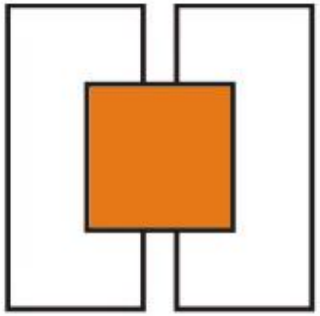

inter SECTION

The INTERSECTION Research Project

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SEVENTH FRAMEWORK PROGRAMME

ELSAG DATAMAT
A Finmeccanica Company

cini
Consorzio Interuniversitario Nazionale per l'Informatica

LANCASTER UNIVERSITY

THALES

FOKUS

Fraunhofer
Institute for Open Communication Systems

Telefónica

iTTi
e-technologies & business

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

TELESPAZIO
A Finmeccanica / Thales Company

era
MOŻESZ WIECEJ

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Outline

- Security and Resilience: current scenario and open issues
- Proposals for research work on resilience
- A bird eye view of the INTERSECTION research project
- Additional info on INTERSECTION

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Security and Resilience: Current Scenario and Open Issues

SEVENTH FRAMEWORK PROGRAMME

Life in an interconnected world
The PERFECT WORLD version

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- Hardware is becoming more and more powerful (as well as cheaper and cheaper), while still exhibiting an easy-to-predict, highly deterministic behaviour
- A variety of network technologies makes seamless integration of individual systems possible, allowing to build highly-dependable Systems of Systems (SoS)
- The resulting SoS, although extremely complex, are easy to use and manage
- A plethora of applications - ranging from e-government to entertainment - is deployed at no risk (since failures do not exist and bad guys are locked out at all times)

Life in an interconnected world
The REAL WORLD version

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- Hardware cost is indeed dropping, and computing power is increasing dramatically. Embedded systems have become pervasive (there will be more than 3 embedded systems per person by 2010!) but they have also become more complex than a Main Frame of some ten years ago
- Many different network technologies – optic, WiMax, Ethernet (in a variety of flavours), WiFi, Bluetooth, NFC – are being interconnected, but this leads to a number of interoperability and security problems
- Properly configuring and managing the resulting SoS has become a security and availability nightmare
- Despite such problems, complex distributed SoS are being extensively used for deployment of critical services, with challenging requirements in terms of resilience

Current Protection Approach
Basic Network Elements

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- **Network endpoints** (computers) *should* have local security agents (antivirus software, password policies, good system administration)
- **Network elements** (routers and probes) can provide IP metrics, detect patterns and apply filtering rules
- **Network security** is based on Intrusion Detection Systems (IDSs) that interact with network elements

Current Protection Approach
Intrusion Detection Systems

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- **IDSs are centralized and located off-network, at Security Operation Centres**
  - ⇨ They typically work in isolation and are thus unable to provide any support in terms of active resilience
- **IDSs do not support real time analysis**
  - ⇨ They're slow! In many cases a late detection of an attack cannot prevent or mitigate damages
- **IDSs do not cooperate among them**
  - ⇨ Every network carrier has its own IDS that does not share critical attack information with contiguous IDSs operated by commercial competitors
  - ⇨ In case of distributed attacks, two contiguous IDSs might discover only part of the evidence required to trigger a fruitful reaction

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Proposals for Research Work on Resilience

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Suggested Main Research Themes

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- **Real-time processing of security-related data**
  - How to filter, process, and correlate information coming from a variety of sources (e.g. network infrastructure, application logs, operating system data structures, and more) in order to raise alarms in a dependable (i.e. reliable and timely) fashion
- **Intrusion Tolerance**
  - How to build systems that deliver a dependable service even when intruders break in
- **Effective diagnosis for complex networked systems**
  - How to filter, process, and correlate information, so as to:
    - assess the extent of the damage in individual system components
    - trigger recovery actions

