RACI Workshop Panel

Resilience assessment of critical infrastructures: From accidental to malicious threats

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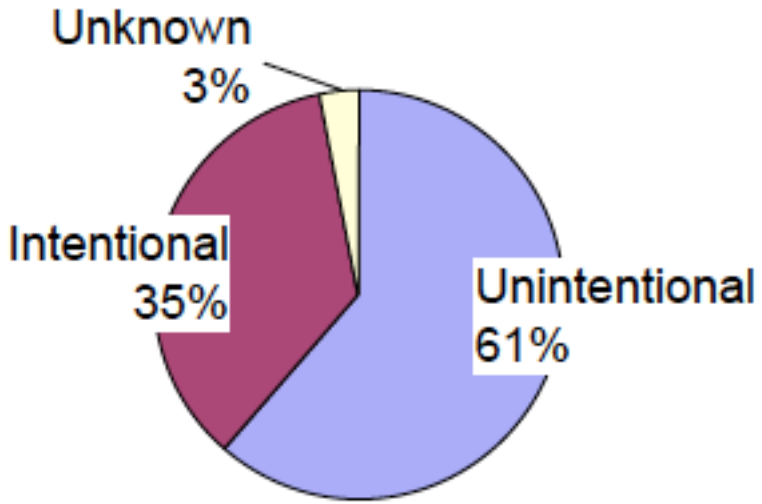
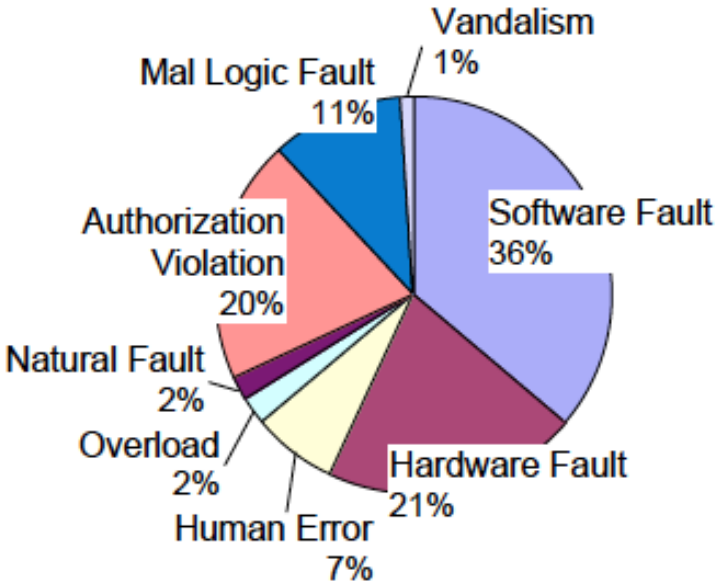
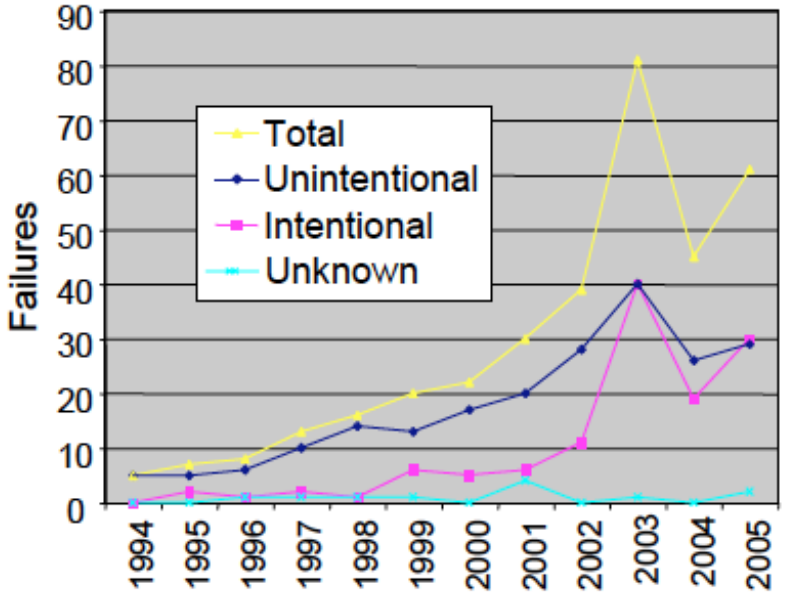
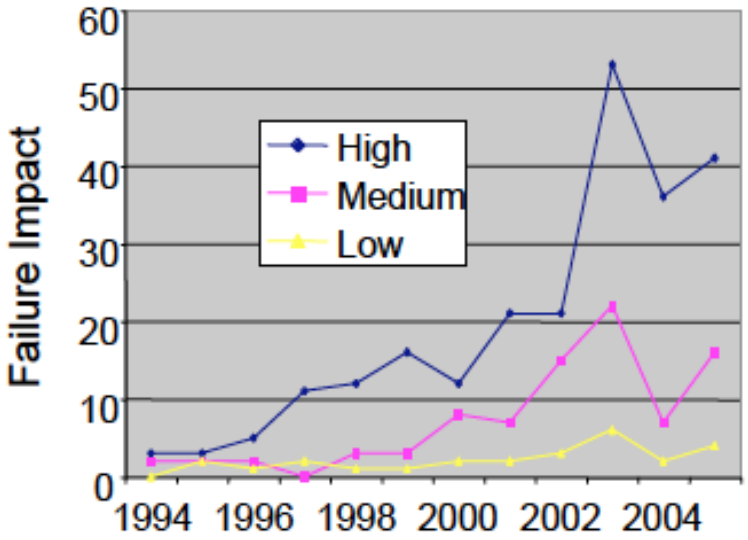
Analysis of 347 computer-related infrastructure failure cases

