

Critical response in Security and Safety Emergencies
<http://www.crisys-project.eu/>



Results from CRISYS Project

Project Manager

Nicola Iarossi (E.O.S.)

Roma 4th October 2012

INTERNATIONAL WORKSHOP ON
EMERGENCY MANAGEMENT FOR CRITICAL
INFRASTRUCTURES CRISES





The CONTEX

Research Context



Part of EU Research Seventh Framework Programme (FP7)

■ Theme 10 – Security

■ Activity 10.4 – Restoring security and safety in case of **crisis**.

■ Area 10.4.1 – **Demonstration** Programme

■ Topic 10.4.1-1 – **Aftermath Crisis Management** – *Phase 1*

TWO Phases

Phase1 Roadmap & Network

Phase2 Integrated & Scalable Crisis Management System **Demonstrator**

■ Two studies granted on the same topic in the **period 1/02/2011 – 31/05/2012** for the phase 1 : **ACRIMAS** and **CRISYS**

European Context



- There is an **increasing frequency** of natural and manmade disasters
- European Parliament and Commission aspiration to **improve** EU civil protection response both within and outside Europe [[links ECHO-EEAS-ISS](#)]
- Recognition of the **sovereign role of Member States** through the **principle of subsidiarity** and desire for mutual support at times of crisis through **principle of solidarity**
- Current **ad hoc** approach of sharing resources by volunteering response modules is seen as **partially effective**
- Proposals being discussed involve a **more planned response capability**

European Focus

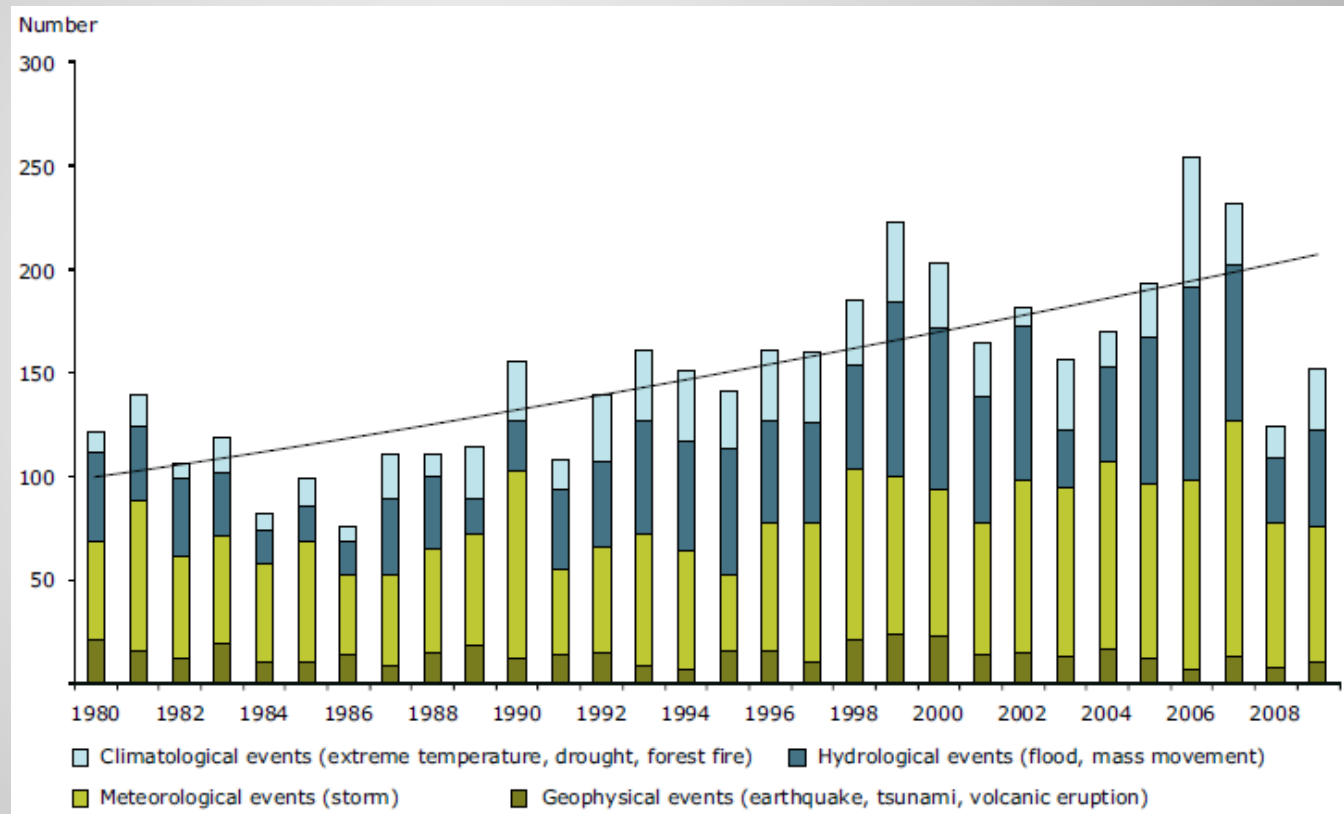


Increasing Risk

- Climate
- Hydrological
- Meteorological
- Geophysical

EU Priorities

- Wildfires
- Floods
- Earthquakes
- Technical Failure









The SUPPORTING and COORDINATING ACTION

Consortium



| | | |
|---|-------------|-----------|
| EUROPEAN ORGANISATION FOR SECURITY | EOS | BE |
| EDISOFT SA | EDI | PT |
| CENTRE FOR SECURITY STUDIES | KEM | GR |
| NATIONAL CENTRE FOR SCIENTIFIC RESEARCH | NCSR | GR |
| ALTRAN BV | ALT | NL |
| INTERNATIONAL FIRE AND RESCUE SERVICES ASSOCIATION | CTIF | GE |
| TELETRON EURORICERCHE SECURITY ENGINEERING | TLT | IT |
| INDRA | IND | SP |
| THALES | THA | FR |
| FINLAND MINISTRY OF INTERIOR [RESCUE SERVICES] | FMOI | FI |
| UNIVERSITY OF CENTRAL LANCASHIRE | UCL | UK |
| SOCIETE FRANCOISE DE MEDICINE DE CATASTROPHE | SFMC | FR |
| ISTITUTO AFFARI INTERNAZIONALI | IAI | IT |
| ZANASI ALESSANDRO | ZAN | IT |
| TRANSELECTRICA | TRA | RO |

| | |
|---|--------------------|
|  | Coordinator |
|  | Suppliers |
|  | Public bodies |
|  | R&D centers |

Coordinator: European Organization for Security



43 Members
13 countries

Objectives



Overall aim (phase I + II):

Demonstrate an **integrated and scalable** crisis management system ...

... capable of providing **comprehensive situational awareness** to decision makers ...

... to ensure a **timely, coordinated and effective** response ...

... in **defined and novel disaster** situations.

Demonstration to be **focussed** and offer a **practical solution**.

CRISYS Objective (phase I):

Build a **Roadmap** capable of **full implementation** ...

... to show specific **demonstration actions** in **Phase II** ...

... whilst **establishing contacts and awareness** with the main **public and private stakeholders** in the field of Crisis Management

Basic concepts



- Must recognise **what already exists** and **how** Crisis Management is **organised and managed**.
- Note changes in **EU Civil Protection policy** and the **Member States relationships**.
- Assess **effectiveness of capabilities and capacities** to meet anticipated and unidentifiable threats.
- Target **community resilience and business continuity**.
- Propose **improvements in joint working, EU policy and practices** to strengthen cohesion, interoperability, operational effectiveness, affordability, cultural and moral values.
- Test and validate** with stakeholder actors.
- Disseminate** Project findings.

Challenges



A major challenge is **LEGACY** and how to **link existing approaches, technical solutions, procedures, standards** etc. in the civil protection field, which can be extremely fragmented at national and even local level, **to permit a fast and adequate response to natural and man-made threats.**

The project also has to **PRACTICALLY DEMONSTRATE** in a few years the solution and cannot be a virtual exercise.

