This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 608090.

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Protection Against Cyber-Attacks: Introducing Resilience for SCADA Networks

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Lancaster University

Symposium on Innovative Smart Grid Cybersecurity Solutions
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Outline

- *Cyber-Attacks on Critical Infrastructures*
- *Resilience Strategy*
- *Resilience for SCADA networks*
  - *Resilience Policies & Resilience Architecture*
- *Results & Questions*

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Cyber-attacks on Critical Infrastructures

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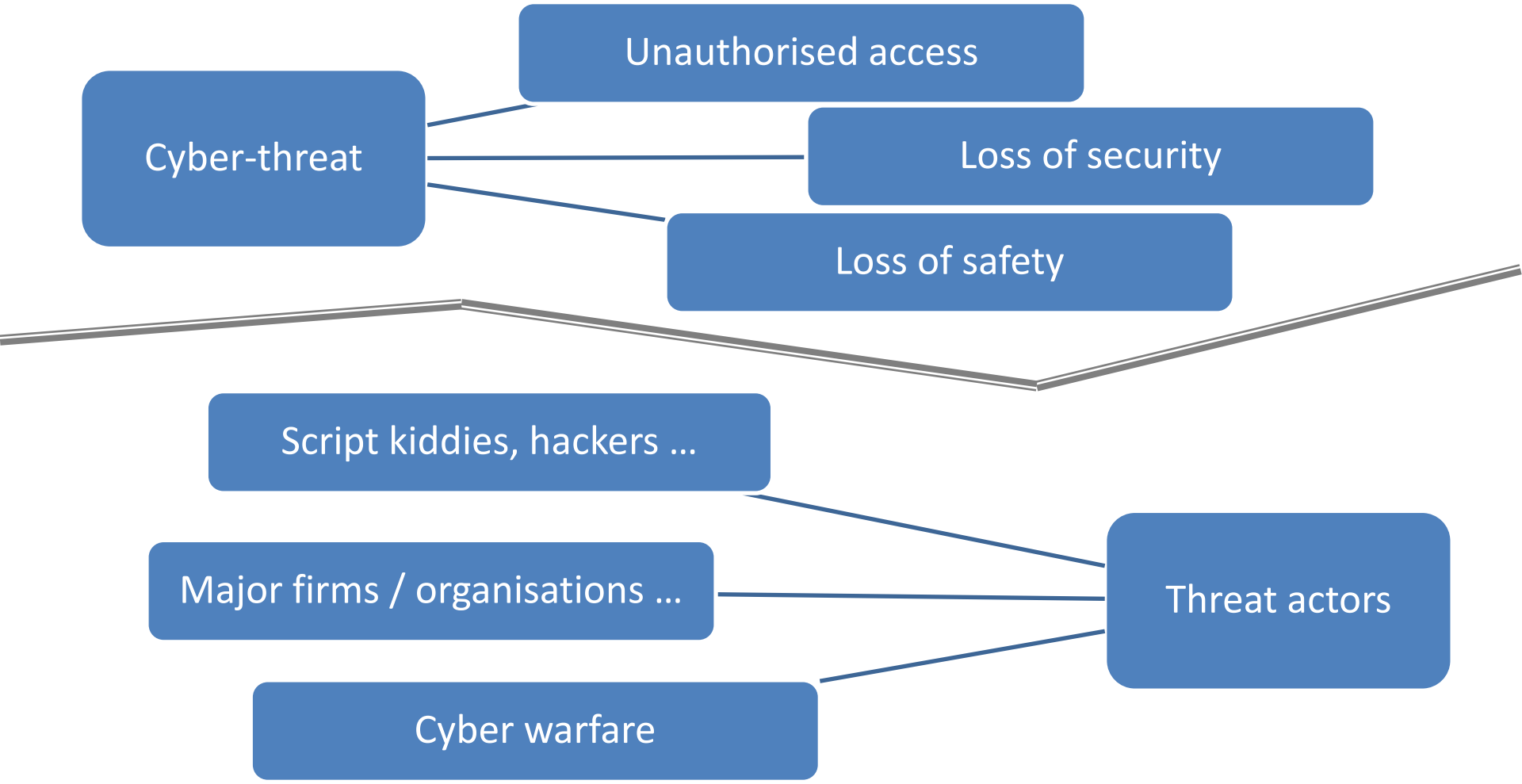
Cyber-threats & actors to CI



