for emergency managers
 - To improve CI operators contingency plans
 - The CI Risk Assessment Module will be one of the key capabilities of the long standing objective of the CIPRNet NoE consortium, that is, the establishment of the EISAC initiative (European Infrastructures Simulation and Analysis Centre).
 - This RoMA project will consolidate and deploy, at the City scale, within the DSS the CI Risk Assessment Module

CIPRNet CI Risk Assessment Module


External data: sensors data, public data, CI data,




Web GIS Interface




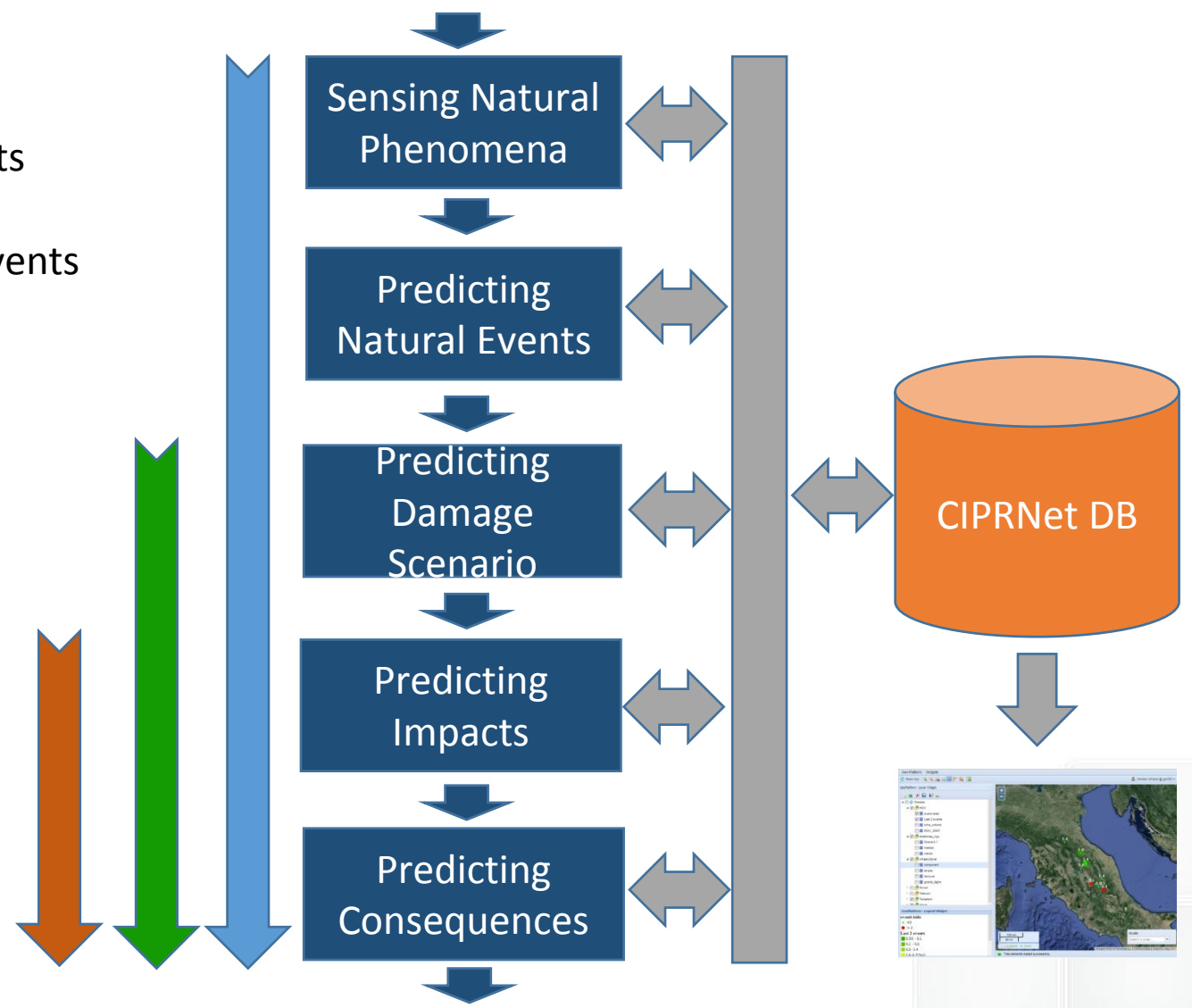
CIPRNet CI Risk Assessment Workflow

 **The Risk Assessment Loop**
- 24/7 RA of CI components
in a given area .
Threats sources: natural events

Service on demand

 Synthetic natural
events simulator

 Synthetic damage
simulator



CIPRNet CI Risk Assessment Workflow

$$R(T_i, CI_j^x) = \Pr(T_i) V(CI_j^x, T_i) I(CI_j^x)$$

$$\Pr(T_i)$$

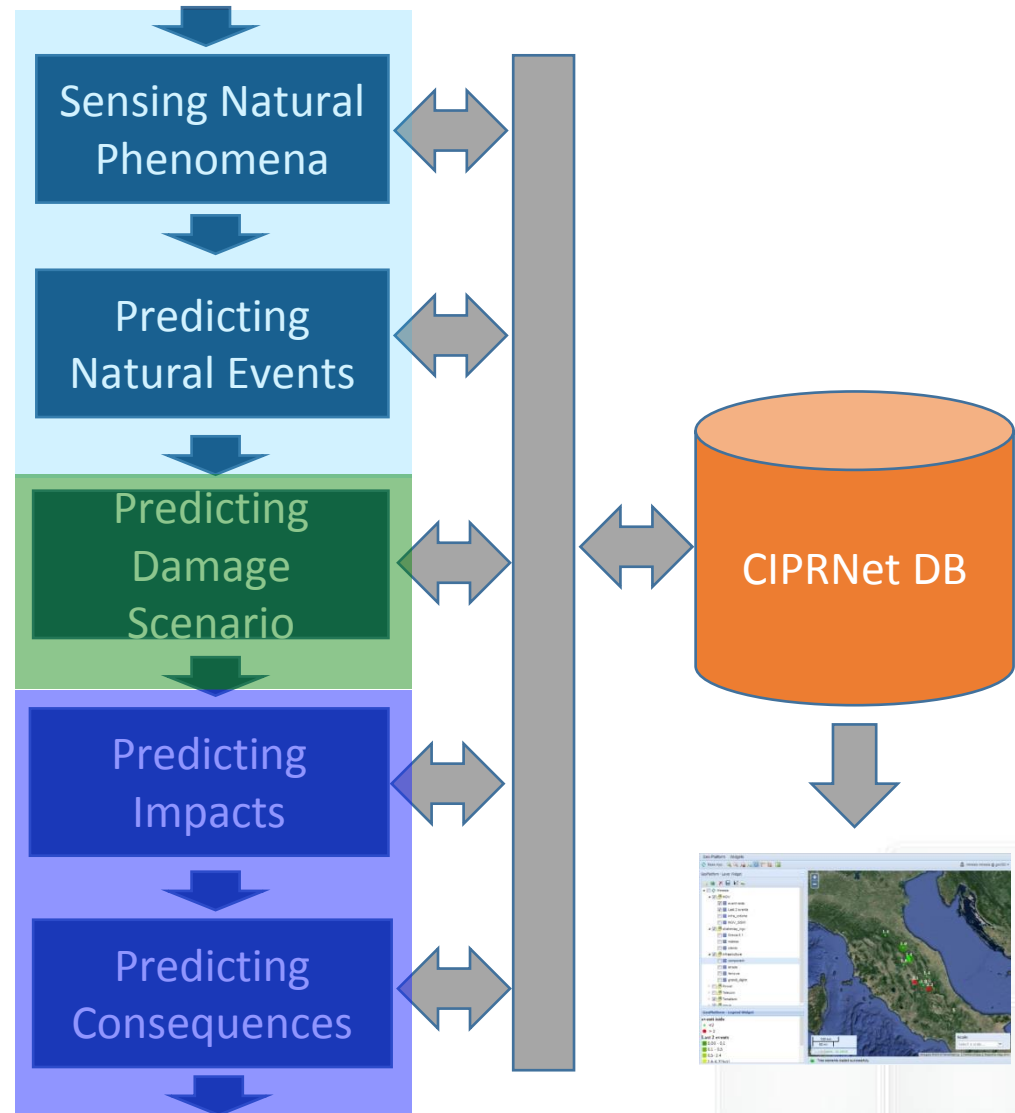
Probability of occurrence of the threat T_i