POLITICAL ACCEPTABILITY within Member States is essential to meet **EU political challenges: primarily for use in EU countries the system must also be deployable abroad** in concert with other Nations UN and NGOs so Europe's external humanitarian aid programmes can reflect the stronger post Lisbon Treaty alliances.

Foundation of Understanding



Imperative we first understood how the civil protection sector operates.

1. Review presently adopted solutions, procedures and the operational, legal, societal, political, legacy environments in which those mechanisms are set.

2. Establish parameters of operations – not simply scenarios but how to create wider capability and capacity.

3. Understanding of the issues surrounding effective operational needs (e.g. interoperability of technical solutions, commonality of procedures, decision and crisis decision tools, the importance of languages; common training approaches; homogeneous risk assessment methodologies etc.) **for the most significant demonstration actions.**

CRISYS Questions



- 1 Can we **improve response** either in **speed or effectiveness**?
- 2 **What known barriers** exist that inhibit or delay the **practical response to crisis**?
- 3 Are there **tools or practices** that will help improve:
 - communication ?
 - situational awareness ?
 - command and decision support ?
 - deployment in harsh environments ?
 - search and rescue ?
 - medical care ?
 - restoration of basic services ?
- 4 If so **what are they and how might they be demonstrated** ?

How we have proceeded ?



By conduction a **study** with

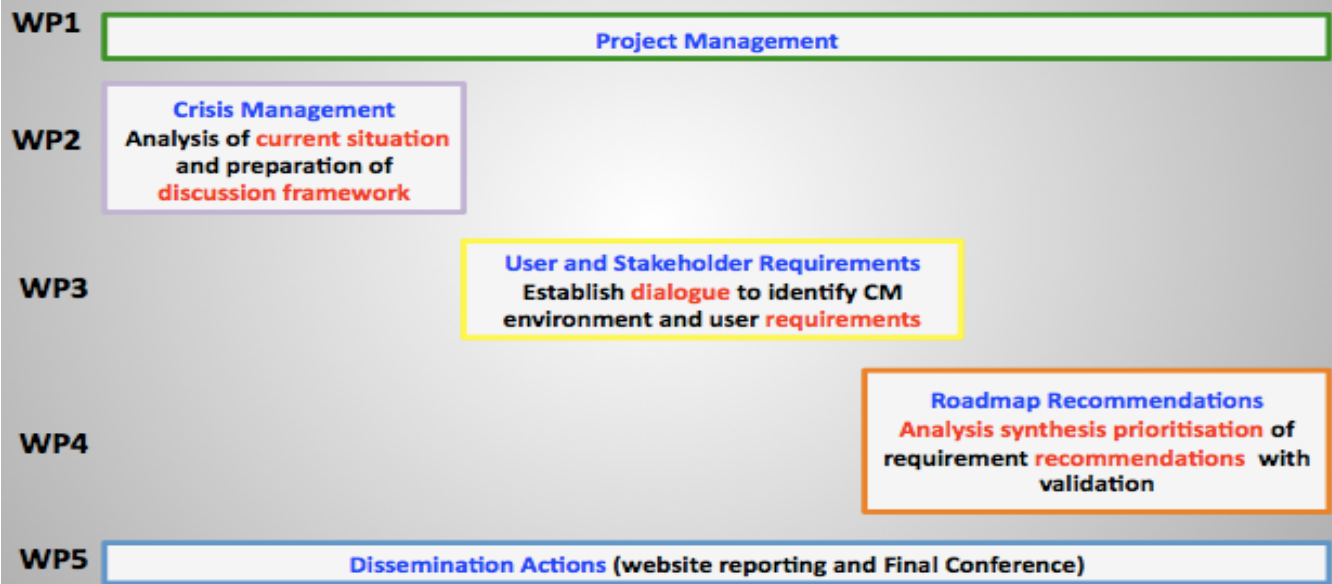
- Web Research
- Field Research
- Analysis & Reporting
- Communication



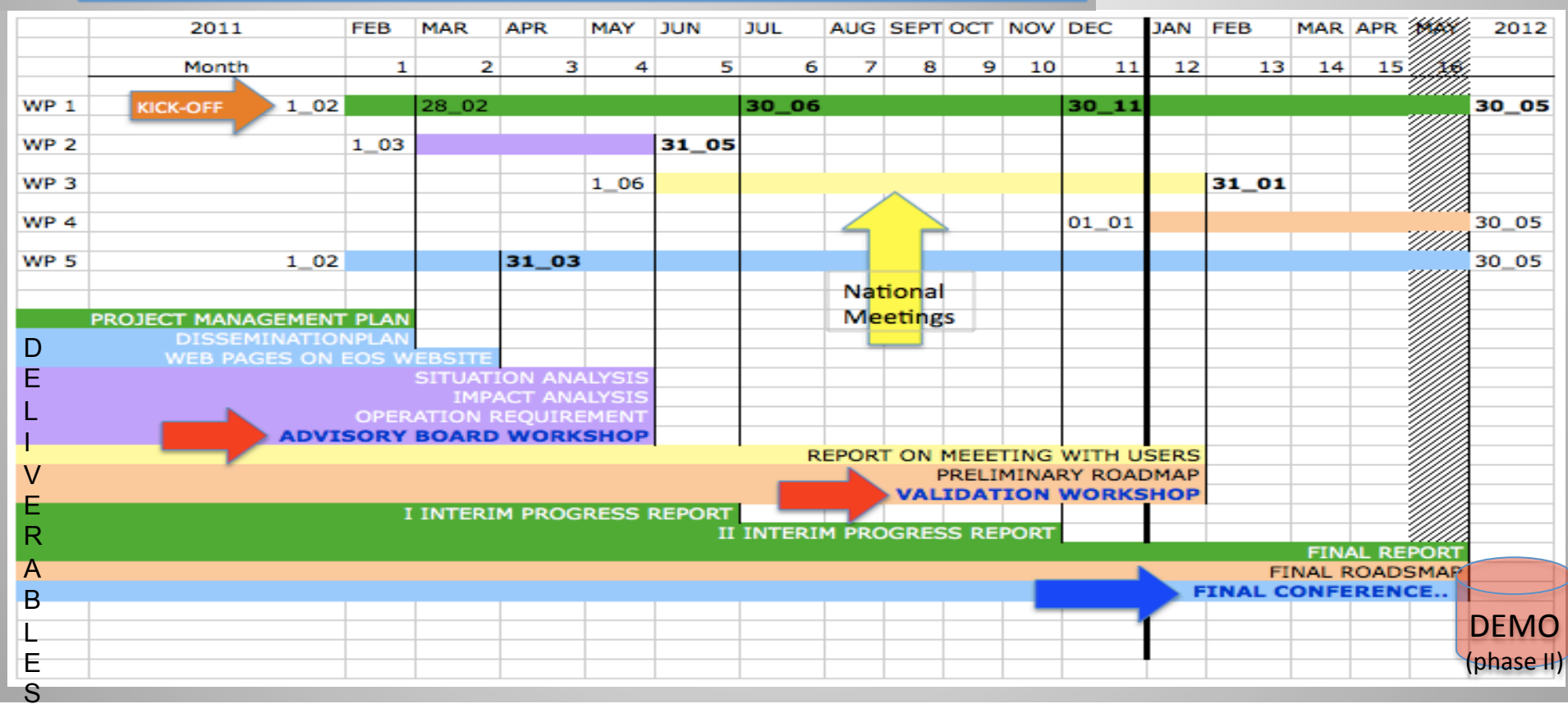
Identifying the **current situation**, the **gap** for cooperation and a **roadmap** for improvement



Using **standardized questions** in different areas of research



Activities' SCHEDULE



DEMO
(phase II)

Process (Structural Framework)



Work Package 3
User and Stakeholder Requirements
 Establish dialogue to identify CM environment and user requirements

- User and Stakeholder Needs
- Common Threads
- Disaster Improvement Model
- Structured Meetings
- Matrix of responses

Work Package 2
Crisis Management
 Analysis of current situation and preparation of discussion framework

