



NEST

GIACS

General Integration of the Applications of
Complexity in Science

Coordination action



Italian National Agency for New Technologies, Energy and the
Environment

*D3 - Complexity in Human and Infrastructures
networks*

**Third six.month report
(15.07.2006 – 14.01.2007)**

Start date of project: July 15th 2005

Duration:36 month

Data of issue: 19.02.2007

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1. Preface

In the third period of activities of GIACS project (15.07.2006 – 14.01.2007), ENEA has concluded the first task (out of three) of WP3 and continued its efforts towards the fulfilments of the remaining two. During this time ENEA has also participated in other GIACS related activities such as general meetings, workshops and conferences. Most of the activities are documented and reported in the GIACS web site on the page devoted to WP3, which is continuously updated by ENEA. (www.giacs.org/node/154)

The purpose of this document is to give a summary of these activities and their results, it is divided in two sections. The first section describes the activities directly related to the task. The second section reports other related activities.

2. Task related activities

2.1 Conclusion and submission of deliverable D3.1.

The first task in the frame of WP3 was the gathering of relevant data for the possible cooperation between Industries – STREPS. Gathering data process was mostly carried out during the first periods of activity [1,2]. These data were then summarized and reported in the deliverable D3.1 on July 31st 2006 [3].

2.2 Steps towards the second and third deliverable

The second and third deliverables are:

D3.2 Support of visits leading to common Complexity PhD industry-STREPS.

D3.3 Session in workshop organized to put together complexity and technology for initiating common PhD projects: industry-STREPS.

As a part of its activities towards these tasks, ENEA has organized two events. The first, a STREP – INDUSTRY one day workshop that was supposed to take place at ENEA Headquarters, Rome on November the 17th, 2006 (Rationale and program can be found in the end of this document). This workshop however was not actualized for reasons reported here after (Sec. 2.2.1). The second event, a workshop of the title “ENEA per il governo e la sicurezza delle Grandi Reti Tecnologiche ed Energetiche.” (ENEA for the management and the security of major technological and energy networks) was carried out on the 24th of November, 2006, with a large participation of Industrial Stakeholders and Policy Makers at national and EU level, as reported in section 2.2.2.

2.2.1 STREP – INDUSTRY one day workshop

Here follows the workshop’s rationale, its program and a summary of the actions taken towards its realization, together with possible explanation of why it was not.

ONE DAY GIACS (General Integration of the Applications of Complexity in Science) WORKSHOP

<http://www.giacs.org/>

Title: Applying Complexity Science to Real World Networks

Place: Rome, ENEA's Headquarters

Date: 17 November 2006

Local Organizers: Sandro Bologna, bologna@casaccia.enea.it – Vittorio Rosato, rosato@casaccia.enea.it – Limor Issacharoff, limor@casaccia.enea.it

Rationale:

The complex nature of modern real-world networks (e.g. energy, telecommunications, transportation, logistics, etc.) and their interdependencies poses a number of theoretical and practical challenges. In general, networks are inherently difficult to understand and to manage. There is an apparent lack of tools and methods enabling to predict their behaviour and especially their response to faults (random or resulting from deliberate attacks).

Many of the challenges and problems posed by the new and large networks are just emerging. The inherent characteristics of new information infrastructures radically differ from those of traditional infrastructures in terms of scale, connectivity and dependencies. Moreover, there are several “drivers” that will likely aggravate the problem of critical information infrastructures in the future. Among these drivers are the interlinked aspects of market forces, technological evolutions, and newly emerging risks. If we add socio-political and cognitive dimensions to the equation, it becomes clear that we are dealing with a “new” problem that requires new analytical techniques and methodologies that are not yet available.