$$V(CI_j^x, T_i)$$

Vulnerability of the j -th CI component of the x -th CI w.r.t. threat T_i

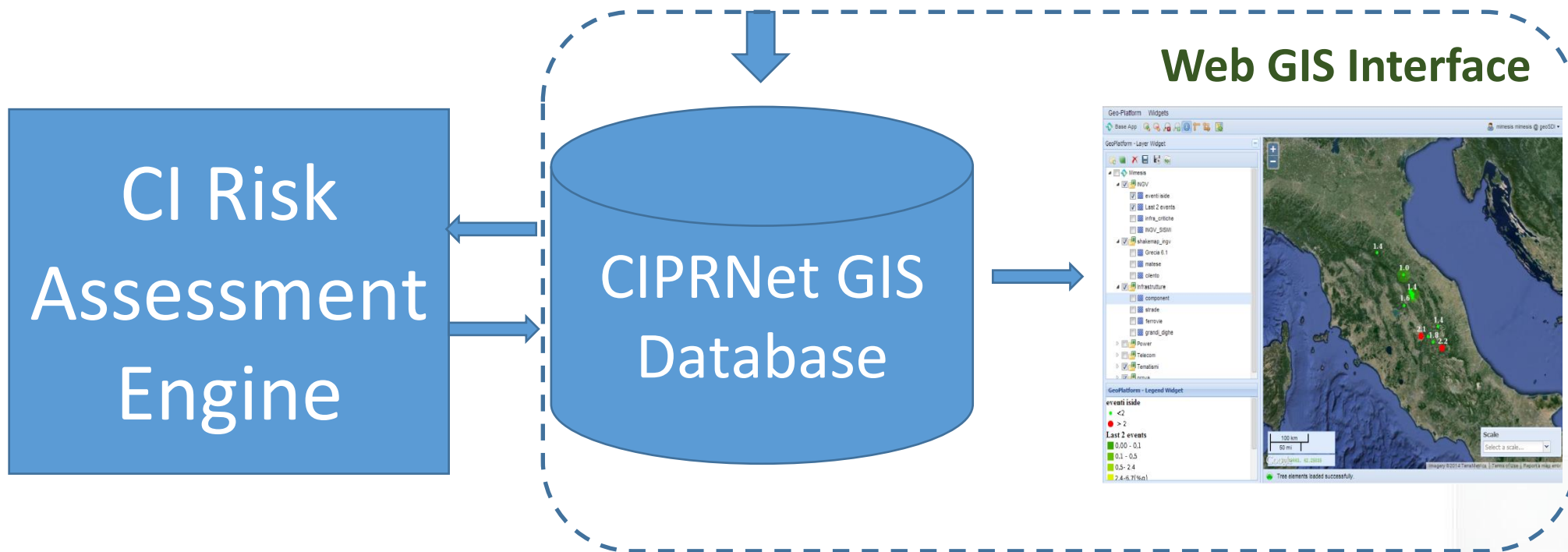
$$I(CI_j^x)$$

Impact relative to the loss of the j -th CI component produces upon failure (e.g. CI, environment, population)



CIPRNet CI Risk Assessment Workflow

External data: sensors data, public data, CI data,



Data Ontology and Structure



Public Data



Data accessible after DSS log in



Commercial Data



Private and strategic data

BASIC DATA

Territorial layers and maps



- Administrative layers
- Primary services (hospitals, schools, etc.)
- Morphology and Land Cover
- Geology & Landslides
- Seismic risk
- Hydrogeological Risk & Hazard

Socio-economical



- Census Data (population, buildings, industrial activities, etc.) and other statistical data
- Parcels and Indicators