- Legacy
- Standards
- Citizens

Quality Assessment Toolkit

High frequency

- Earthquake
- Flood
- Wildfire
- Technical failure
- Manmade event

Low Frequency

- Mikado Effect

Work Package 4
Roadmap Recommendations
 Analysis synthesis prioritisation of requirement recommendations with validation

- Gaps
- Recommendations
- Demonstration Roadmap of solutions

Work Package 5
Dissemination Actions
 Website Reporting
 Final Conference

Politics and Social

- EU
- MS
- Civil Protection Authority
- Municipal Authority
- Citizen

Assets

- MS
- Municipal
- Voluntary
- NATO

Modus operandi

Standards

- Interoperability
- Operating practices
- Logistics

Citizen

- Education
- Knowledge
- Awareness



**RESULTS: CAPABILITIES PRIORITIZATION
in the relevant DOMAINS**

Focus



4 ACTIONS [People–Process–Information–Technology] ; 8 CAPABILITIES

Modes of action

Prevention

Preparedness

Response

Restoration

Focus of the project

Impact analysis

Coordinated decision making & planning

Flexible and effective deployment

Main capabilities

1. Communication

2. Situational awareness

3. Command and decision support

4. Logistics and resource planning

5. Fast deployment on harsh environment

6. Search and rescue

7. Medical care

8. Restore of basic services

Validated Priorities



| Prioritised Domain Capabilities | |
|--|---|
| Operations | Assets |
| Incident Command System <i>Need for common understanding Map national ICS onto local systems Local plans must have a receive aid component</i> | Identification and tracking system <i>Need to ensure the educational component is included in Phase II</i> |
| Response Framework | Availability recognition tools |
| Risk assessment capture and analysis <i>Need is already established</i> | Attribute capture classification system <i>Example of mass CBRN decontamination</i> |
| External actors protocols and networking <i>Define actors and Stakeholder protocols Clarity needed about who and what role the stakeholder fulfills</i> | Equipment and vehicle needs <i>Essential to ensure the right tools are available</i> |
| Command and Control protocols <i>Links to ICS</i> | Specialist modularised assets |
| Lexicon and language augmentation <i>Common definitions required Ownership by DG ECHO</i> | Logistics hub & collation logistics system |
| Situational awareness tools and integration <i>Linked to Decision Management</i> | Transportation and supply chain systems <i>Linked to pre planning knowledge base</i> |
| Communication protocols | Improvement of assets interoperability <i>Need to improve ability to interchange and support tools in the field</i> |
| Recording review and evaluation system <i>Evaluation in the operational focus is not a high priority Low in Operations and higher in Education</i> | <i>Note: Common recovery and cost control system needed</i> |
| <i>Note: Well-being of stakeholders to work under pressure</i> | |
| Learning and Public Awareness | ITC |
| | Mobile data systems for harsh environments |
| On Line E Learning systems <i>Existing systems can help and the platform is just technology</i> | Information Management system <i>Link to legacy systems important</i> |
| Access controls and protocols <i>Open and professional levels needed</i> | Information capture toolkit <i>Use of smart technologies</i> |
| Public learning programmes | GIS visualisation overlays & simulation tools <i>Simulation tools should be seen as distinct Visualisation should have same system reference (symbology and iconology)</i> |
| Alert and reverse alarms <i>Open to all Stakeholders across borders</i> | Data verification, warehousing and data mining |
| Lessons Learnt capture & dissemination system | Data encryption |
| Stakeholders exercise and training <i>E leaning Table top and virtualisation could be extremely cost effective for strategic managers</i> | Information formats and verification systems <i>Includes an educational platform component Social media application that links to officially verified CM system</i> |
| Competency and skill verification system | Control room design and implementation <i>Upgraded to common EU minimum standard Configured to meet incoming assets</i> |
| Red = high, Orange = medium, Green = low | Mobilisation and dynamic information management |



RESULTS: CONCEPT MODEL

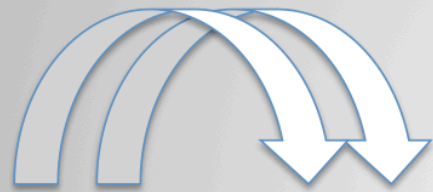
A business architecture of crisis management has then been visualised in one homogeneous **CRISYS Concept Model** by using all of these elements:

- capabilities
- domain
- Information
- sector



EVENT
After
math

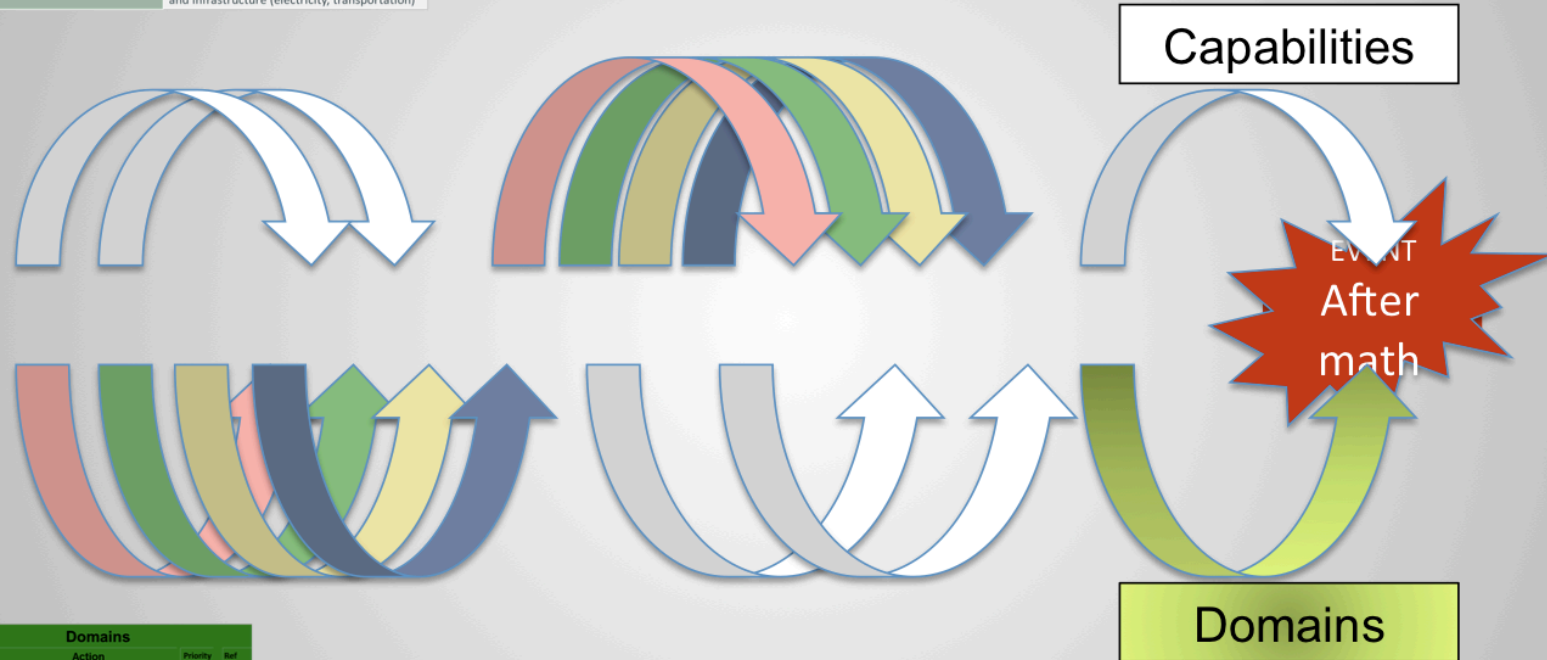
| Capability: | The ability to: |
|---|--|
| 1. Communication | Exchange information between citizens, rescue workers and authorities |
| 2. Situational awareness | Collect and present relevant static and dynamic information about the incident |
| 3. Adaptable command & decision support | Coordinate action between various rescue organisations |
| 4. Logistics and resource planning | Plan, support and control the allocation of rescue workers and equipment |
| 5. Fast deployment on harsh environment | Deploy rescue workers and equipment at the area of the incident |
| 6. Search and rescue | Trace and rescue victims |
| 7. Medical Care | Provide large scale medical aid and care in a crisis situation |
| 8. Restore of basic services | Restore basic needs of people (water, food) and infrastructure (electricity, transportation) |