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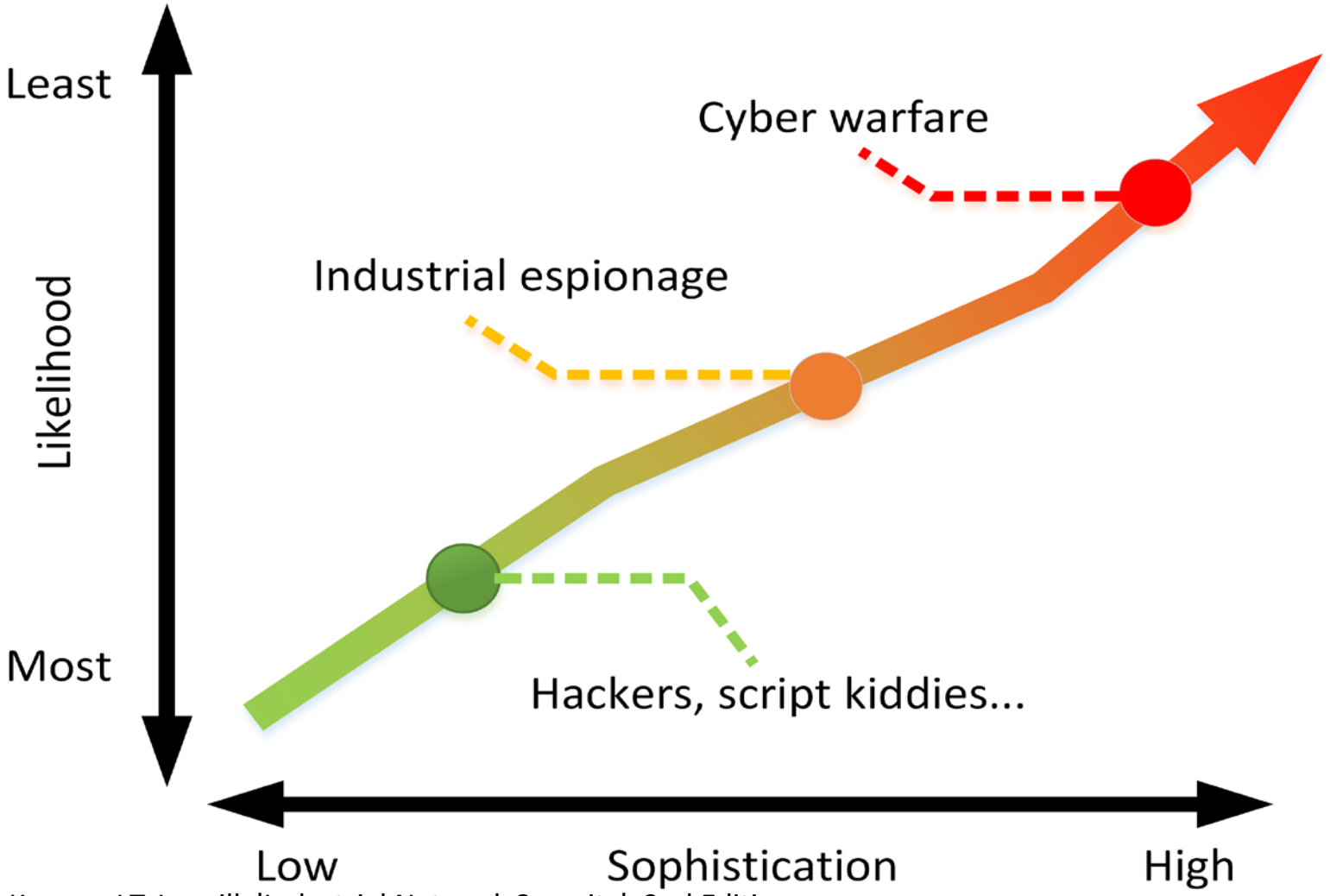
Likelihood vs. consequence*