Historical events



- Parametric catalogue of damaging earthquakes
- Inventory of Landslide Phenomena
- Historical data of rainfall and thermometry

Technological Infrastructure



- Electric (Generating Stations, Substations, Transmission Lines, Electric Interconnects, Transmission Zones, Electric Distribution Territories)
- Natural Gas and Oil (Natural Gas Pipelines, Natural Gas Interconnects, Natural Gas Facilities, Natural Gas Production Regions, LNG Receiving Terminals)
- Road network and Railways

Quasi-real time data



- Seismic event data (epicentre and magnitude), PGA and Shake Maps
- Weather forecast
- Rainfall: Nowcasting data



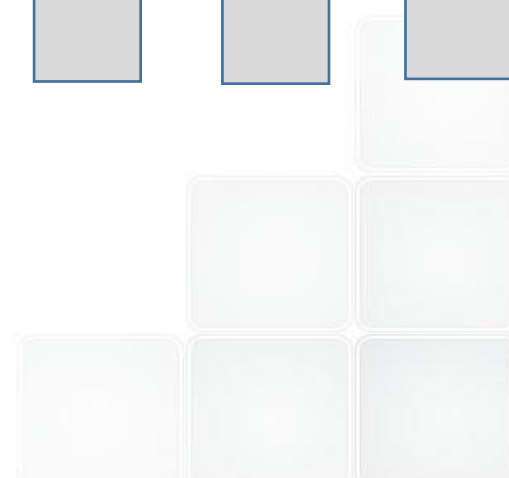
DAMAGE SCENARIO



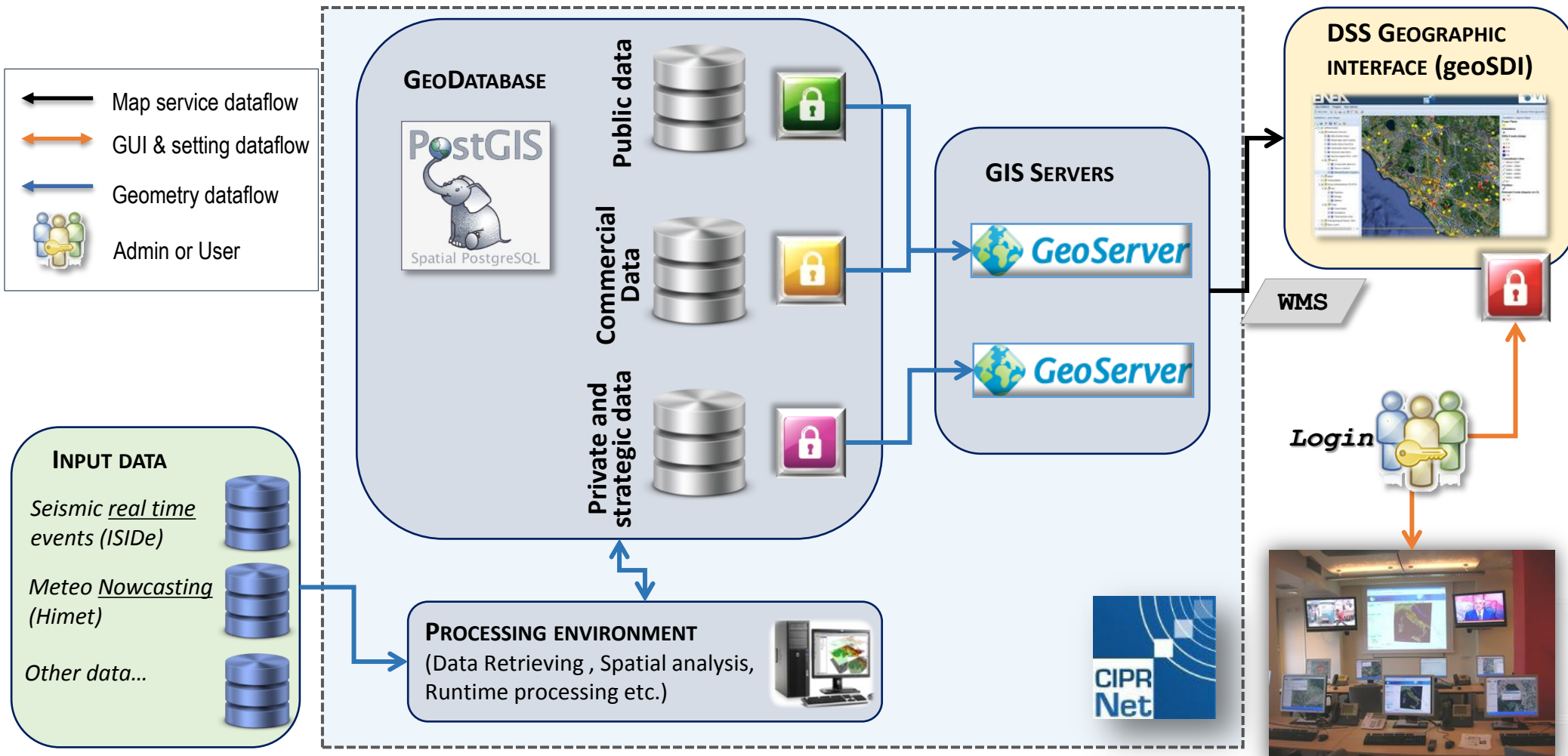