[Rahman, Beznosov, Marti, “Identification of sources of failures and their propagation in critical infrastructures from 12 years of public failure reports“, Int. Journal on Critical Infrastructures, vol.5, n°3, 2009]









Resilience assessment

Dependability Assessment

Quantitative, model-based and measurement, decision-making

Security assessment

Qualitative, process-oriented

Need for a unified framework and tools enabling the combined analysis of accidental and malicious threats

- Model based + experimental techniques
- Qualitative + quantitative approaches

Challenges

- Interdependencies
  - interdependencies related failure scenarios
    - ✓ Cascading, escalating, and common cause failures
- Scalability
  - Master complexity through the use of abstractions and composition of different types of models & formalisms
- Dynamic evolution of system and threats
  - Adaptive assessment frameworks

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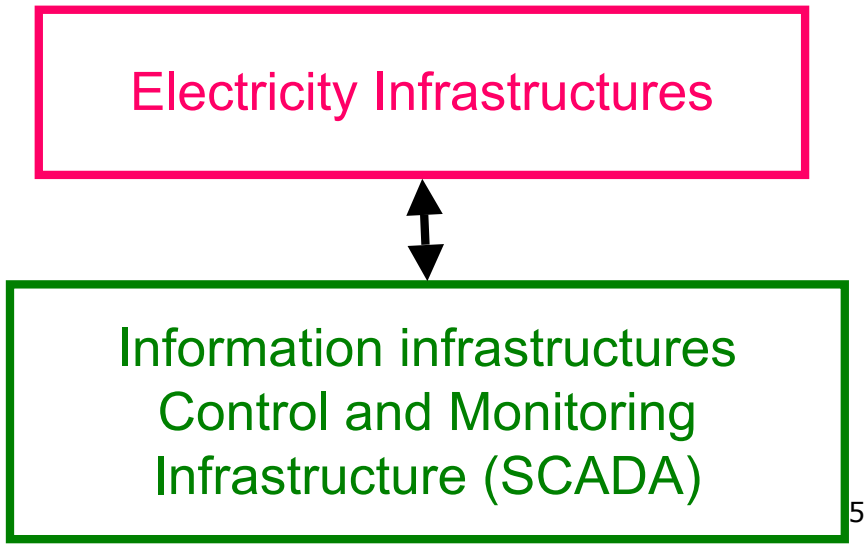
CRUTIAL