* E. Knapp, J.T. Langill, 'Industrial Network Security', 2nd Edition

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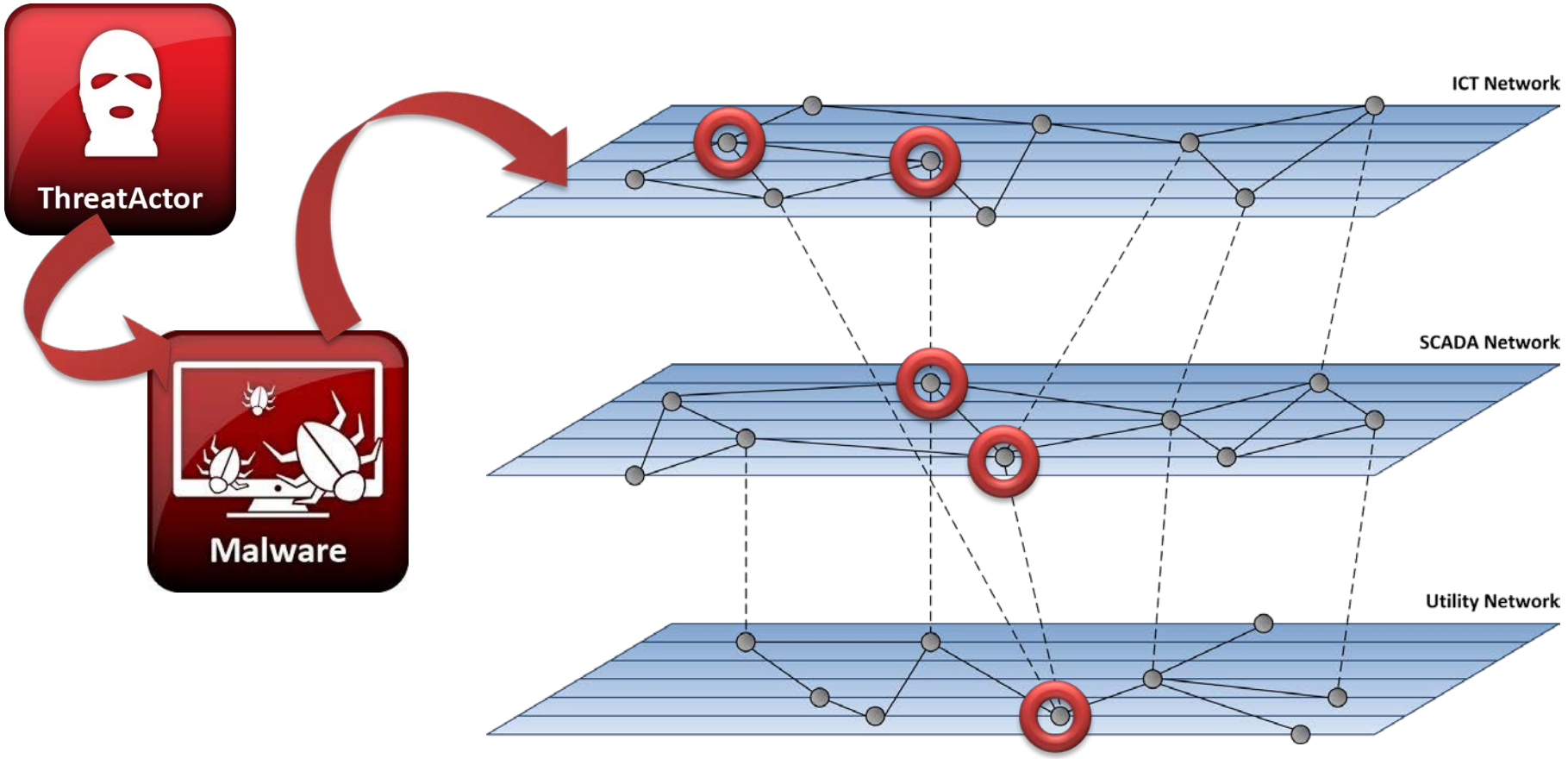
Attack vectors



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Resilience Strategy

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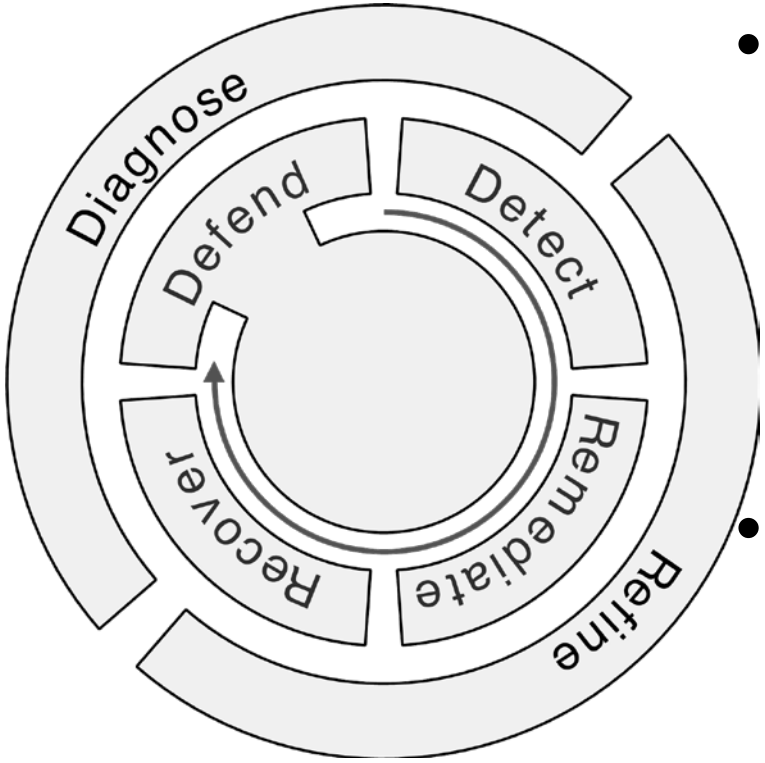
Resilience and ways of achieving it…