IMPACTS



CONSEQUENCE ANALYSIS

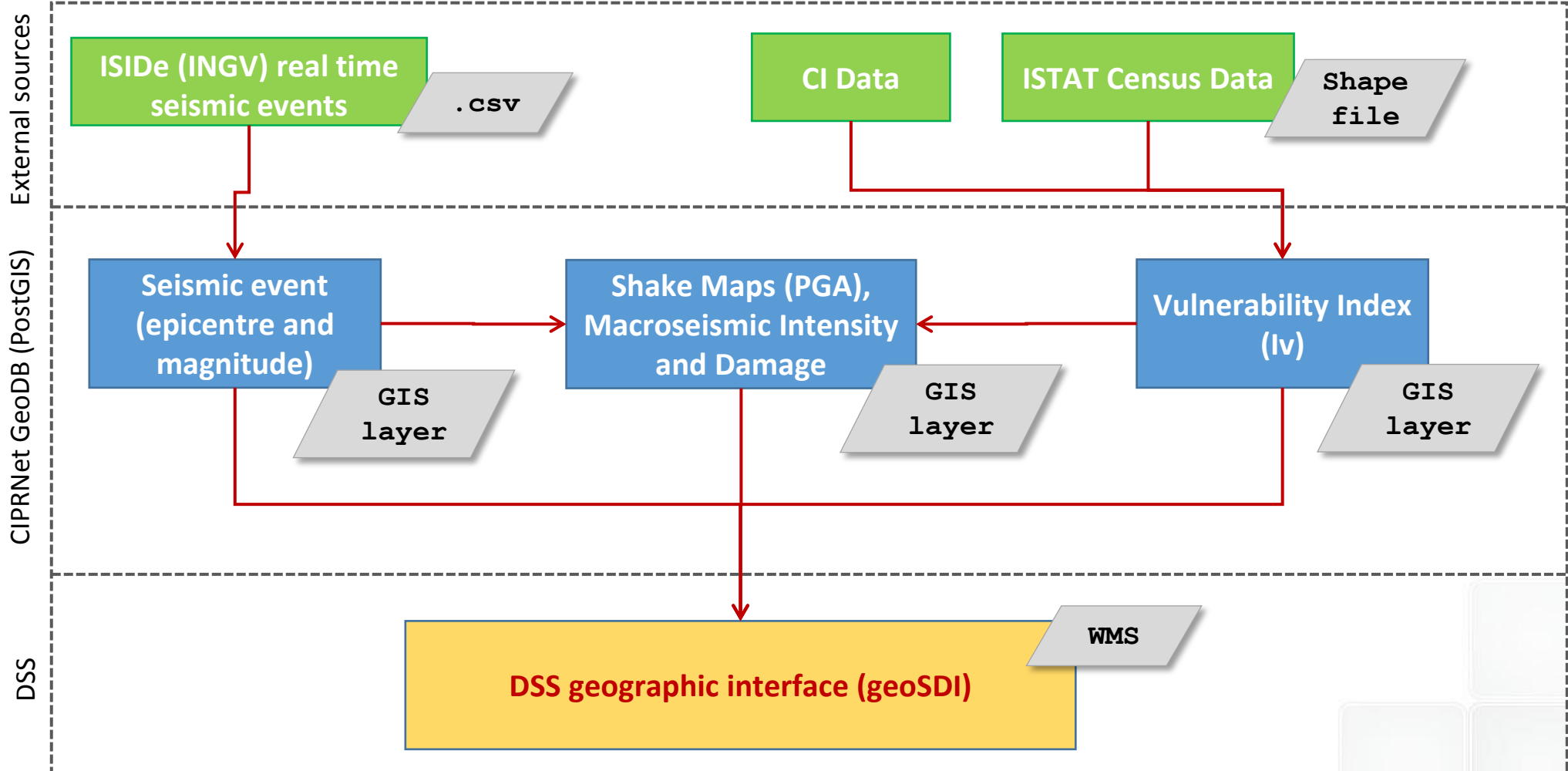


Data Flow and processing

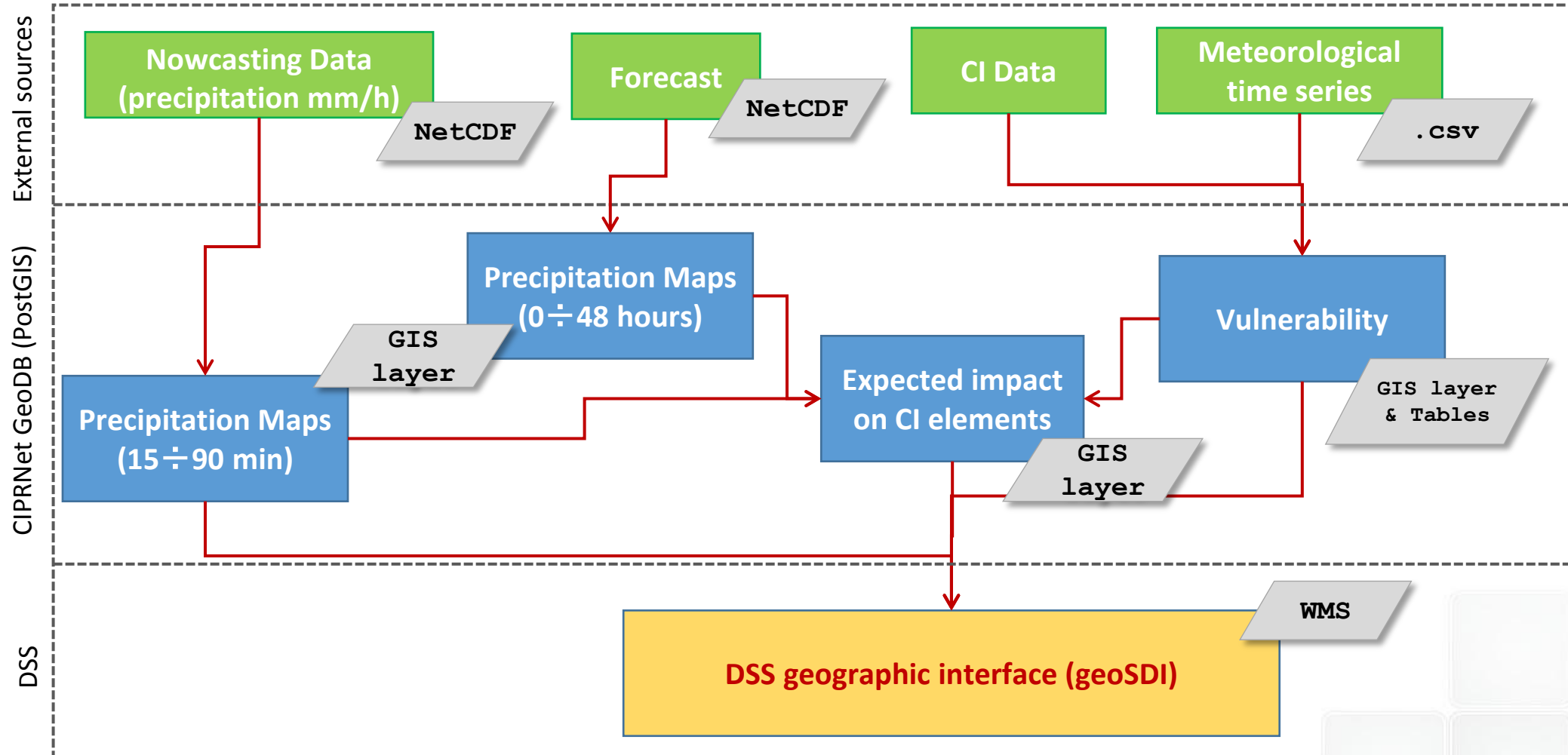


EISAC
NODE

Example of Data Flow: Earthquake scenario



Example of Data Flow: Heavy Rainfall scenario



Conclusion(1)



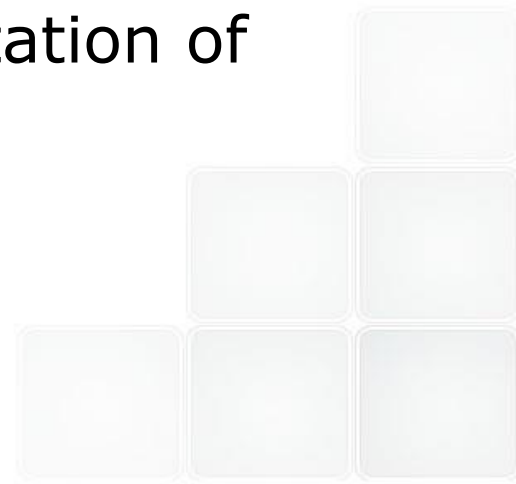
- Data & functionalities of the CI Risk Assessment Workflow for Rome (running on an ENEA server)
- Upon completion the system will allow
 - 24/7 RA for all CI considering interdependencies phenomena
 - Synthetic natural events simulator (Earthquake, Heavy Rainfall)
 - Synthetic damage simulator
- Current implementation
 - 24/7 RA for the Rome electrical distribution grid (ACEA network)