Capabilities



| Capability: | The ability to: |
|---|--|
| 1. Communication | Exchange information between citizens, rescue workers and authorities |
| 2. Situational awareness | Collect and present relevant static and dynamic information about the incident |
| 3. Adaptable command & decision support | Coordinate action between various rescue organisations |
| 4. Logistics and resource planning | Plan, support and control the allocation of rescue workers and equipment |
| 5. Fast deployment on harsh environment | Deploy rescue workers and equipment at the area of the incident |
| 6. Search and rescue | Trace and rescue victims |
| 7. Medical Care | Provide large scale medical aid and care in a crisis situation |
| 8. Restore of basic services | Restore basic needs of people (water, food) and infrastructure (electricity, transportation) |



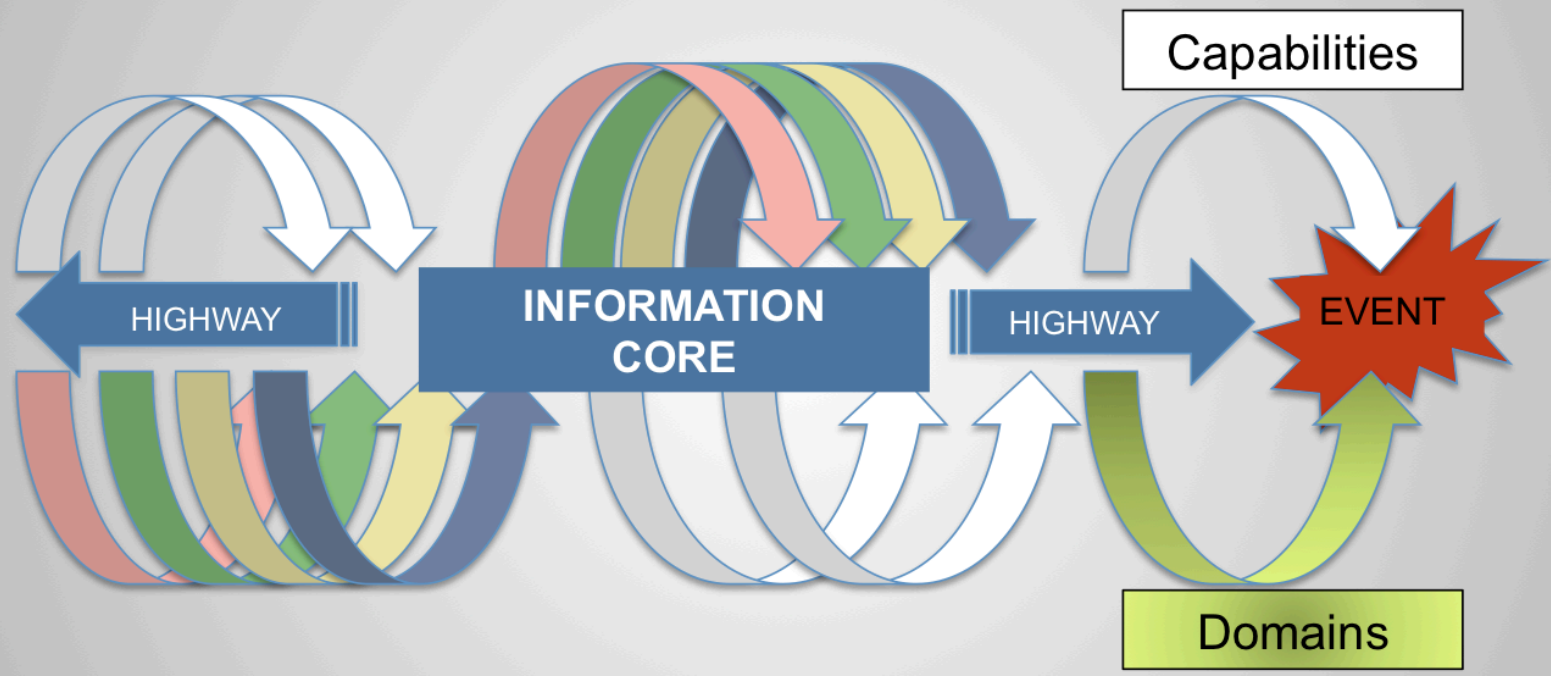
| Domains | | | |
|--|----------|-----|--|
| Action | Priority | Ref | |
| Operations | | | |
| Incident Command System | Medium | O1 | |
| Response Framework | High | O2 | |
| Risk assessment capture and analysis | High | O3 | |
| External Actors protocols and networking | Medium | O4 | |
| Decision Management Tools | Low | O5 | |
| Command and Control protocols | Medium | O6 | |
| Lexicon and language augmentation | Low | O7 | |
| Situation awareness tools and integration system | Low | O8 | |
| Communication protocols | High | O9 | |
| Recording review and evaluation system | Low | O9 | |

| Assets | | | |
|---|--------|----|--|
| Identification and tracking system | Low | A1 | |
| Availability recognition tools | Medium | A2 | |
| Attribute capture classification system | Medium | A3 | |
| Equipment and vehicle needs | Low | A4 | |
| Specialist modularised assets | Medium | A5 | |
| Logistic hub and collation logistics system | High | A6 | |
| Transportation and supply chain systems | High | A7 | |

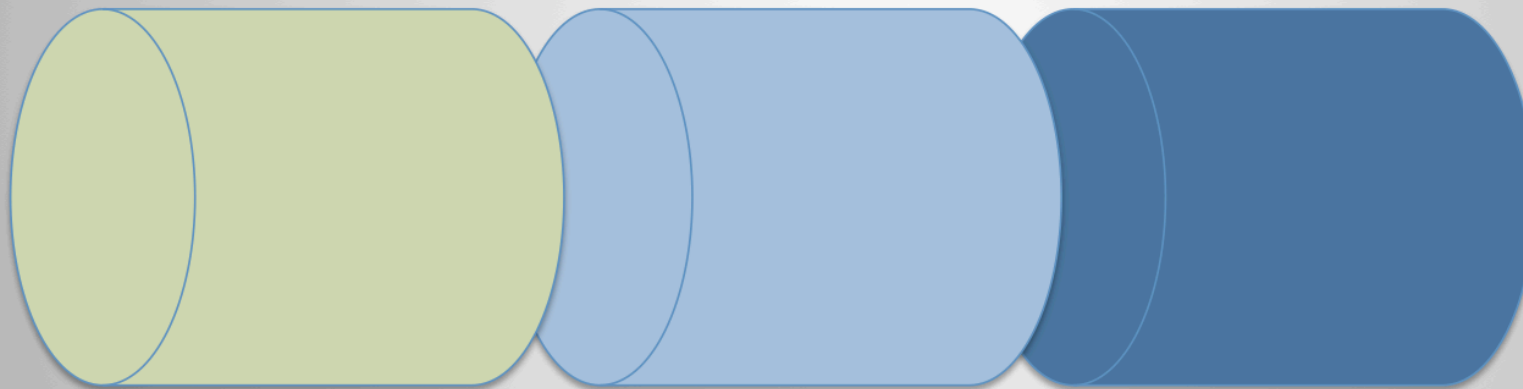
| Education | | | |
|---|--------|----|--|
| Online E-learning platform | High | E1 | |
| Access controls and protocols | Medium | E2 | |
| Public learning programmes | Medium | E3 | |
| Alert and reverse alarm | Low | E4 | |
| Lessons Learnt capture and dissemination system | Medium | E5 | |
| Responders exercise and training | High | E6 | |
| Competency and skill verification system | Medium | E7 | |

| ITC | | | |
|---|--------|----|--|
| Mobile Data systems for harsh environments | High | I1 | |
| Information Management System | Medium | I2 | |
| Information capture tools kits | Medium | I3 | |
| GIS and visualisation overlays and simulation tools | High | I4 | |
| Data verification and warehousing | Medium | I5 | |
| Data encryption and mixing systems | Low | I6 | |
| Information formats and verification systems | High | I7 | |
| Control room design and implementation | Medium | I8 | |
| Mobilisation and dynamic information management | Medium | I9 | |