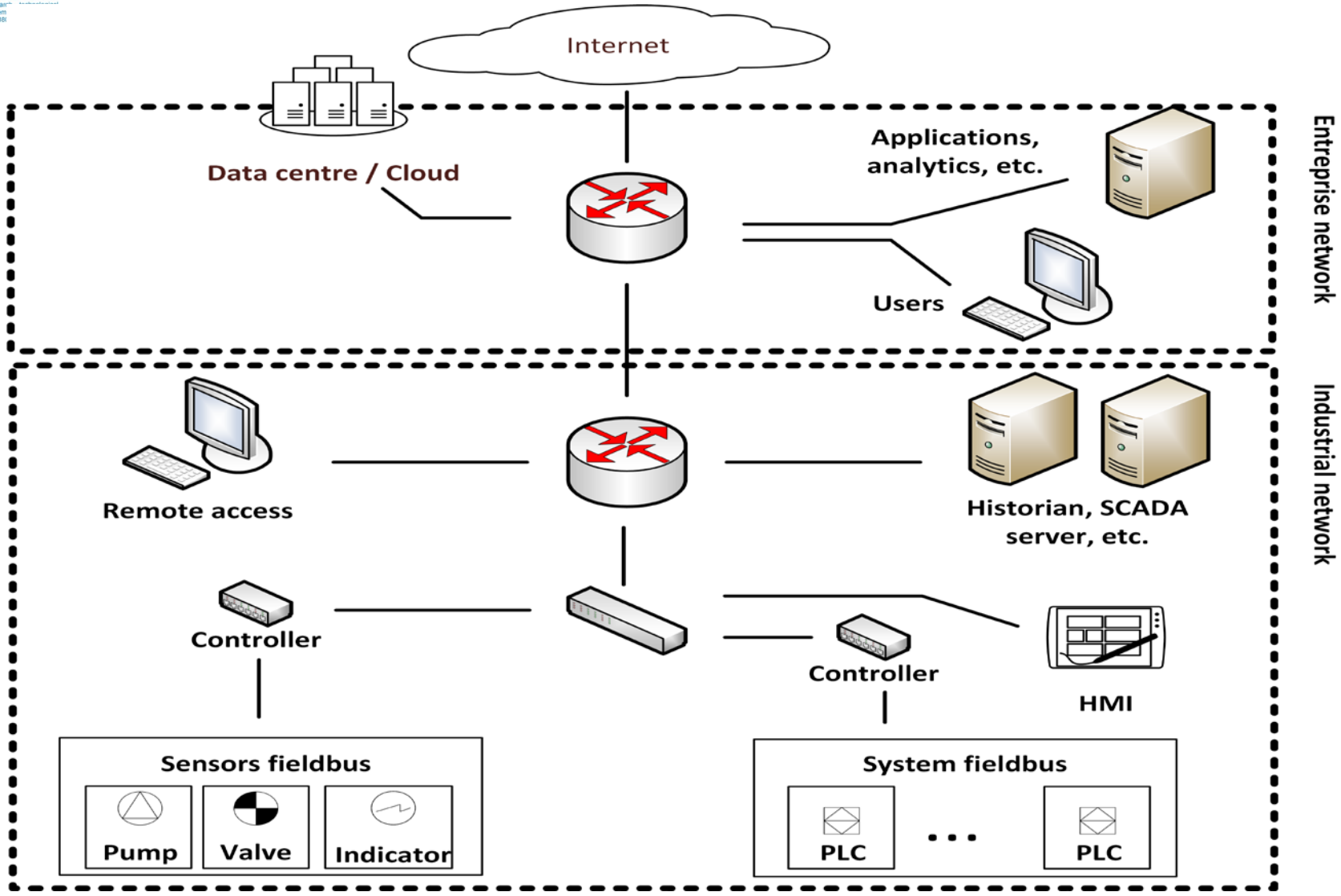


Resilience strategy

- *'… the ability of a network/system to defend against and maintain an acceptable level of service in the presence of challenges.' **
- D^2R^2+DR
  - Real-time control (internal) loop
  - Background (external) loop

* J. Sterbenz, D. Hutchison, et al. 'Resilience and survivability in communication networks: Strategies, principles, and survey of disciplines.' Computer Networks 54.8 (2010): 1245-1265.