IDS Technology Challenges

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- **IDSs should react automatically and in real-time**
  - they have to react soon, before damage is made
  - reactions must intelligently take into account their own side-effects, e.g. the impact of reaction on SLA on provided network services
- **IDSs should be located in-network**
- **IDSs should be distributed and redundant to improve resilience**
- **IDSs should cooperate horizontally with peers**
  - information exchange can allow a deeper and more effective analysis
- **IDSs should be modular**
  - several detection technologies can be deployed as additive, cooperative and pluggable modules thus making IDSs more flexible

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A bird eye view of The INTERSECTION research project

The INTERSECTION Project

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- **In**frastructure for he**te**rogeneous, **r**esilient, **se**cure, **c**omplex, **t**ightly **i**nter-**o**perating **n**etworks
  - FP7, Area 5 sub-programme: “Security, Privacy and Trust in the Future Internet”
    - Creation of a trustworthy and resilient Future Internet as a conglomerate of networks and systems, with built-in security, dependability, privacy and trust
    - Enabling users to understand security, privacy and trust in the Future Internet
  - Start date: January 1st, 2008
  - Duration: 24 months
- **Part of the Future Internet programme**

The INTERSECTION Consortium

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ACADEMIA

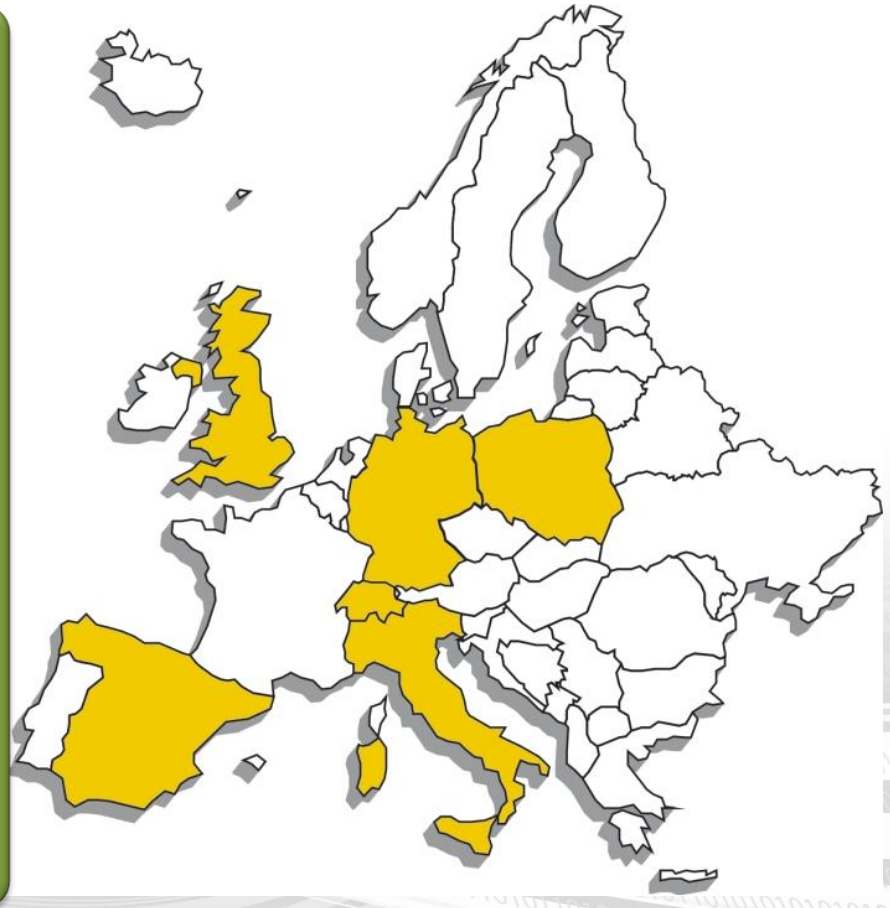
- Consorzio Interuniversitario Nazionale per l'Informatica
- Lancaster University
- Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung
- Eidgenoessische Technische Hochschule Zuerich

INDUSTRY

- Elsag Datamat (Coordinator)
- Thales Research and Technology
- ITTI (SME)