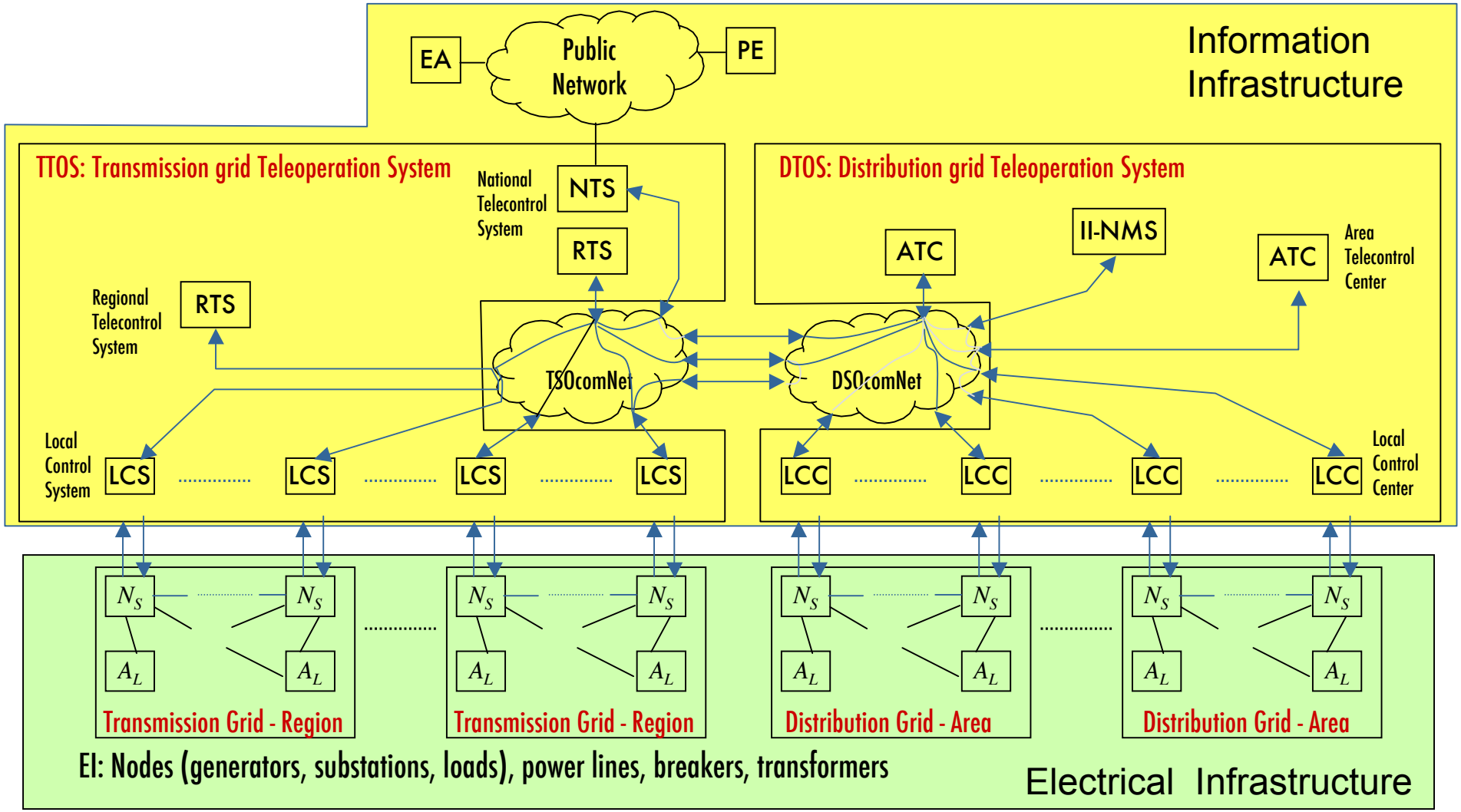
CRitical UTility InfrastructurAL resilience