Common network architecture



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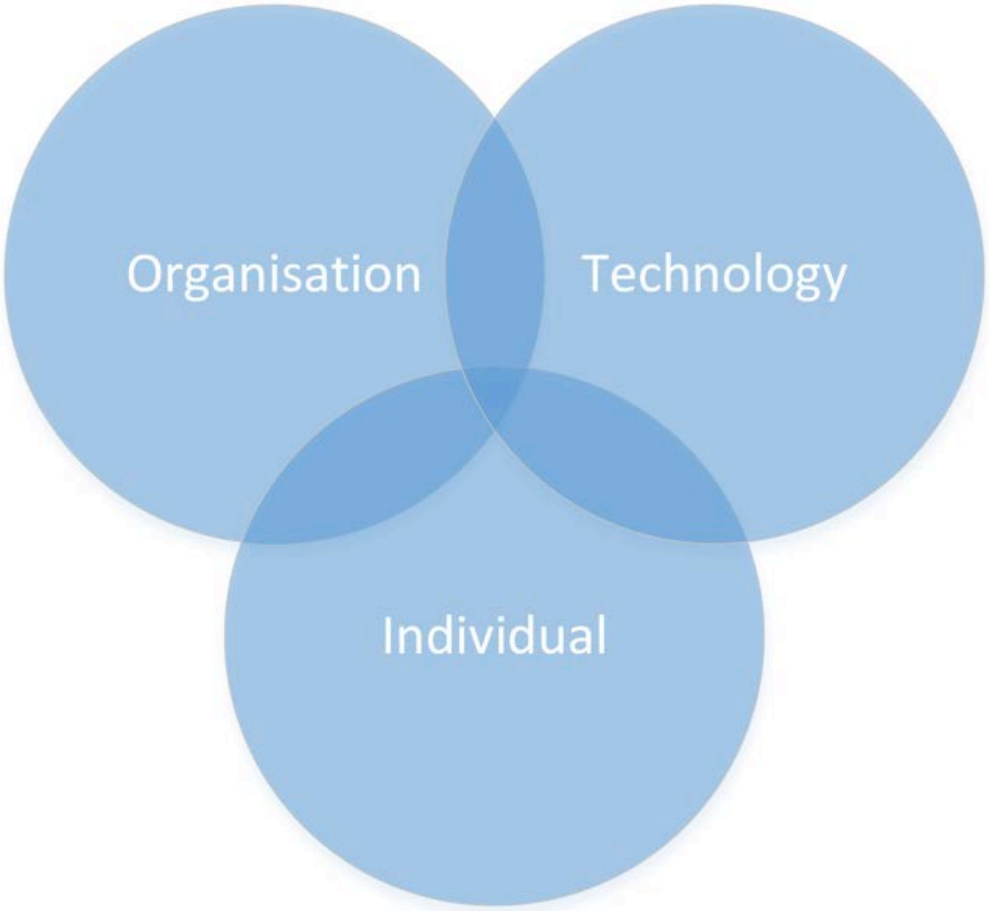
Viewpoints for critical infrastructures



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Resilience in Access Control Policies

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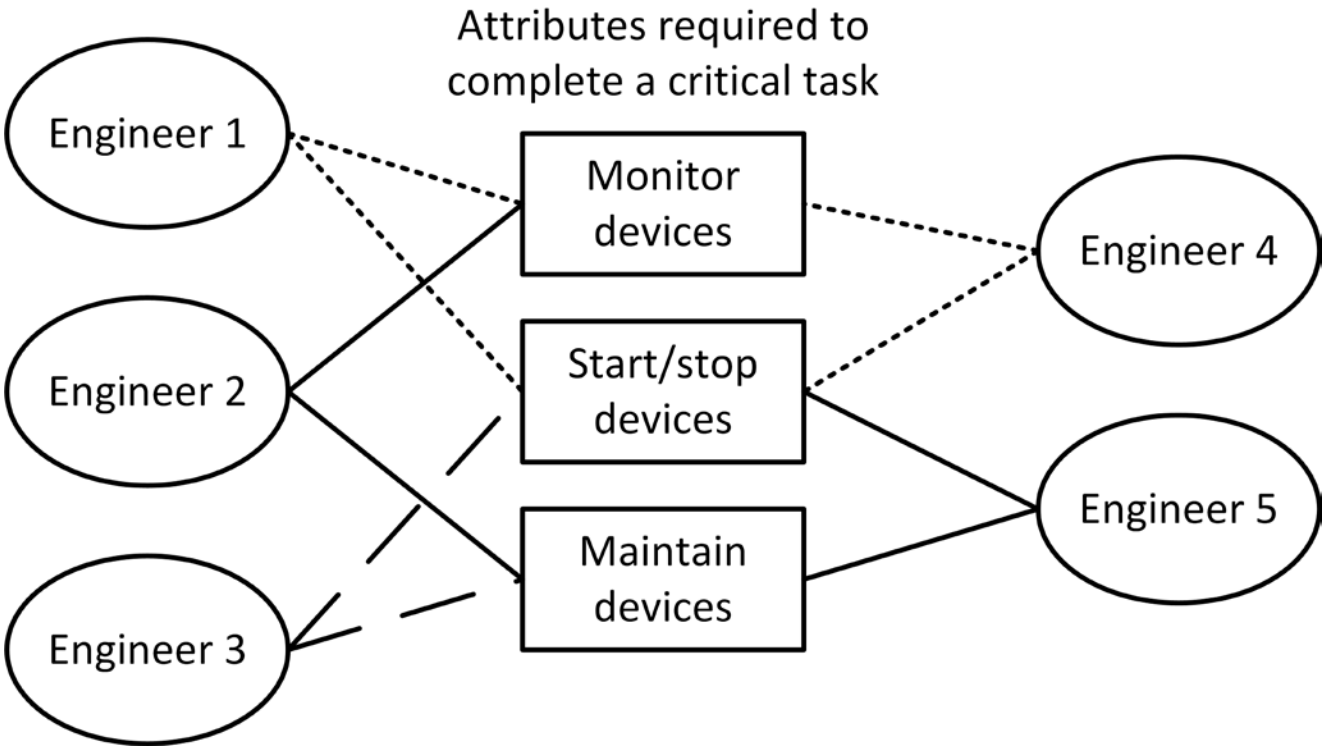
Resilience policies