END USERS

- Telefonica Investigación y Desarollo
- Telespazio
- Polska Telefonia Cyfrowa



Project Focus

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Main Project Objectives

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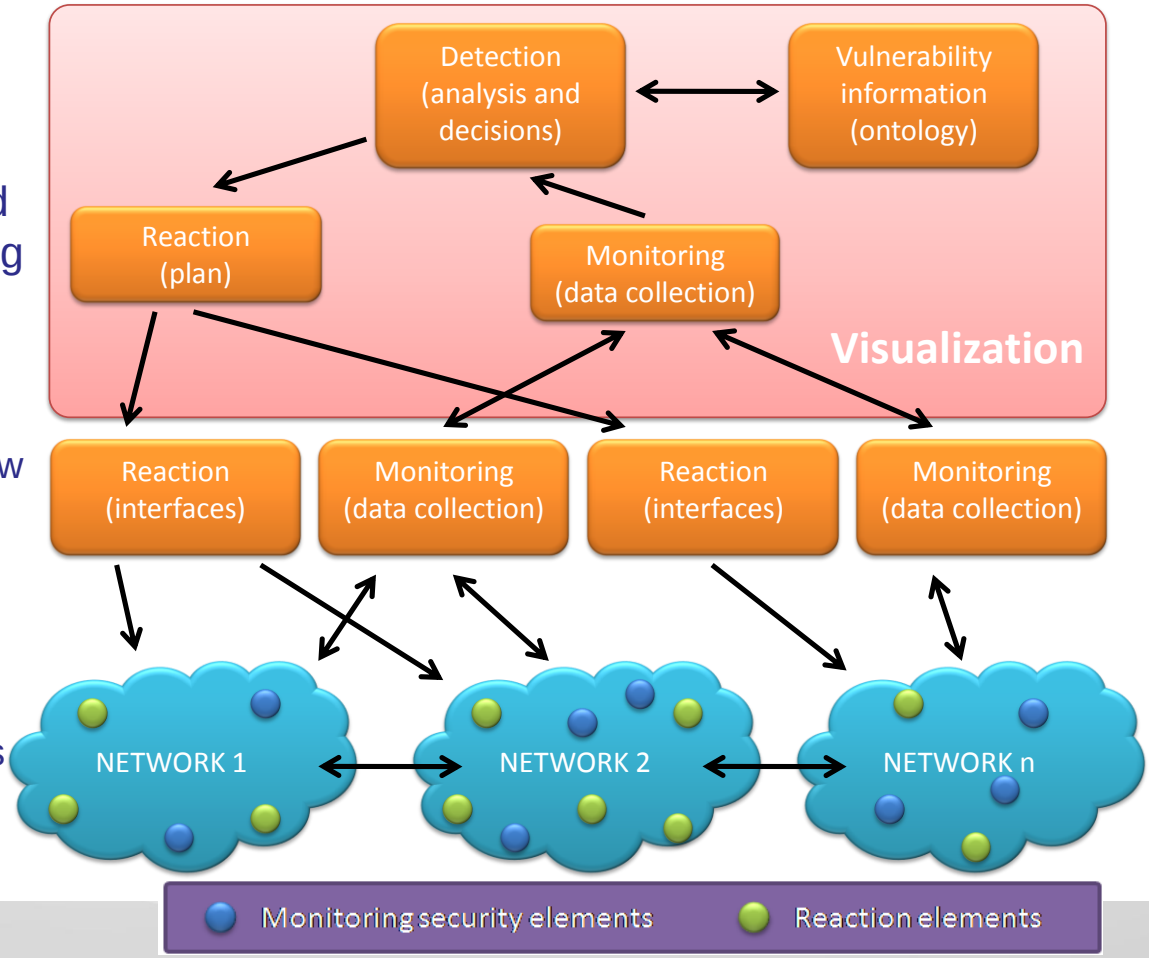
Identify and classify vulnerabilities of heterogeneous and interconnected network infrastructures (wired, wireless, satellite, mobile networks)

Create a European vulnerability database

Design and implement an integrated network security framework including different components and tools able to:

- detect anomalous events
- react to well-known, as well as to new forms of anomalies
- deploy distributed countermeasures against evolving threats
- provide mechanisms for intrusion tolerance to reduce the likelihood of intrusions generating system failures



