Towards a European Infrastructures Simulation and Analysis Center

Erich Rome

ERNCIP Conference, December 13, 2012, Ispra, Italy

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Today's state of Critical Infrastructure Protection @ EU

- European Critical Infrastructures directive 2008 passed
- National CIP plans passed in some MS
- New (governmental) authorities / agencies for CI(I)P established in some MS
  - NL: CPNI.NL
  - SE: MSB
  - DE: Cyber Defence Centre
  - PT: ANPC
  - ...
- R&D projects on CIP, funded by Framework Programmes, EPCIP, and other programmes
- European-level community-building activities by ERNCIP

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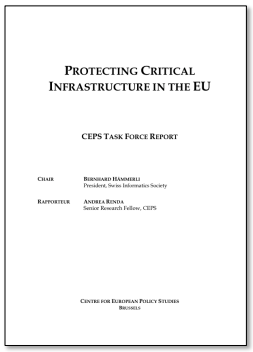
Assessment by Centre for European Policy Studies CEPS

The gaps: That is currently missing (from *):

- "Lack of common taxonomies, metrics, and risk management framework for CIP-related risk."
- "Assessment of EU preparedness for CI disruptions is far from being mature."
- "National policies increasingly focus on cyber threats (EP3R does it on EU level, too)." that is: they are not following the recommended all hazards approach
- "Understanding of CI failures due to dependencies or interdependencies is still limited and needs to be improved."
- "International cooperation of key players in CIP policy is difficult."


PROTECTING CRITICAL INFRASTRUCTURE IN THE EU

CEPS TASK FORCE REPORT

CHAIR BERNHARD HÄMMERLI
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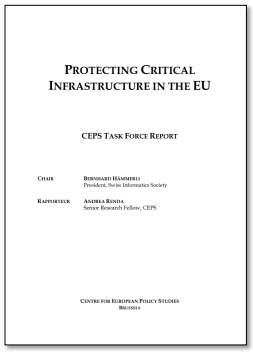
BRUSSELS

* CEPS Task Force Report (CEPS, Brussels, 2011): *Protecting Critical Infrastructure in the EU*

Some Recommendations by CEPS

- "The key pillars [of a [European] CIP policy] are then the development of standards and best practices, education and training, R&D and information-sharing, and modelling and EU-wide simulation capabilities."
- "In the *ex ante* phase of CIP policy, infrastructure risk assessment plays a key role, and should be subject to further research and standardisation."
- "The EU must empower a single agency to deal with CIP and CIIP issues adopting an all-hazards approach."
- "The EU should promote the development and adoption of common risk metrics and standards for risk identification, assessment and management in the field of CIP, as well as the development of a mature insurance market."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Modelling, Simulation and Analysis (MS&A) for CIP

- Essential for preparedness and mitigation capabilities of emergency and crisis management staff and first responders:
  - Knowledge and practical experience gained in real events
  - Knowledge and practical experience gained in real exercises
  - Knowledge and experience gained in other training activities
- National exercise frequency: 1 per year (Germany) => Only 1 scenario per year!
- Modelling, simulation & analysis by computer provides additional opportunities for training
- MS&A also provides a basis for
  - Capability for understanding dependencies between CI
  - Capability for analysing consequences and impacts of CI service disruptions
  - Capability for doing "what … if …" analyses (different courses of actions)
  - Capability for doing *post mortem* analyses

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CIP in the USA – NISAC

- National Infrastructures Simulation and Analysis Center
  - Started as a research cooperation in 2000
  - Since 2003 part of US Department of Homeland Security
  - Source of national expertise for CIP R&D and analysis (congress mandate!)
- **Goals:** Supporting the preparedness and protection of nation and society by
  - Analysing CI loss or disruption, incl. hot phase!
  - Participating in understanding of protection, reaction, mitigation and reconstruction options
- **NISAC Inventory:**
  - Data of CI elements, economical data, …
  - MS&A methods for 17 different CI sectors
- Fact: Major European institutions started consulting by NISAC

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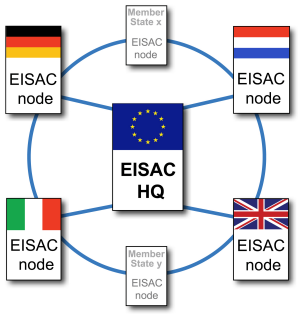
Towards an EISAC
FP7 DIESIS Design Study (2008–2010)

- Comprehensive design study of “EISAC”
- Technical results
  - Interoperability middleware for federated modelling, simulation, and analysis for CIP
  - Scenario-oriented ICT architecture & workflow
  - Working demonstrator: Distributed federation of 4 simulators
- Non-technical results
  - A business model, including a catalogue of technology, tools, and services of EISAC
  - An assessment of legal issues and suitable legal forms for EISAC
  - A deployment plan

Towards an EISAC
FP7 DIESIS Design Study (2008–2010)

Distributed trans-national organisational model

- European headquarter (“hub”)
  - Technology development & standardisation
  - Coordination between national nodes
  - Support for stakeholders at EU level
- National nodes (“spokes”)
  - “Localised” services for national stakeholders
  - Experts familiar with national CI, legislation, organisation of civil protection, language …
  - Could be an existing research site



The next step: CIPRNet – Critical Infrastructure Preparedness and Resilience Research Network

- Concept: CIPRNet establishes a **Network of Excellence** in Critical Infrastructure Protection R&D for its stakeholders.
- Co-funded by FP7; 2013–2016