Resilience in access control is the ability of a system not to restrict, but to enable access



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Resilience policies – tool chain

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Access control policy tool (ACPT)

NIST

Model in NuSMV

+

Resilience specifications

NuSMV model checker

Detected resilience violations

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Resilience Architecture for CI

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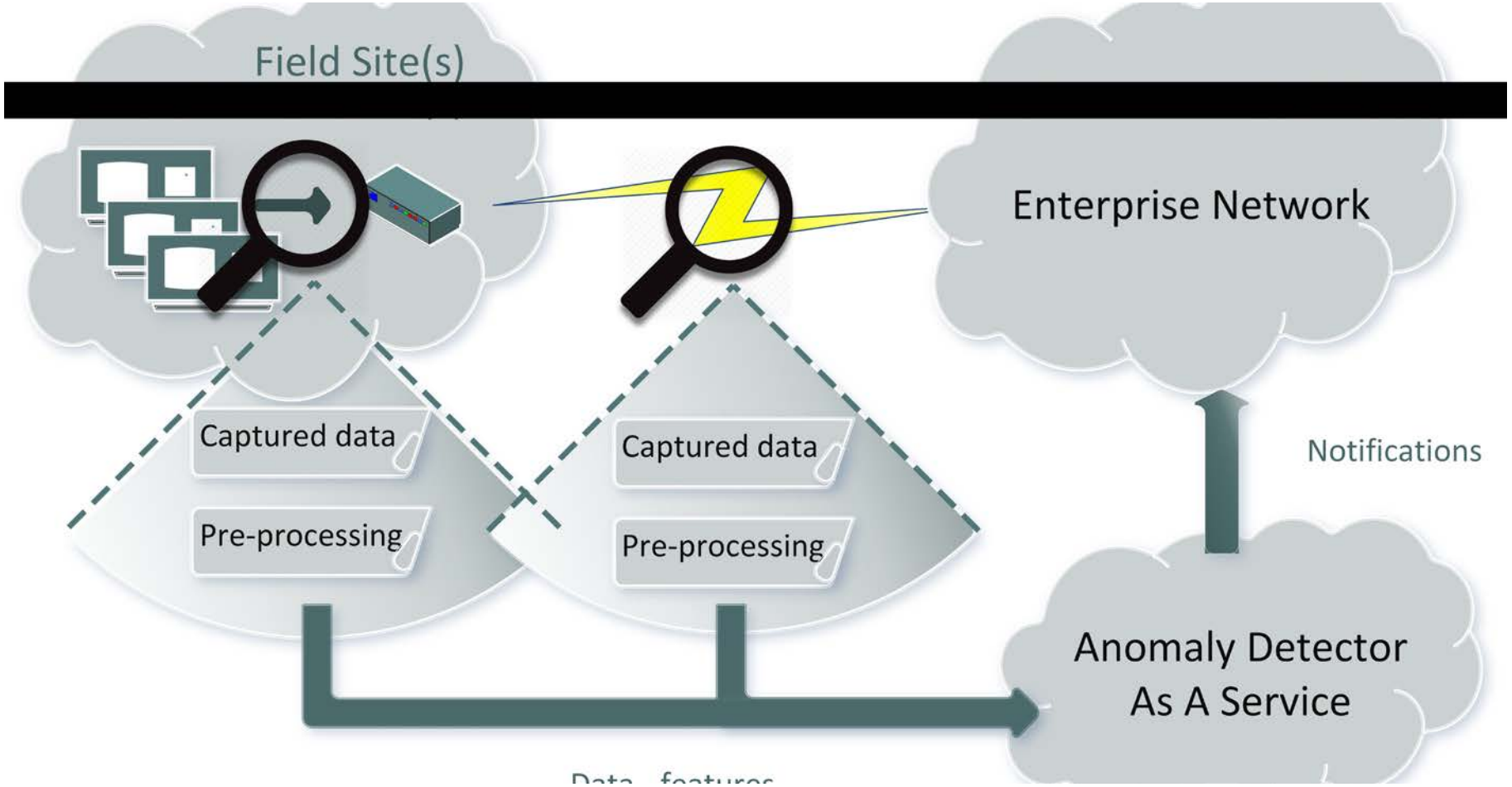
Anomaly detection framework