Intersection Top-level Architecture

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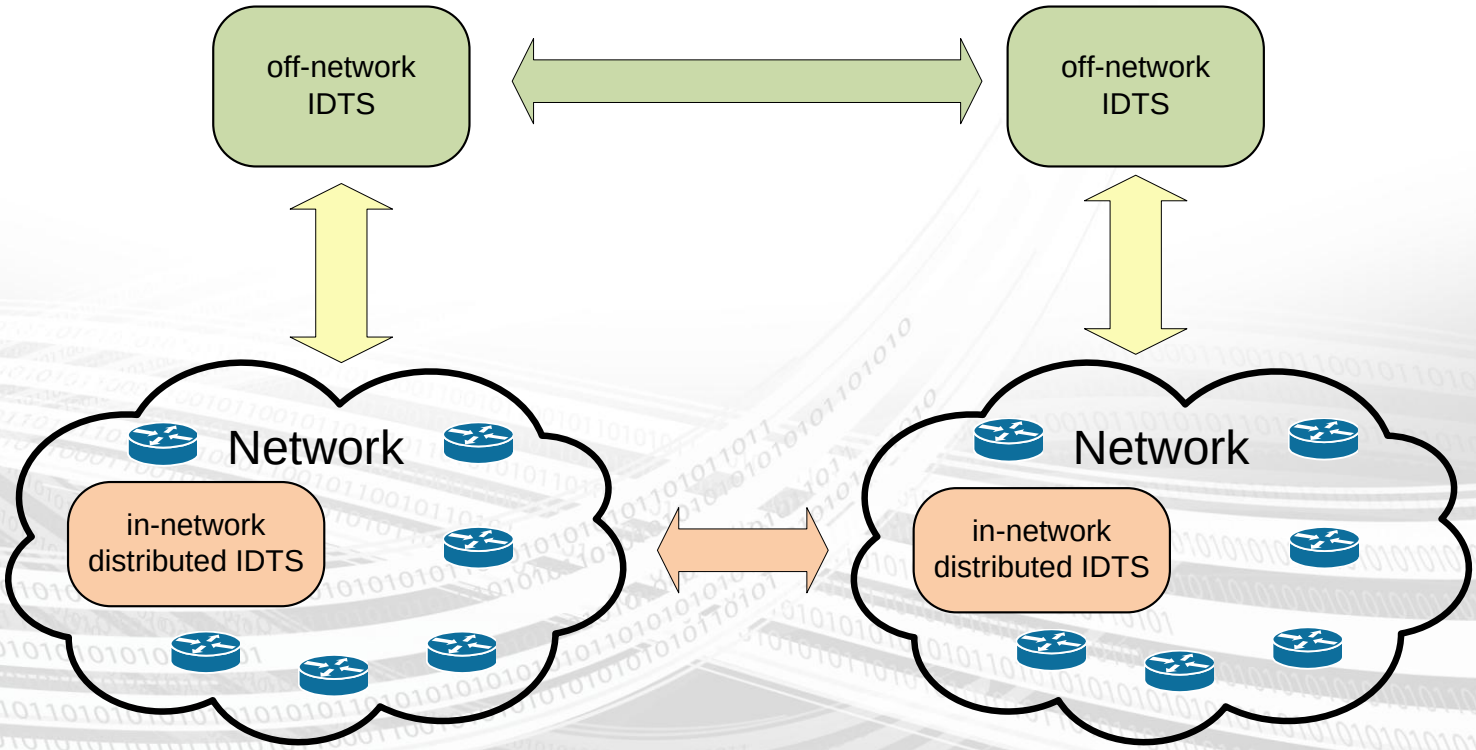