Specific Targeted Research Project

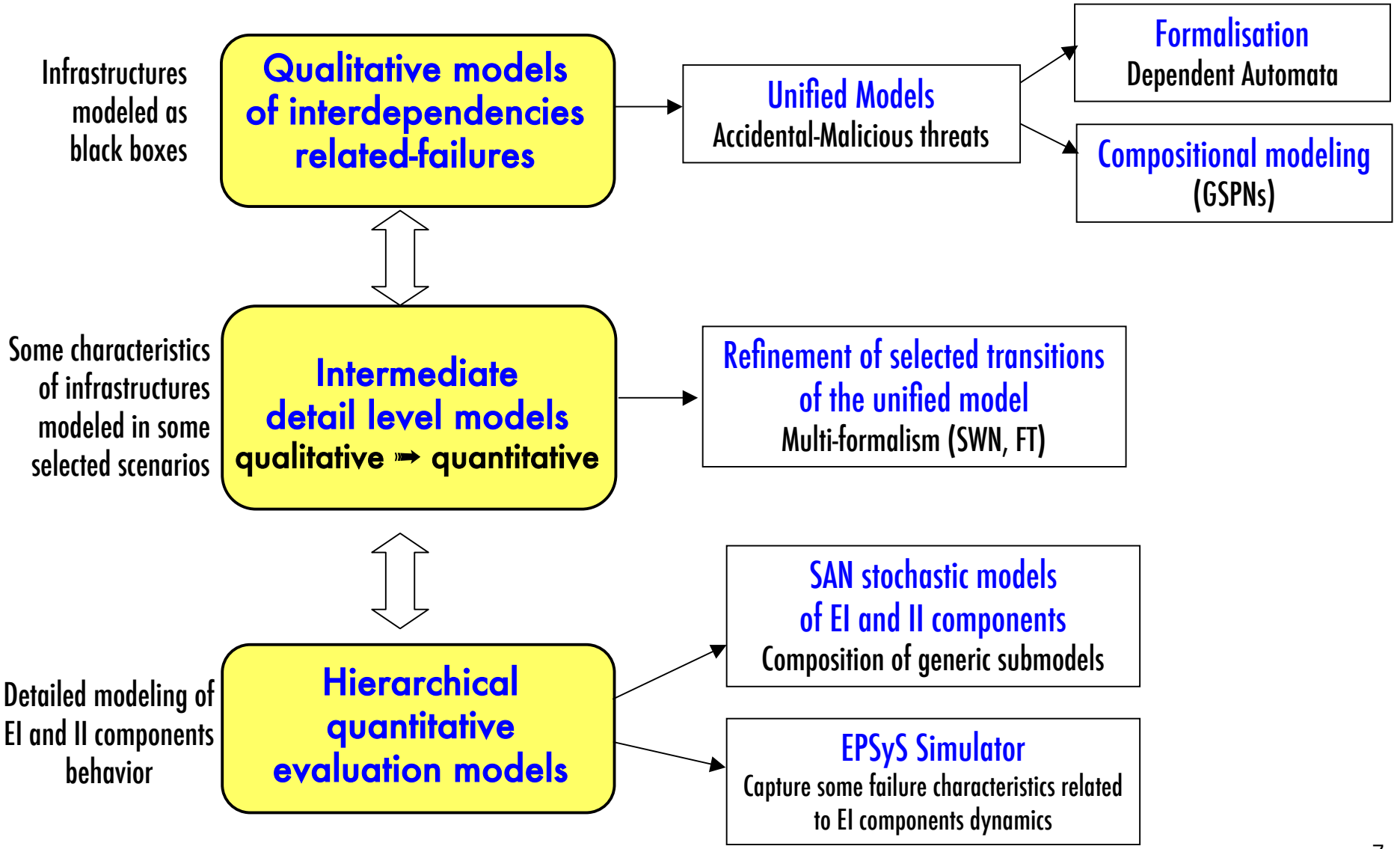
FP6-2004-IST-4-027513

Jan 2006- March 2009

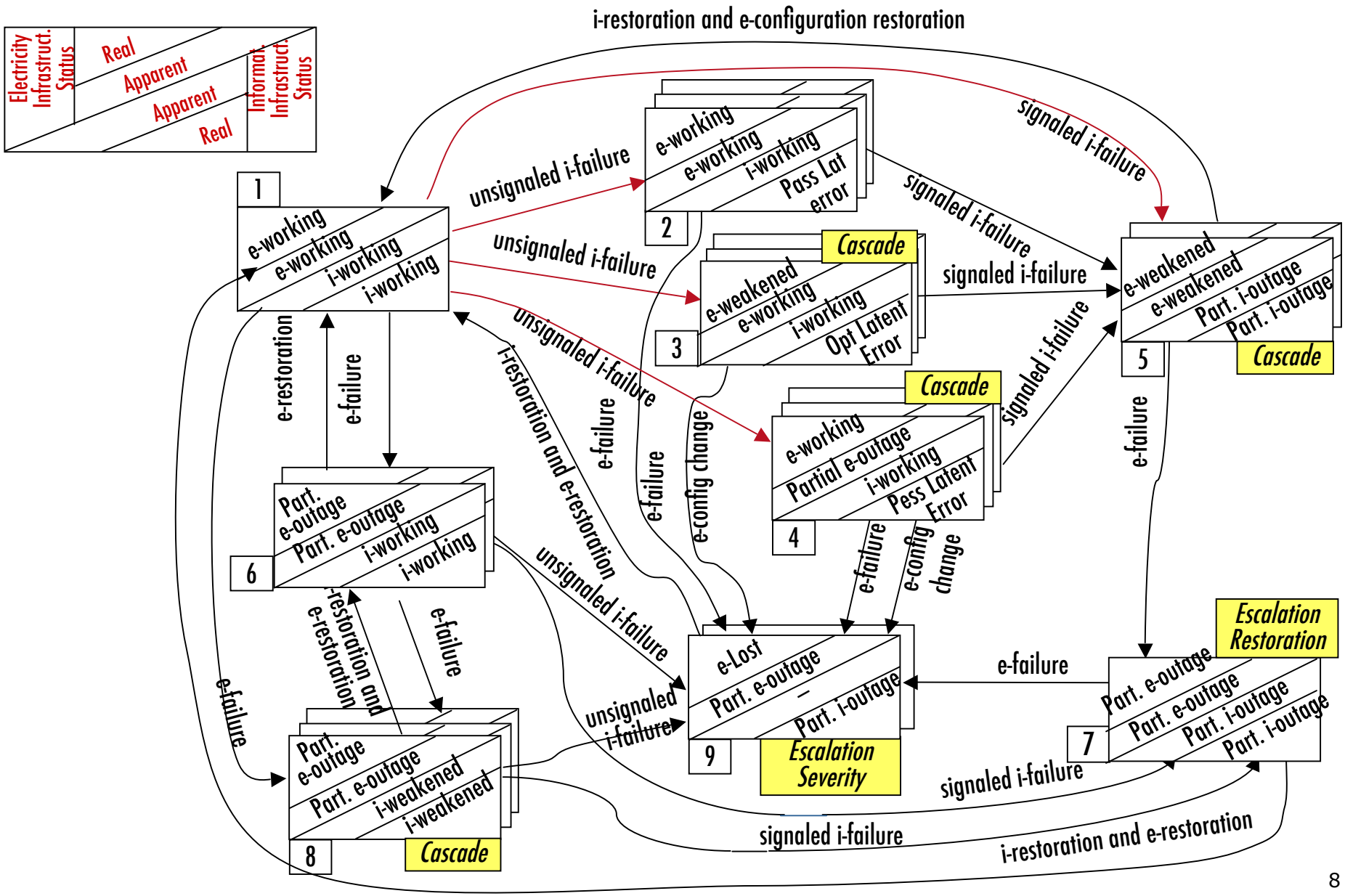



Information Infrastructure
EA
Public Network
PE
TTOS: Transmission grid Teleoperation System
National Telecontrol System
NTS
RTS
Regional Telecontrol System
RTS
TSOcomNet
DTOS: Distribution grid Teleoperation System
ATC
II-NMS
ATC
Area Telecontrol Center
DSOcomNet
Local Control System
LCS
LCS
LCS
LCS
LCC
LCC
LCC
LCC
Local Control Center
N_S
A_L
Transmission Grid - Region
Transmission Grid - Region
Distribution Grid - Area
Distribution Grid - Area
EI: Nodes (generators, substations, loads), power lines, breakers, transformers
Electrical Infrastructure