This points to one fundamental issue and a major challenge in terms of research: only interdisciplinary approaches do sufficient justice to an issue that is inherently interdisciplinary due to its multi-faceted nature. However, this subject has received up to now a little attention from large parts of academia and networks owners/operators. Research is generally focused on specific technical aspects at local or closed subsystems. These aspects are important – but they often miss crucial key features of the complex systems at hand and are thus inadequate to suggest correct solutions when facing “interdependent” critical events.

Effective analysis of large networks vulnerabilities and behaviours, calls for holistic approach and will require a comprehensive and truly interdisciplinary research agenda encompassing fields ranging from engineering and complexity sciences to cognitive and human organisational sciences.

The aim of the Workshop is to call for an interdisciplinary group of scientists and engineers working together to bridge the gap existing to date between the academia working on the development of new tools and techniques for dealing with large and complex networks and the owners/operators of the different networks. Attention will be devoted to network's vulnerability,

cause and treatment of cascading failures and their economical aspect, with special emphasis to the issues which can engender the development of new tools in different application domains, such as the prediction and the understanding of the propagation of the cascade effects, the understanding of the differences between social-based and non-social-based networks, the estimate of the economical aspects of network vulnerabilities.

The Workshop is organised from GIACS Project in collaboration with the STREPS Projects that have been selected as most application oriented.

DRAFT PROGRAM

10.00 Sandro Bologna, bologna@casaccia.enea.it ENEA, “Introduction to the Workshop”

10.10 Rosario Mantegna mantegna@unipa.it , Palermo University, “Setting the Scene”

10.30 Fabrice Saffre, fabrice.saffre@bt.com, **Robert Ghanea-Hercock**, robert.ghanea-hercock@bt.com BT Group, Pervasive ICT Research Centre, UK, “Challenges and results in the domain of Telecommunications Networks”

11.00 Panos Argyrakis, Panos@physics.auth.gr , Aristotle University of Thessaloniki, “Challenges and results in the domain of Internet Networks – The DYSONET Project”

11.30 Coffee Break

12.00 Dirk Helbing, helbing1@vwi.tu-dresden.de, Dresden University of Technology, “Challenges and results in the domain of Disaster Management Networks”

14.30 Janusz Holyst, jholyst@if.pw.edu.pl, Warsaw University of Technology, “Challenges and results in the domain of Public Transport Networks - The CREEN Project”

13.00 Lunch Break

14.30 Vittorio Rosato, rosato@casaccia.enea.it, ENEA, “Challenges and results in the domain of Electrical Networks”

15.00 Sebastian Doring , S.Doering@wzl.rwth-aachen.de , Rheinisch Technische Hochschule, Aachen, Germany, “Challenges and results in the domain of Industrial Logistic Networks – The COLL-PLEXITY Project”

15.30 Janusz Holyst, jholyst@if.pw.edu.pl, Warsaw University of Technology, “Challenges and results in the domain of Media Networks – The CREEN Project”

16.00 Bertrand de La Chapelle, bdelachapelle@gmail.com , French Foreign Affairs Ministry, “Challenges and results in the domain of Governance Networks”

16.30 Massimo Salzano, salzano@unisa.it , Salerno University, “Challenges and results in the domain of Economic Networks”

17.00 Discussion and Conclusions

17.30 Closing Workshop

Steps towards the workshop and encountered obstacles

During Summer 2006, ENEA has undergone an intensive activity for promoting this event in different contexts: on one side, at the level of academic and research institutions (in Italy and abroad) to trigger the interest of the largest possible community of scientists active in the field of Complex Systems. On the other side, ENEA has made use of its pivotal position between public research, industry and Infrastructures owners for attracting, around this themes, also industrial policy makers, technological and strategic personnel of large Italian companies operating in the field of Infrastructure management and protection.

The major problem encountered has been related to the diversity of the approach and the diversity of goals of the scientific and the industrial communities. Infrastructure stakeholders do display their own technology (sometime based on updated scientific and technological methods) which is said to allow a complete vision and control of the specific technological system. In other words, it seems to be a scarce demand of further technology for a better control of critical systems. Moreover, it seems that a shared vision of the relevance of an interdependent analysis of the Critical Infrastructures is still missing, although recent events (Italian blackout in 2003 and the EU-wide blackout of 2006) have clearly demonstrated the needs of an extended governance for mitigating the effects of large-scale events.