INFORMATION and DATA



SECTORISATION

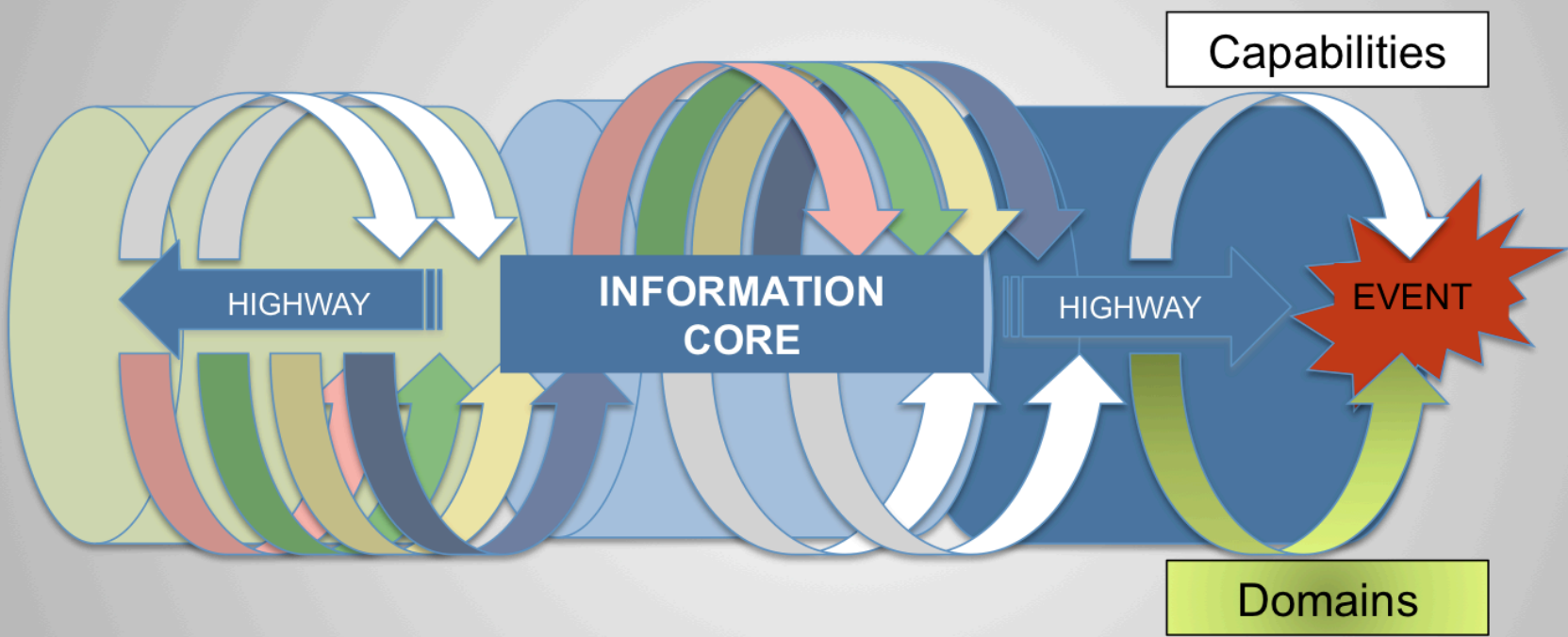


**Strategic
Fused Data
National**

**Tactical
Field Data
Regional**

**Operational
Hands On Data
Local**

SECTORISATION



**Strategic
Fused Data
National**

**Tactical
Field Data
Regional**

**Operational
Hands On Data
Local**



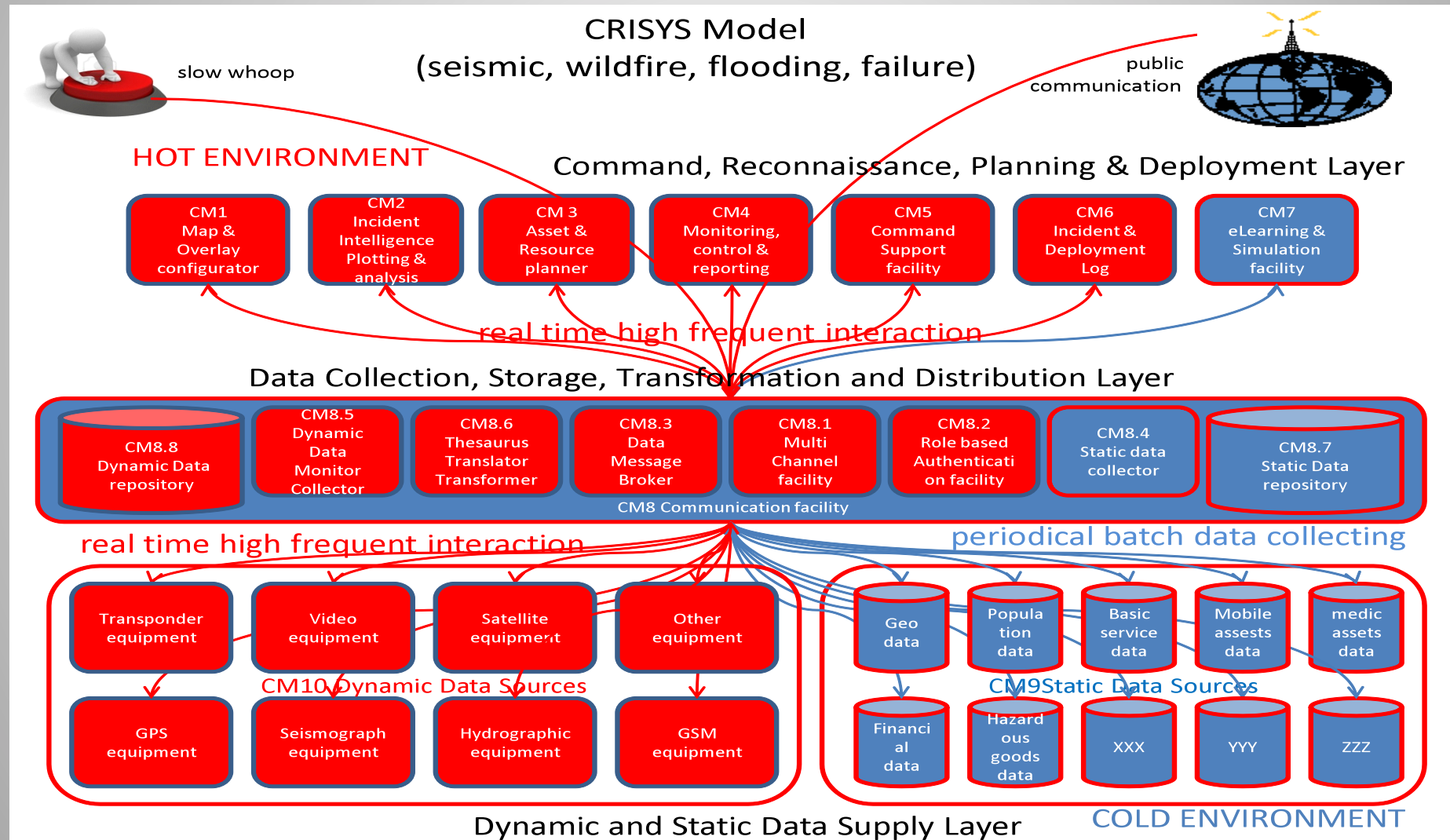
RESULTS: OPERATING MODEL



The **CRISYS Operating Model (COM)** is a common framework :

- offering an overview of all capabilities involved in disaster response decision making, command and operational deployment;
- serving as a guide for classification of capabilities, identification and demonstration of the available practices, technology solutions, tools and the necessary implementation efforts
- seeking a maximal reuse of existing legacy systems and solutions and readily available tools and technologies .