 - Heavy rainfall & Earthquake data flow
 - Electrical grid-SCADA dependencies module
 - We start the design of the interface between the CI Risk Assessment Module and the ACEA informative systems
- The module will be continuously updated as more CI operators (e.g. ACEA ATO2 S.p.a for the water domain) will be involved
- The module will be continuously updated as more external data will be available (e.g. Lightning data)



Conclusion(2)



- The RoMA project will continue the institutional design of I-EISAC by enhancing collaborations and commitment by
 - The Presidency of the Council of Ministers
 - The Department of Civil Protection
 - The National Institute of Geophysics and Volcanology (INGV)
 - CI operators and stakeholders
 - Other institutions of the Ministry of Interiors (Fire Brigades, Regional and Local implementation of Civil Protections, City Security Offices)



Thanks for the attention

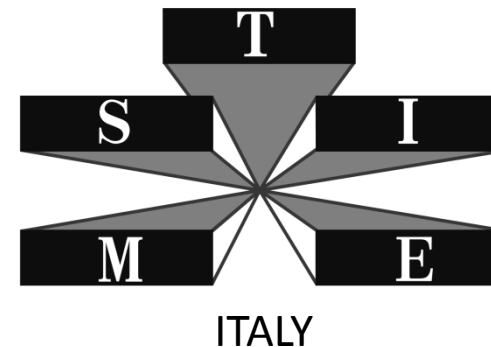


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- www.ciprnet.eu
- Please consider to contribute and participate to the following events



The 10th International Conference on
Critical Information Infrastructures
Security
Berlin, Germany, October 5–7, 2015

Deadline for submissions is 8th May 2015



TIEMS 2015 Annual Conference: “Evolving threats and
vulnerability landscape: the new challenges for the
emergency management”.
Rome – 30th September – 2nd October 2015.

Deadline for submissions is 31st May 2015