Intersection Framework Architecture
In-Network Elements

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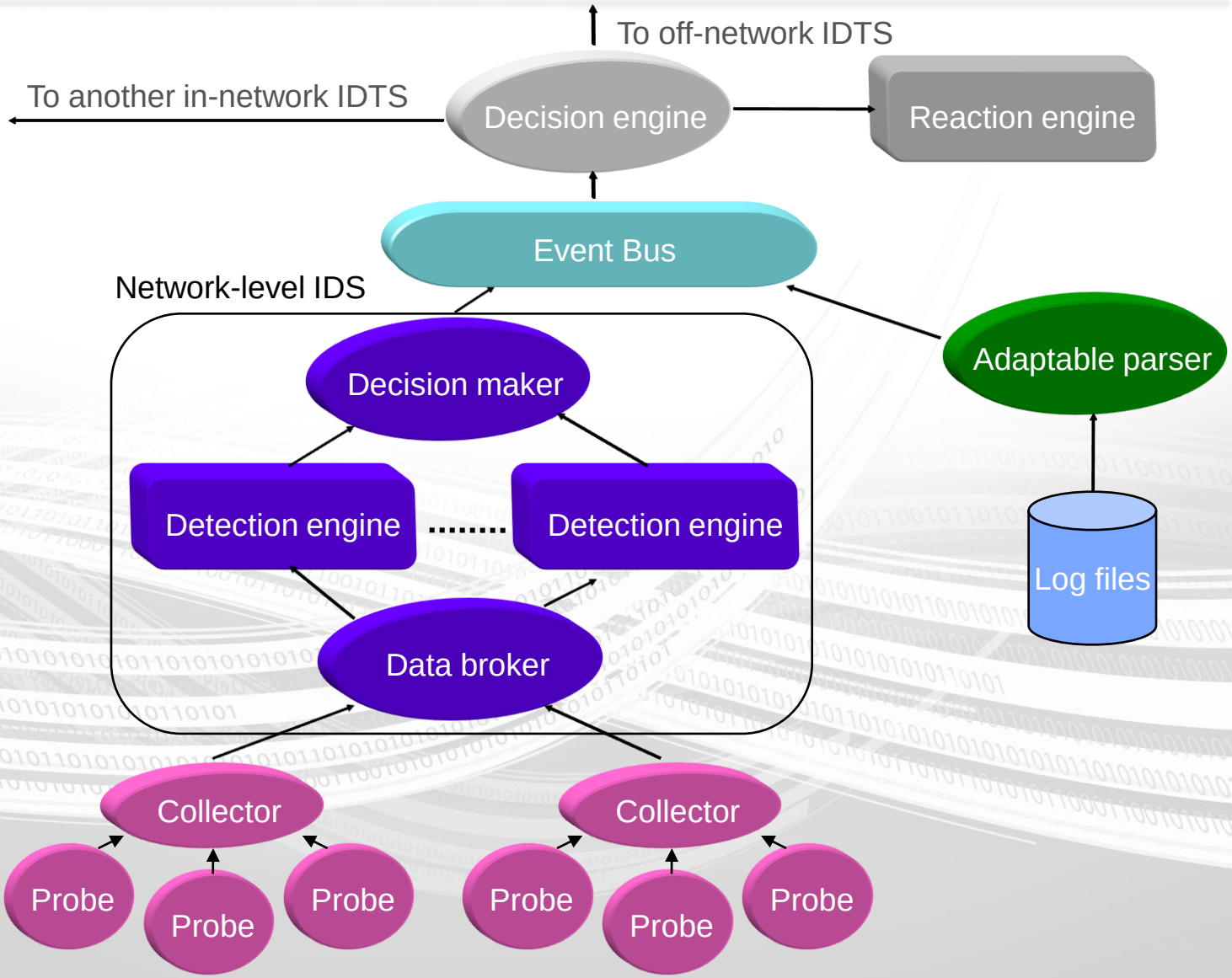

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Main IDS Research Related Issues

- A key activity in Intrusion Detection is dependable (i.e. accurate and timely) information extraction from multiple data feeds
- Ability to process data streams in real-time is crucial
- Correlation analysis is needed for improving detection while reducing false positives
- Data feeds can be highly heterogeneous (ranging from Web server logs to firewall traces), but the definition of a unified format for all data feeds is not a viable solution, especially when dealing with COTS and/or a (typically large) installed base of proprietary technologies