CRISYS Operating Model (COM)



COM mapping capabilities



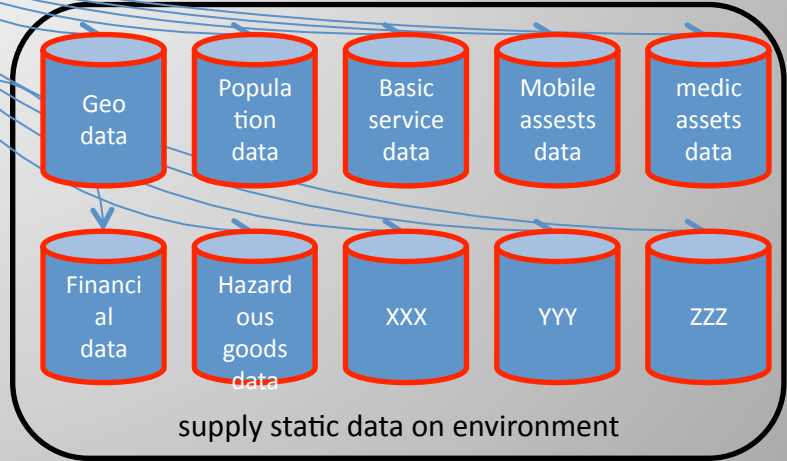
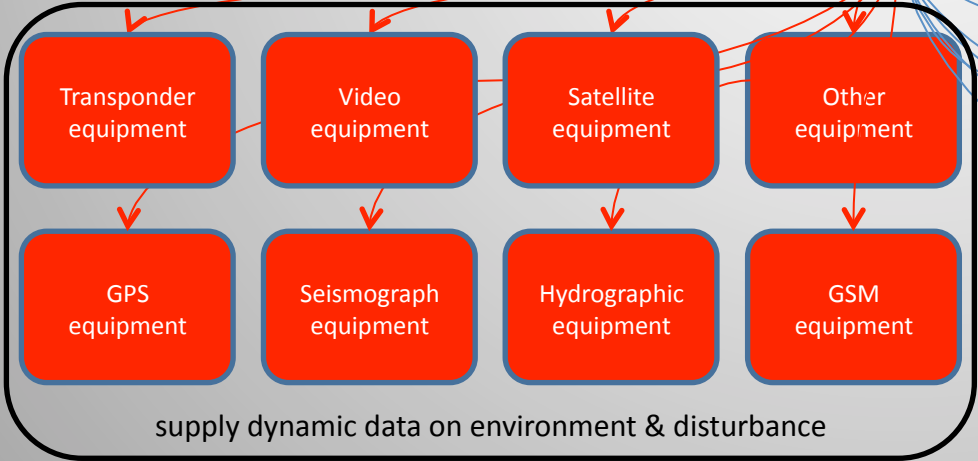
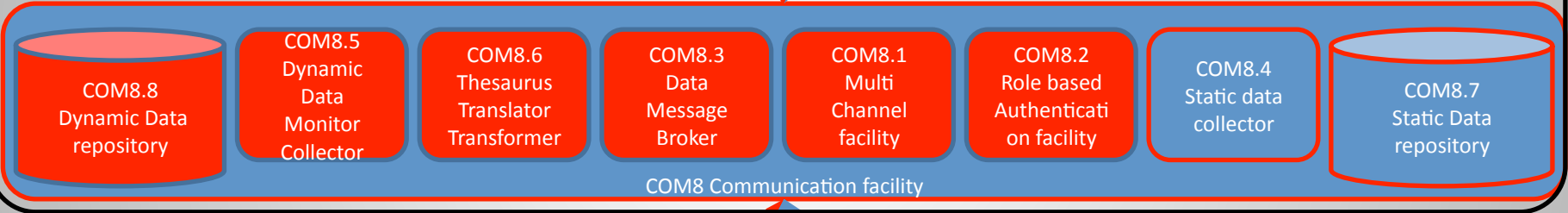
- SITUATIONAL AWARENESS
- Mapping the undisturbed environment
- Plotting the disturbance

- LOGISTICS & RESOURCE PLANNING
- Identifying scenario
 - Closed loop adaptive planning
 - Execute the deployment
- ADAPTIVE COMMAND & DECISION SUPPORT
- Monitoring
 - Logging



learning, Simulation, Quality

COMMUNICATION real time/always on/fault tolerant, interoperability, transformation and access authorisation





**RESULTS: PROGRAMME for the
DEMONSTARTION & VALIDATION PROJECT**



OBJECTIVE: demonstrate that the CRISYS concept and COM capabilities can secure the agility and resilience required to manage crisis situations

PROGRAMME: the Demonstration comprises these elements:

1. Proposed **Scenarios**
2. **Mapping** of methods, practices, technology solutions
3. **Toolbox** Recommendation
4. Roadmap **Plan** and Timing.

1 - Proposed Scenarios



The study presents three scenarios:

- 1. Earthquake*
- 2. Toxic Gas Release*
- 3. Coronal Mass Ejection*

Although presenting a specific nature, their **complexity** and **escalation patterns** are designed to cover all of the four main CRISYS disaster types.

Earthquake

Semi Rural Population 100,000



| | | |
|----|----------------------|---|
| 1 | Area Population | 100,000 in semi rural area with historic sites |
| 2 | Area Affected | 50 K ² highly some mountainous terrain |
| 3 | Habitation | Mixed older buildings/modern offices and dwellings 2-3 stories |
| 4 | Casualties | Up to 300 fatal, 2,000 injured, 65,000 homeless |
| 5 | Evacuation | 47,000 in immediate at risk zone Many self evacuations |
| 6 | Damage | 2 K ² total destruction with structural damage up to 15K |
| 7 | CNI Impact Risk | Nothing immediate except total loss of telecommunications |
| 8 | Environment | Rural hill sites many land slips |
| 9 | Domino Effect | Risk of aftershocks up to 5.0 Richter or higher some remote |
| 10 | Financial Impact | Heritage buildings lost with tourism damaged |
| 11 | Duration | 1 week immediate with 1 year rehabilitation |
| 12 | Jurisdiction | Single |
| 13 | Threat Intelligence | Not appropriate natural phenomena |
| 14 | Climate and Timeline | Dry 14°C Wind east 8-10 knots workday 01.50 early morning |
| 15 | Language | Common to all residents |
| 16 | 15 Minute Response | 2 Paramedic 4 Police 4 Fire and Rescue Units |
| 17 | Health Care | 1 K 150 bed General Hospital, 1 Care Home within 2 K radius |

Toxic Gas Release

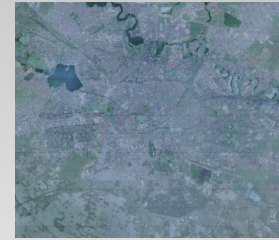
Urban Population 120,500



| | | |
|----|----------------------|--|
| 1 | Area Population | 120,500 in urban area adjacent industrial sites |
| 2 | Area Affected | 87 K ² with centrally dividing river relatively flat terrain |
| 3 | Habitation | Mixed industrial/commercial adjacent o 2-3 storey housing |
| 4 | Casualties | Up to 1,000 fatal, 7,000 injured, 20,000 triage/self reporting |
| 5 | Evacuation | 47,000 in immediate at risk zone Many self evacuations |
| 6 | Damage | 2 K ² severe destruction with structural damage up to 5K off site |
| 7 | CNI Impact Risk | 3 major auto routes, national rail, power plant, airport |
| 8 | Environment | River estuary adjacent site, protected natural area |
| 9 | Domino Effect | Possible triggers on CNI and natural environment |
| 10 | Financial Impact | Private commercial loss with high export loss potential |
| 11 | Duration | 1 week immediate with 16 weeks domestic rehabilitation |
| 12 | Jurisdiction | Shared between 2 authorities along river border with 1 bridge |
| 13 | Threat Intelligence | Considered accidental not dissident or terrorist inspired |
| 14 | Climate and Timeline | Raining 10°C Wind west 5-7 knots workday 17:00 rush hour |
| 15 | Language | Common to all |
| 16 | 15 Minute Response | 4 Paramedic 8 Police 6 Fire and Rescue Units |
| 17 | Health Care | 2 K 100 bed General Hospital, 3 Care Homes within 5 K radius |