Partners

1. Coordinator: Fraunhofer IAIS, DE
2. ENEA, IT
3. TNO, NL
4. UIC, FR
5. CEA, FR
6. EC Joint Research Centre, EU
7. Deltares, NL
8. University of Cyprus, CY
9. University of Technology and Life Sciences, PL
10. Università Campus Bio-Medico di Roma, IT
11. University of British Columbia, CA
12. ACRIS GmbH, CH

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CIPRNet Consortium

- … from nine countries plus the EU (via JRC)
- Representing over 50 research projects in CIP
- Multipliers in the consortium, including
  - International association of infrastructure operators
  - Coordinators of IntelliCIS COST Action and CLIMRUN project
  - Members of NMDC (NL) and NITEL (IT) national research platforms
  - Organisation coordinating ERNCIP
  - International partner from Canada
- Large inventory of knowledge and technologies
- Advisory board of government agencies, CI private sectors, and science

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The next step: CIPRNet – Critical Infrastructure Preparedness and Resilience Research Network

Some general objectives

1. To provide support from the CIP research communities to emergency management, governmental agencies and policy-makers, enhancing their all hazard preparedness.

2. To enhance the resilience of Critical Infrastructures by improving the knowledge and understanding, the preparation and the mitigation of CI disruptions and their consequences.

3. To lay the foundation for a long-lasting virtual centre of competence and expertise in CIP, the European Infrastructures Simulation & Analysis Centre (EISAC).

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CIPRNet: Creating new capabilities

Plan for achieving objectives 1 and 2:

- Implementing new capabilities for supporting more effective responses to disasters that affect or originate from multiple CI:
  - **Bundle and integrate** existing know-how, technologies, and data for supporting the planned capabilities,
  - **Create added-value decision-support capabilities** for national and multi-nation emergency management and CI owners based upon **integrating** technologies available at CIPRNet partners,
  - **Support the secure design of Next Generation Infrastructures,**
  - **Demonstrate timely, actionable, risk-informed CIP analyses and strategies for authorities** (both nationally, cross-border, and EU-wide) and CI owners,
  - **Boot** EISAC.

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CIPRNet: Building capacities

Plan for achieving objective 3:

- Building the required capacities for creating these new capabilities:
  - **create a critical mass of expert knowledge, expertise** and advanced CIP research by **integrating** resources of the CIPRNet network,
  - **boost interaction** of the CIPRNet-worked experts and their EU and national projects,
  - **perform dedicated training activities**, for young and established researchers, CIPRNet end-users and other stakeholders, and
  - **foster cooperation** between CIP researchers, experts, end-users and other stakeholder.
- **Founding a long-lasting virtual centre of competence and expertise in CIP**

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CIPRNet: New capabilities

CI MS&A modelling for analysing various possible courses of action

- **'what if' analysis:**
  The exploration of different courses of action and their different consequences in terms of the cross-cutting criteria mentioned in the ECI directive
- Application: planning the most effective use of resources in an emergency and exploring a variety of scenarios, for example:
  - which region to evacuate first,
  - which infrastructures to reinforce best/first,
  - which transport or traffic infrastructures required for a mitigation plan will be affected by a disaster and what contingency planning is required,
  - which infrastructures outside a region affected by a disaster need to be operational in order to supply that region and thus need to be protected too.

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CIPRNet: New capabilities

Consequence analysis for different courses of action

- **Decision Support System** (DSS) for supporting Emergency Managers by providing a comprehensive assessment of the behaviour of CIs under severe perturbations.
- DSS tasks:
  - Extract a 'dynamic' probability that a CI will be hit/disrupted by an external event
  - Set-up the emergency scenario
  - Evaluate the impact of the disruption of CI elements causing a reduction in the Quality of the delivered Services
  - Evaluate the impact on population and economy (consequences analysis)
  - Provide risk and emergency managers as well as CI operators
    – with data and estimates helpful for making accurate scenarios assessment
    – needed for undertaking the necessary decisions
    – for optimal mitigation and healing strategies.

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CIPRNet: Dissemination and Training

Dissemination

- Dedicated cooperation workshops (1 per year)
- Organising several CRITIS conferences
- Continuation of the European CIIP Newsletter
- CIPedia, textbooks, scientific publications, web portal …
- **Demonstration of capabilities at a regional or national exercise**

Training

- Lectures at Master of Homeland Security (UCBM, Rome)
- Training materials on CIPRNet capabilities and technologies
- Internal staff training
- External training for stakeholders

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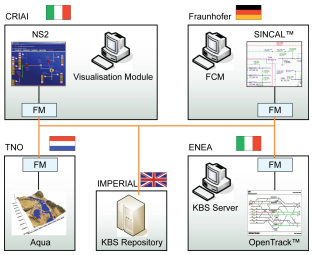
CIPRNet: Partners' inventories

Simulators, taxonomies, middleware, knowledge

Including …

- DIESIS federated simulation interoperability middleware
- OpenMI standard for coupling models
- Almost 20 different simulators
- (Inter)dependency modelling approach
- I2Sim framework
- VITA threat taxonomy
- CI data
- Tools: Visualisation of outages, flood forecast, decision support for SCADA systems
- Simulation models of various CI and external factors



DIESIS Demonstrator:
Distributed federated Simulation

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Conclusion

- Urgent need for advanced decision-support and consequence analysis capabilities for emergency managers and CI stakeholders in Europe
- National resources insufficient for creating the required capabilities
- No European MS&A for CIP capability available
- Additional efforts required for creating new capabilities
  - Pooling resources: experts, researchers, knowledge, technology
  - **Transferring research results into practical application**
- A European Infrastructures Simulation and Analysis Center, delivering such capabilities at different levels, could be the solution
- CIPRNet undertakes a next step towards realising EISAC by capability forming and capacity building
- Complementary to ERNCIP activities

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Thank you for your attention!

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