Architecture of the INTERSECTION IDS

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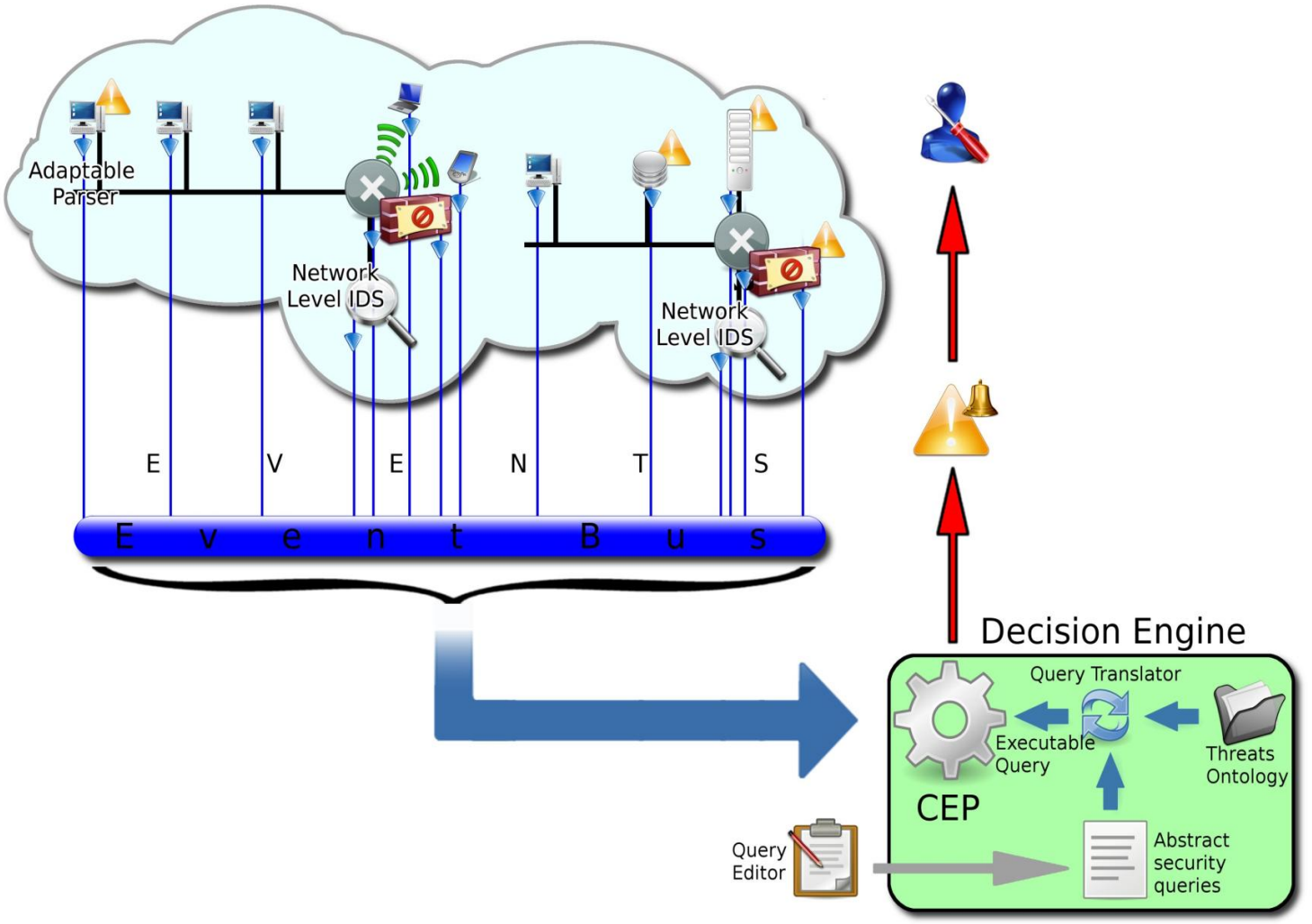

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Additional info on INTERSECTION