CRUTIAL: Multi-level modeling

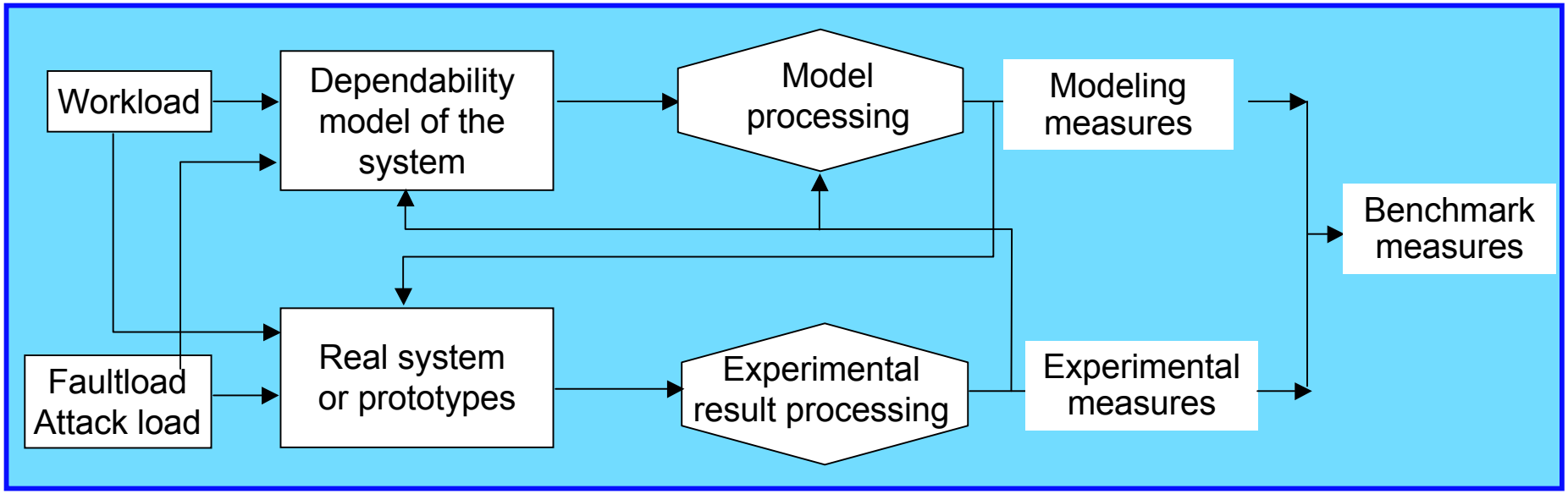


Unified Qualitative Model



Dependability and security experimental assessment

- Failure data and attack data collection
- Controlled experiments



Representativeness, Reproducibility, Repeatability, Portability, Non-intrusiveness, Scalability, Cost effectiveness

Workload and Faultload representativeness

- Workload
  - Building a realistic workload is challenging when considering critical infrastructures and dynamic and changing environments
  - Simulated data may not faithfully capture complex phenomena that characterize real traces
- Faultload and Attack load
  - Fault/errors/attacks categories + statistical likelihood
  - Automatic generation of realistic failure and attack scenarios is difficult
  - Likelihood statistics generally not available
- Need for ‘good quality’, up-to-date, «shared» data

Resilience Argumentation and justification

- From Safety cases and Security evaluation criteria to resilience cases
  - How to structure arguments, assumptions and evidence to provide justified confidence that the critical infrastrutures are able satisfy the requirements?
  - Address safety and security in a combined and coherent way
  - Standardization activities need to move in this direction

- Some initiatives
  - SQUALE project: Security, Safety and Quality evaluation for Dependable Systems (European ACTS project)
  - SEISES project: Convergence of safety and security practices in avionics industry