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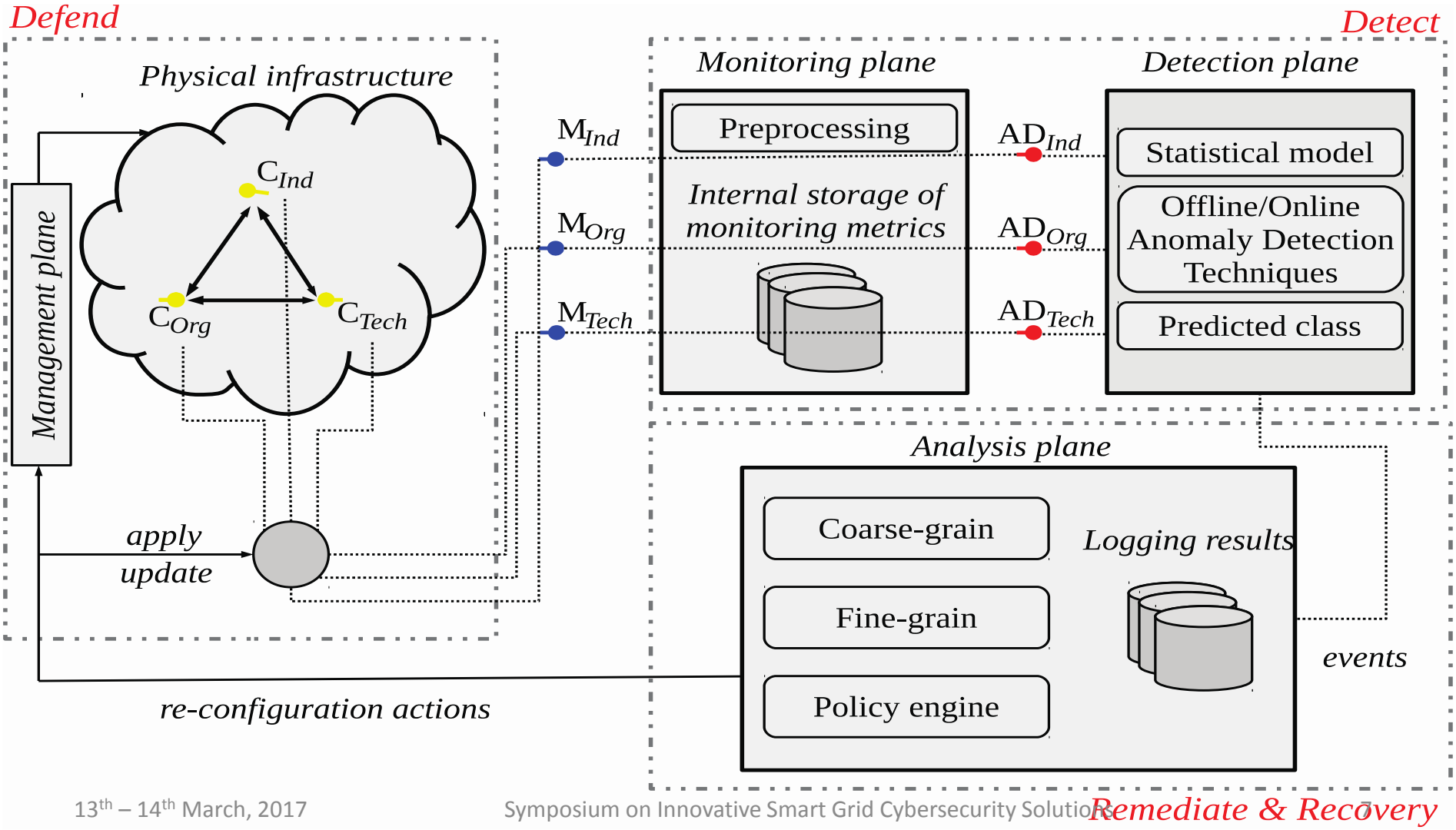
Resilience architecture