Coronal Mass Ejection

High Urbanised Population 1.7 million



| | | |
|----|----------------------|---|
| 1 | Area Population | 1.7 million, highly urbanised, high density occupation |
| 2 | Area Affected | 250 K ² generally low lying river and lakes terrain, a major road and rail transportation hub |
| 3 | Habitation | Mixed commercial-factory-domestic, mainly brick or concrete construction, legacy-on-legacy infrastructure, few historic buildings and many multi-storey dwellings of 7 or more floors |
| 4 | Casualties | Up to 10 fatal, 2,000 already suffering from heat |
| 5 | Evacuation | 60,000 judged at serious risk if power outage lasts over 96 hours |
| 6 | Damage | Minor fires with few reports of structural damage |
| 7 | CNI Impact Risk | Multiple utility failures immediate, loss of telecommunications |
| 8 | Environment | Dry, but heat exhaustion seriously impacting on vulnerable |
| 9 | Domino Effect | Significant as power failure disruption extends |
| 10 | Financial Impact | Significant, head offices of many concerns, Stock Exchange |
| 11 | Duration | 1 week immediate with 2-3 year adjustment to infrastructure |
| 12 | Jurisdiction | National, city and several unitary municipalities |
| 13 | Threat Intelligence | Initial natural phenomena liable to criminal exploitation |
| 14 | Climate and Timeline | Extreme heat 38-40°C Wind north east 4 knots workday 10:00 |
| 15 | Language | Common to all residents few foreign nationals Roma population |
| 16 | 15 Minute Response | Significant with additional military support |
| 17 | Health Care | Over 15 150-250 bed hospitals, 30 care community homes |

2 - Mapping process



SOLUTION = the whole of method, practice, technology and tools or any subset thereof that is capable of demonstrating the function of a single COM component or a combination of COM components, in all cases including their **interoperability features**



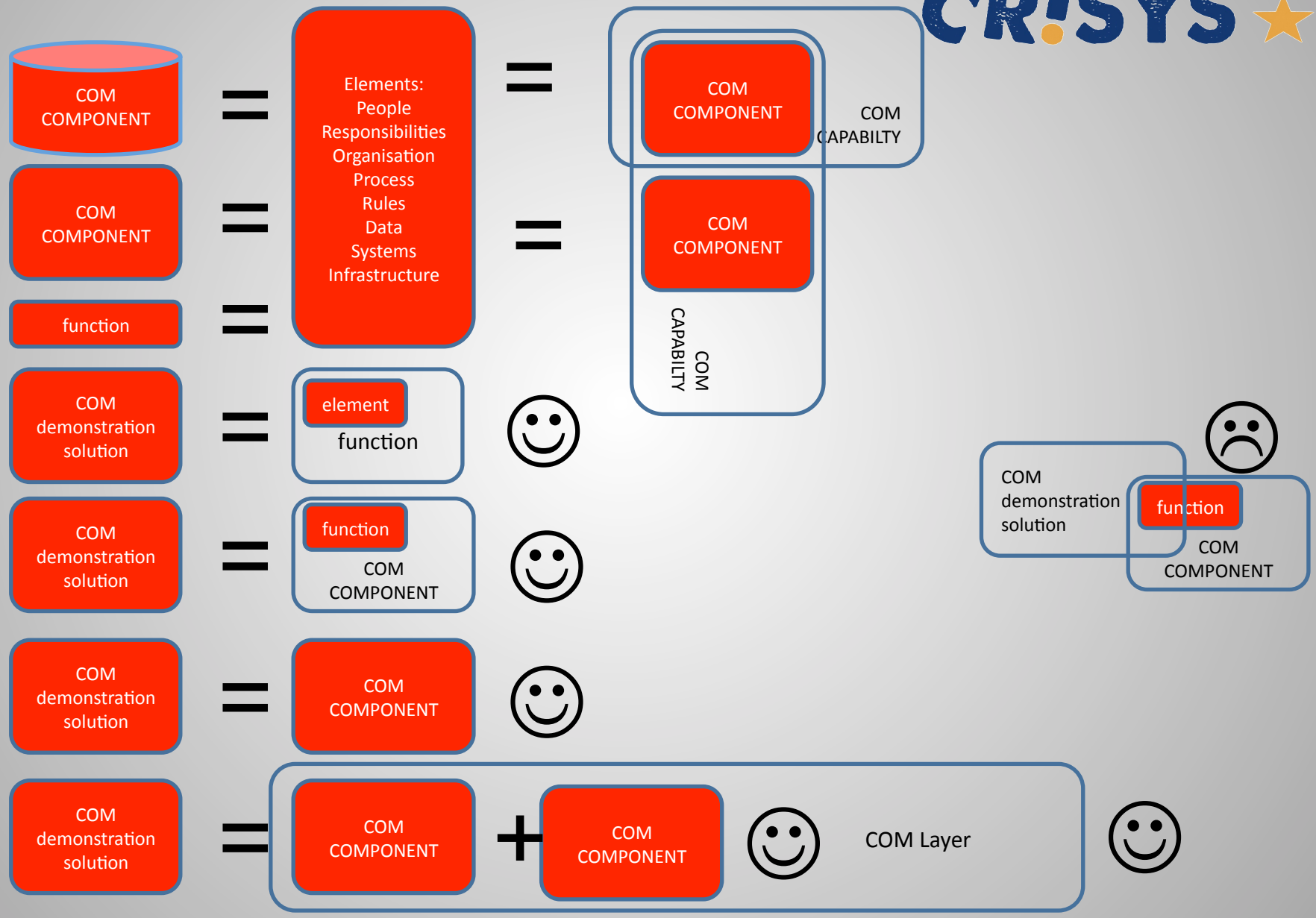
Mapping Solutions and Tools onto the Demonstration Scenarios via the CRISYS OPERATIONAL MODEL

Available solutions and tools should be involved in the disaster scenarios for demonstration and testing purposes by:

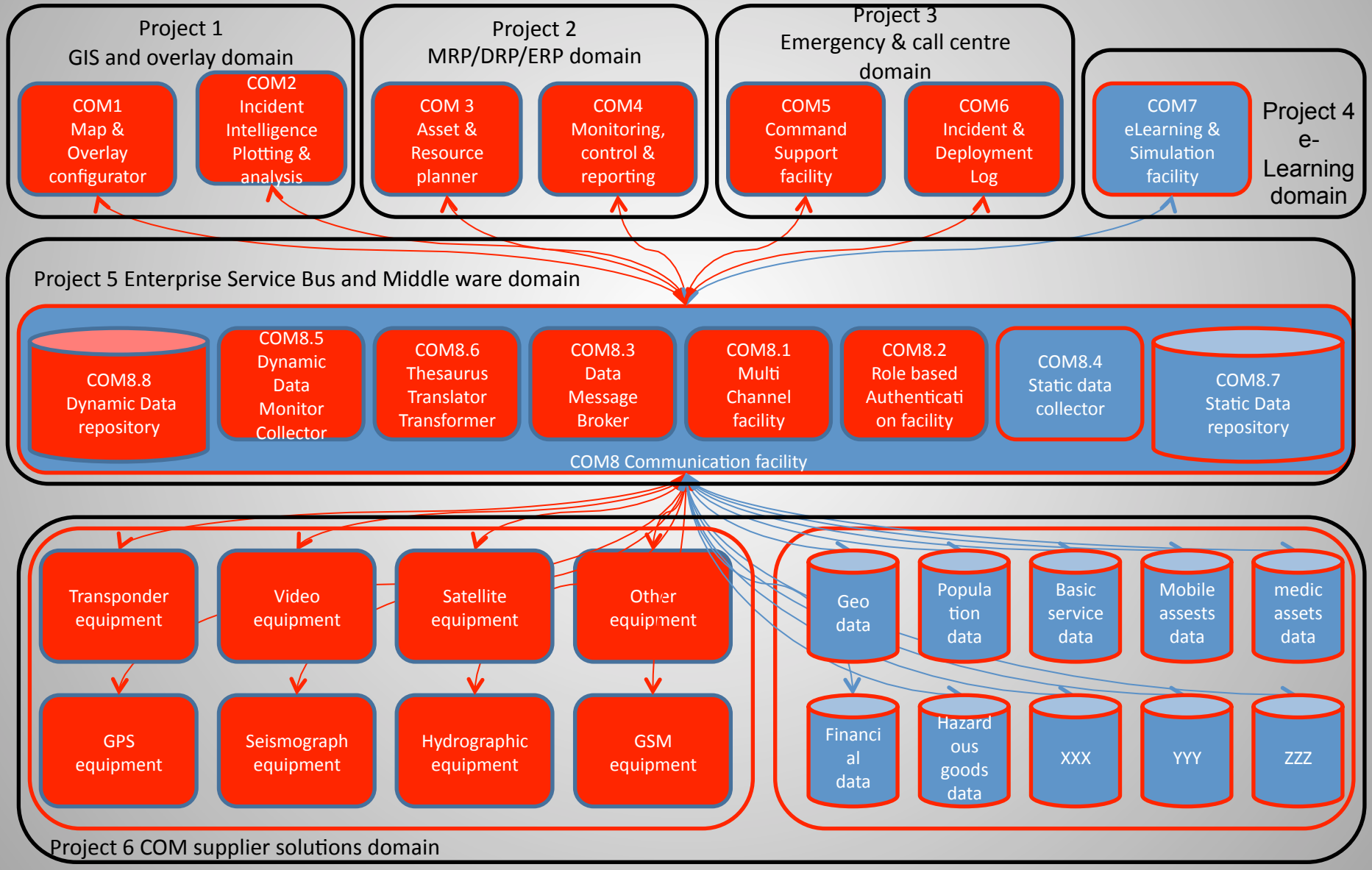
- following a **mapping protocol**
- implementing a comprehensive set of **Proof of Concept Projects**
- testing relevant actions via a **POC Transitioning Process**

COM : MAPPING PROTOCOL

valid configurations of solutions for demonstrations



COM : mapping Proof Of Concept projects & solutions



Proof of Concept (POC) Projects



COM Command, Reconnaissance, Planning & Deployment Layer

- **POC Project 1 Preparedness and Situational Awareness**
- **POC Project 2 Adaptive Planning & Control**
- **POC Project 3 Monitoring, Control and Logging**
- **POC Project 4 Learning & Validation**

Data Collection, Storage, Transformation and Distribution Layer

- **POC Project 5 Information Highway**

Dynamic and Static Data Supply Layer

- **POC Project 6 Data Acquisition** |

Transitional Testing



| Situational awareness | | | | |
|-----------------------|---------------------|---------|----------|----------------------------------|
| Operations | Assets | ITC | Learning | |
| Messages | Module command unit | Sensors | Alerts | |
| X | | | X | Authorities EU/ Member States |
| | X | | | Strategy |
| | | | | Core |
| X | | | X | Operational command |
| | X | | | Operational |
| | | X | | Capabilities |
| X | | X | X | First responders |
| | X | | | Tactics |
| | | X | | Toolkit |

3 - The TOOLBOX Recommendation

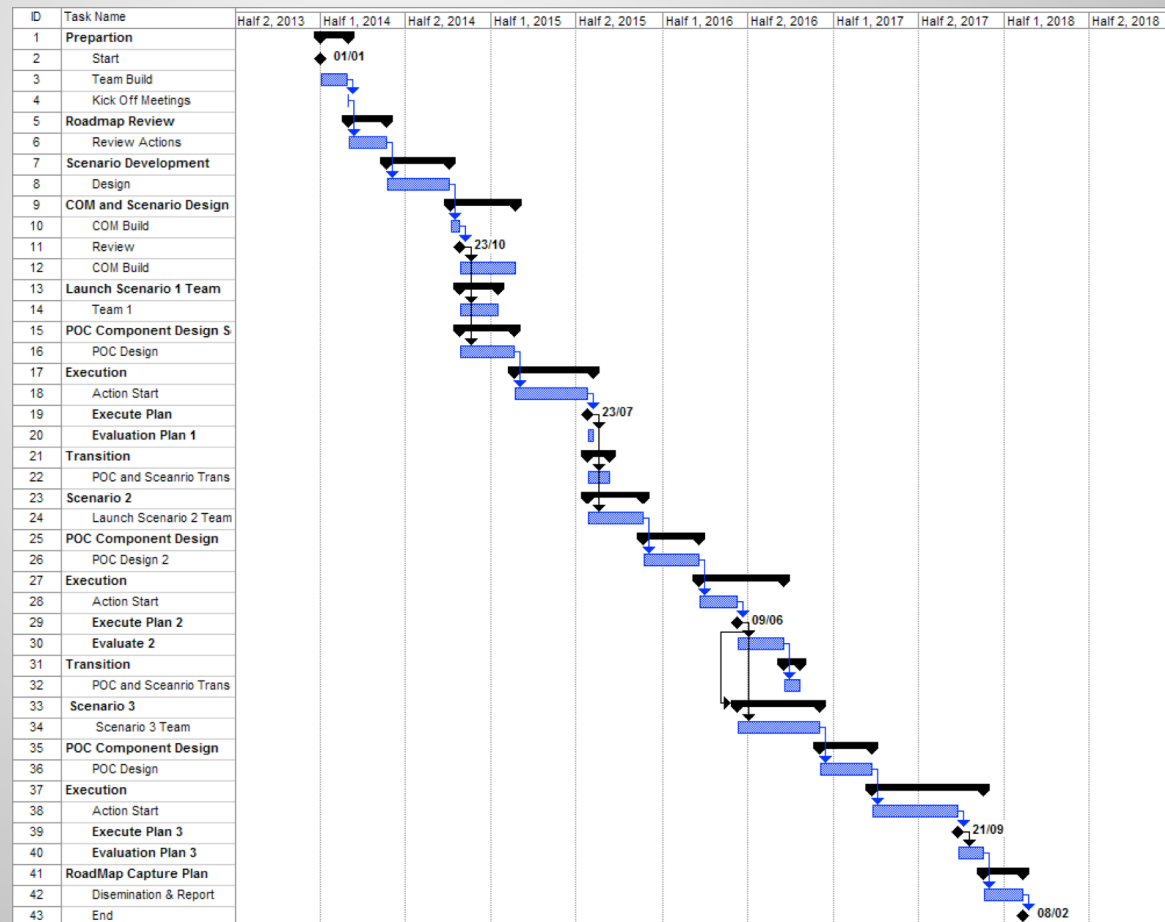


- Rather than trying to demonstrate a ‘system of systems’ configuration, the demonstration roadmap strives **to test a ‘best of breed’ assembly of tools and their interactions**. In this way the demonstration roadmap is kept open for invitation of any type of practice and solution that can provide a sustainable contribution to crisis response management objectives.
- Tools may comprise of **entire systems**, such as a mapping and overlay configuration system, including its rules and methods, thus covering a COM component or even as much as an entire CRISYS capability on its own. Less obvious, but equally relevant are **provisions of proven sets of logical ruling, methods and parameters** even if there is no technical platform for its support included in its offering.

4 - ROADMAP Plan and Timetable



An actions' plan and the relevant timetable has been provided in the study:





Further Information

Critical Response in Security and Safety Emergencies

<http://www.crisys-project.eu/>

CRISYS FINAL ROADMAP – The results of the Crisys Project

http://www.eos-eu.com/files/Documents/CRYSIS/CRISYS_deliverables/CRYSIS_D4_3_The_results_of_the_CRISYS_project.pdf

Contacts

CTIF - International Association of Fire and Rescue Services

Technical Manager: Dennis Davis

firstfirecall@aol.com +44 1244 323177 +44 787 948 1056

EOS – European Organisation for Security

Project Manager: Nicola Iarossi

Nicola.Iarossi@eos-eu.com