Project Plan

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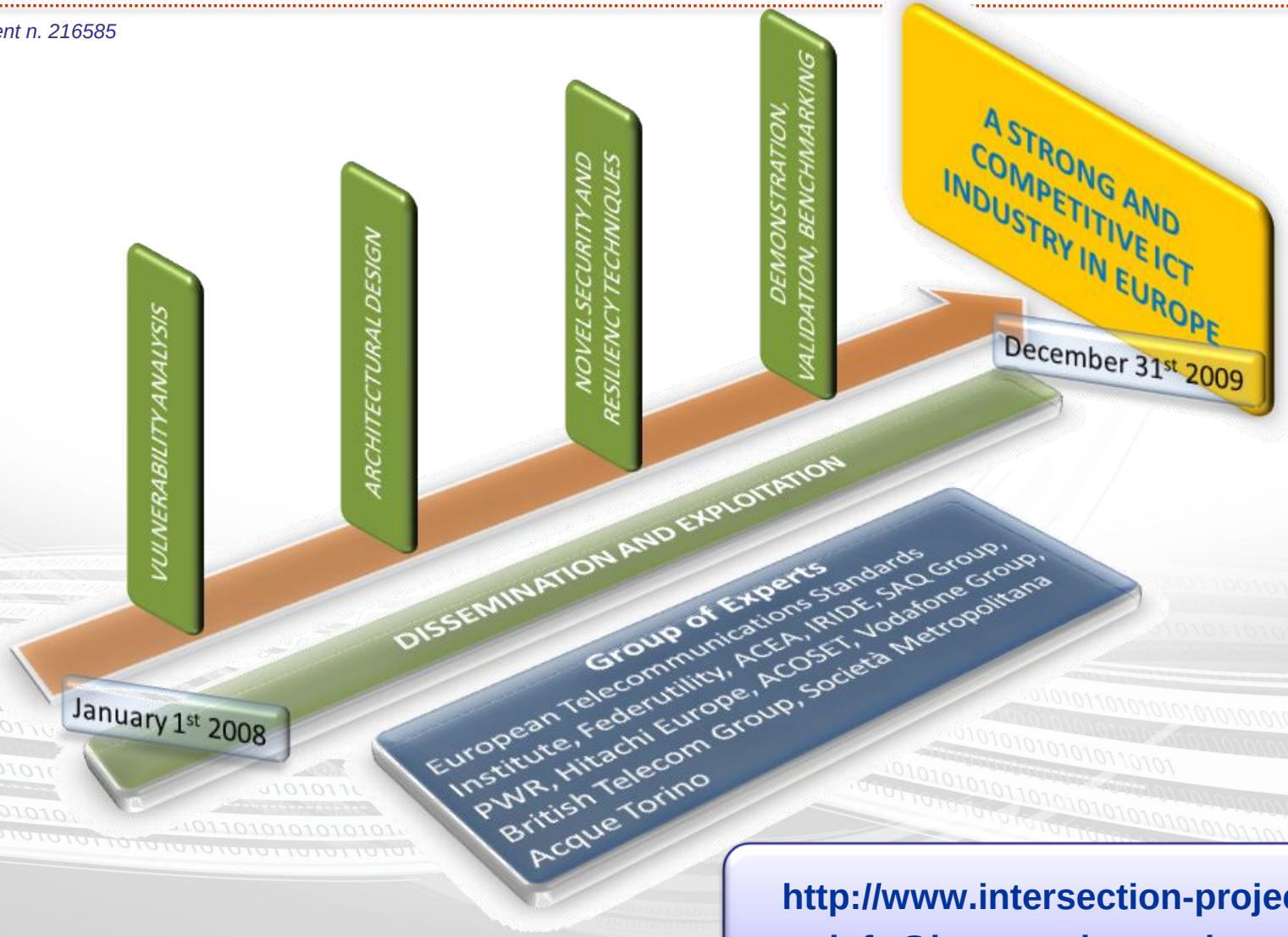