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Results and Discussion

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Evaluation of SCADA attacks

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- Dataset: '*Morris, T., Thornton, Z., Turnipseed, I., Industrial Control System Simulation and Data Logging for Intrusion Detection System Research. 7th Annual Southeastern Cyber Security Summit. Huntsvile, AL. June 3 - 4, 2015.*'
- Gas pipeline log, captured in a laboratory environment, including:
  - Normal operation
  - Cyber-attacks
    - Reconnaissance
    - Denial-of-Service
    - Command injection

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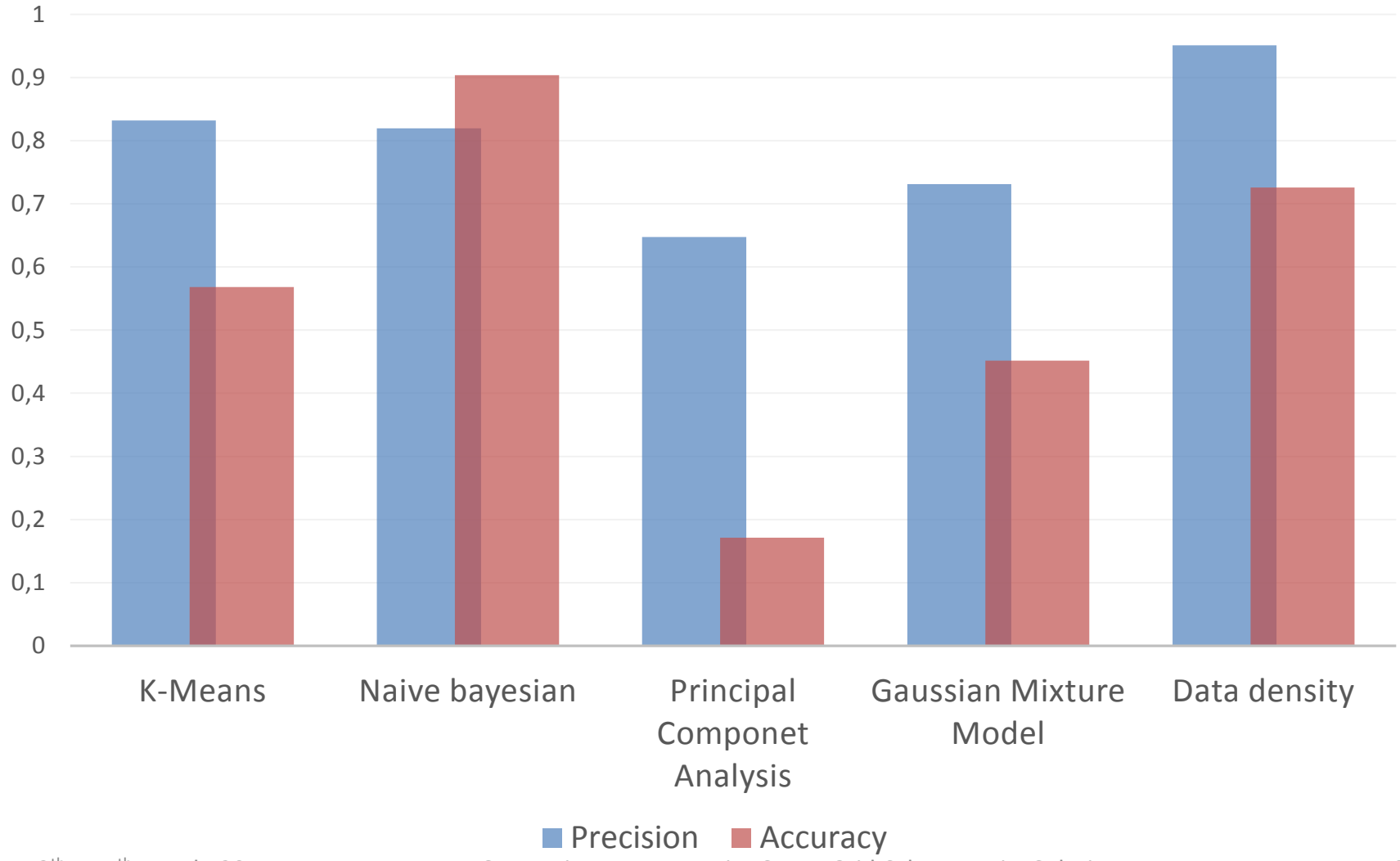
Comparison of techniques



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Questions?

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