This situation is also aggravated by the lack (at least at the scale of Italian nation) of a specific institution committed, at the governmental level, for the coordination of the control analysis of Critical National Infrastructures. To date, the Civil Protection Cabinet (which strictly depends on Prime Minister Cabinet) is the only institution able to catalyse the effort of public and private agents to manage Crisis Events. This institution does not, however, act if not in presence of natural (or similar) catastrophic contingencies.

ENEA is thus committed somehow to prompt to the attention of the Italian political makers the absolute need of a specific entity which, also under normal circumstances, could support infrastructure's owners and deploy its resources to prevent the occurrence of critical, large-scale, events.

On this line ENEA has launched a Project on "Complex Networks and Infrastructure Protection" see the following section (Sec. 2.2.2)

In conclusion, the proposed Meeting has been withdrawn as it has been raised only a moderate interests in the actors which have been invited. The effort will be re-iterated by using, as attraction basin, the European Conference of Complex System event (ECCS07, Dresden October 1-5, 2007). A Satellite Workshop event, entitled "Critical Infrastructures as Complex Systems" has been proposed, and accepted, for being held around the main event. ENEA will thus attempt to re-propose the same global vision and will operate to attract in Dresden the major (Italian and EU-wide) players in that field.

2.2.2 ENEA per il governo e la sicurezza delle Grandi Reti Tecnologiche ed Energetiche

As mentioned in the previous section, among its activities ENEA has launched a Project on "Complex Networks and Infrastructure Protection". The project has been presented to the public on November 24th, 2006 [4], a one day workshop attended by various representatives of the Industrial Stakeholders such as TERNA (operator of electricity transmission and dispatching in Italy), RFI (operator of the Italian Railways) and Telecom Italia (major telecommunication operator).

The workshops' program [4], Rational [5] summary and some of the talks [5] are available in Italian.

3. Participation in various GIACS activities

Hereafter it has been reported the GIACS events in which ENEA has taken part, as well as ENEA's contributions to these events.

- Forum of Complexity Scientific Research Projects (CRP Forum), Turin, ISI, 28/07/06
V. Rosato, S. Bologna: review of ENEA's activities
- Potentials of Complexity Science for Business, Governments, and the Media 2006, Budapest, Collegium Budapest, 3-5/08/2006
L. Issacharoff, S. Bologna: Vulnerability of Technological Complex Networks, Poster presentation
- European Conference on Complex Systems 2006 (ECCS '06), Oxford, Said business school, 25-29/09/2006
V. Rosato

4. Reference

- [1] *GIACS first six month report*
http://www.giacs.org/files/wp3_files/ENEA_FIRST_SIX_MONTH_REPORT.doc
- [2] *GIACS second six month report*,
http://www.giacs.org/files/wp3_files/ENEA_SECOND_SIX_MONTHS_REPORT.pdf
- [3] *GIACS deliverable 3.1*,
http://www.giacs.org/files/wp3_files/GIACS_deliverable3.1.pdf
- [4] *ENEA per il governo e la sicurezza delle Grandi Reti Tecnologiche ed Energetiche*
Program: http://www.enea.it/com/web/convegni/work_241106.pdf
- [5] *ENEA per il governo e la sicurezza delle Grandi Reti Tecnologiche ed Energetiche*
Press relies: <http://titano.sede.enea.it/Stampa/skin2col.php?page=comunicatodetail&id=183>
- [6] *ENEA per il governo e la sicurezza delle Grandi Reti Tecnologiche ed Energetiche*
Talks: <http://www.enea.it/com/web/convegni/work241106/resoconto241106.html>