http://www.intersection-project.eu
info@intersection-project.eu

Expected Project results and innovation

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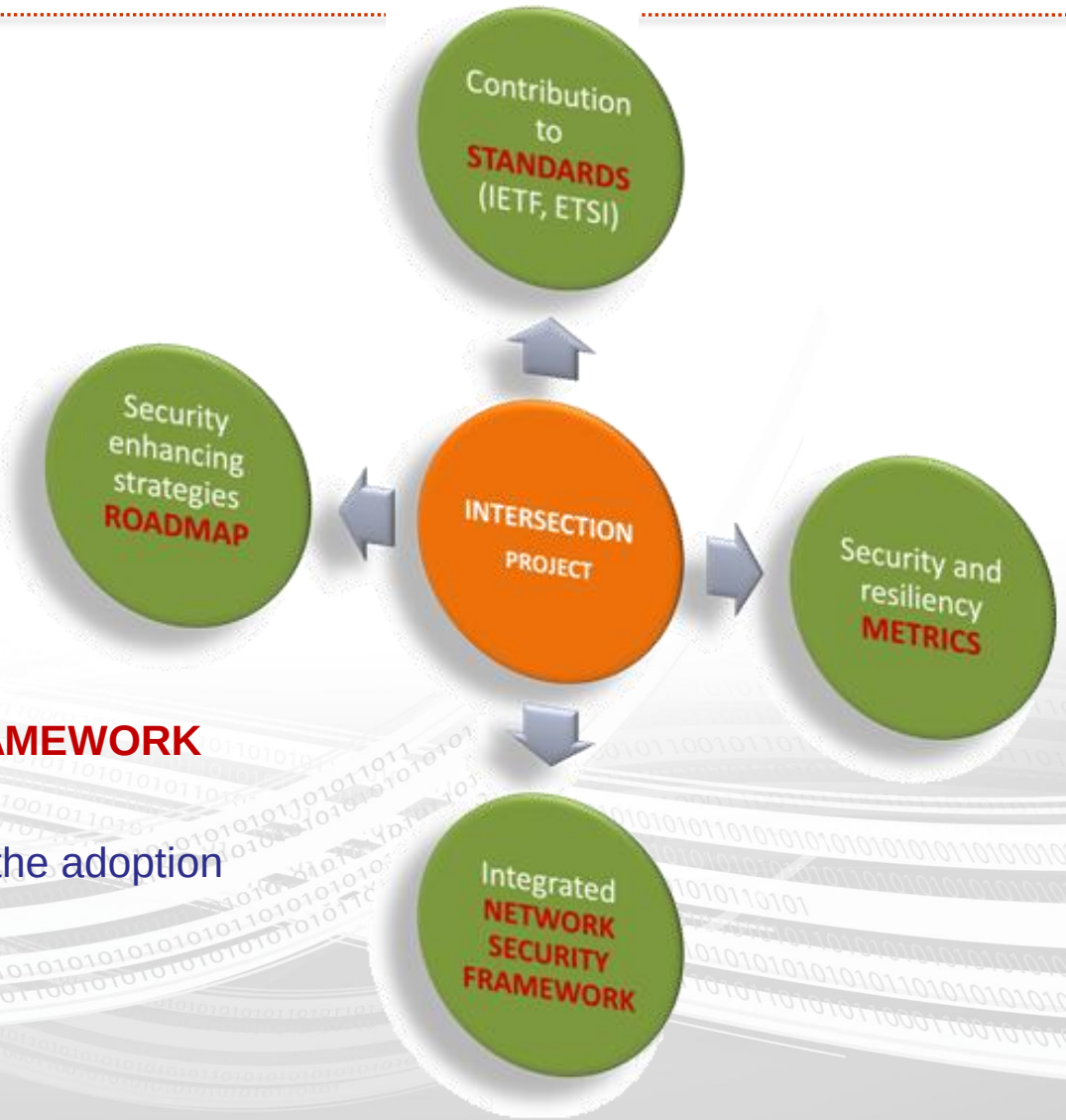
Contribution to **STANDARDS** (IETF, ETSI)

Security and resiliency **METRICS**

Integrated **NETWORK SECURITY FRAMEWORK**

ROADMAP to guide telco operators in the adoption of security-enhancing strategies



Intersection Framework Architecture
Off-Network Elements

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