The Role of Cybersecurity in Modern Societies

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The Need of Security and Resilience

- Physical security
- Cybersecurity
- Fault tolerance and Replication

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Physical security

- Critical Infrastructure Protection
  - Deterrence methods
  - Physical barriers
  - Natural surveillance
  - Security lighting
- Intrusion detection and electronic surveillance
  - Alarm systems and sensors
  - Video surveillance
- Access control
  - Mechanical access control systems
  - Electronic access control systems
  - Identification systems and access policies

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The word “cyber”

- The word Cyber comes from the English word cybernetics, derived from Greek κυβερνήτης (kybernetes) that means ‘helmsman, pilot of a ship’ and, with extended meaning, ‘the person who guides and governs a City or a State’.
- James Watt, at the end of the 18-th century, used the word cybernetic for the first time within a technical framework to describe a tool to control the speed of a steam engine.
- Cybernetic was formalized in the 20-th century thanks to scientists such as Norbert Wiener, McCulloch, Alan Turing e W. Grey Walter.
- Now the word describes an infinity of study and application fields that has not much to do with the original meaning but generically refers to the implications in modern life of virtual worlds.

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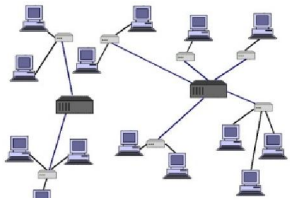
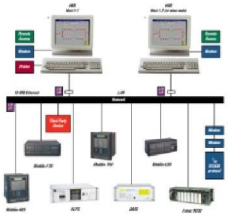
Cybersecurity



- Computer security
- Network security
- Web security
- Cloud Security
- Mobile Security
- Social Engineering and Intelligence for Cyber Security
- SCADA System Security
- Critical Infrastructure Protection

Supervisory Control And Data Acquisition



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Critical Infrastructures

- Complex systems that provide many basic services are commonly referred to as Critical Infrastructures.

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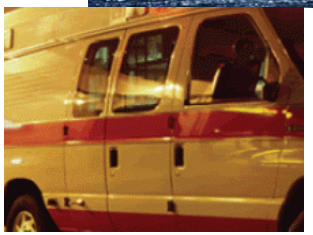
Sectors linked to critical infrastructures

- Chemical
- Commercial Facilities
- Communications
- Critical Manufacturing
- Dams
- Defense Industrial Base
- Emergency Services
- Energy



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Sectors linked to critical infrastructures

- Financial Services
- Food and Agriculture
- Government Facilities
- Healthcare and Public Health
- Information Technology
- Nuclear Reactors, Materials, and Waste
- Transportation Systems
- Water and Wastewater Systems

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Smart City / Industry

- A dominant feature of modern achievements consists in the **pervasiveness of electronic / information technologies** and in their interconnection in networks on a domestic, zonal, and extended geographic scale.
- In order to implement a Smart City / Industry it is necessary to connect all the devices that are part of this reality. This brings with it many benefits summarized in **the Internet of Things (IoT) paradigm**, where devices, sensors, in a word "the objects", are connected in the network, but also considerable risks as the network connection (and the Internet in particular) exposes these environments to possible "cyber" attacks.
- For this reason a policy of prevention and risk management linked to cyber security that must be an integral part of the Smart City / Industry is strictly necessary

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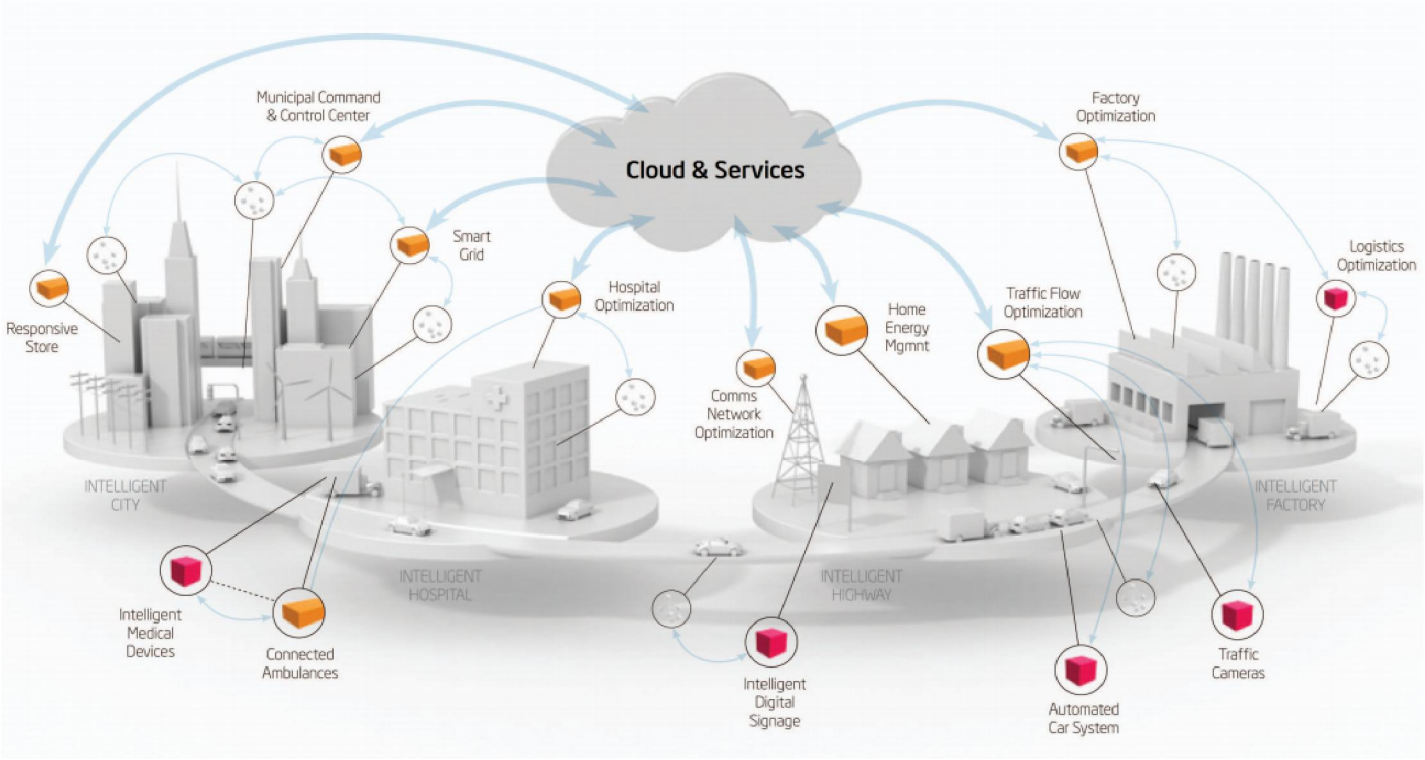
Smart City



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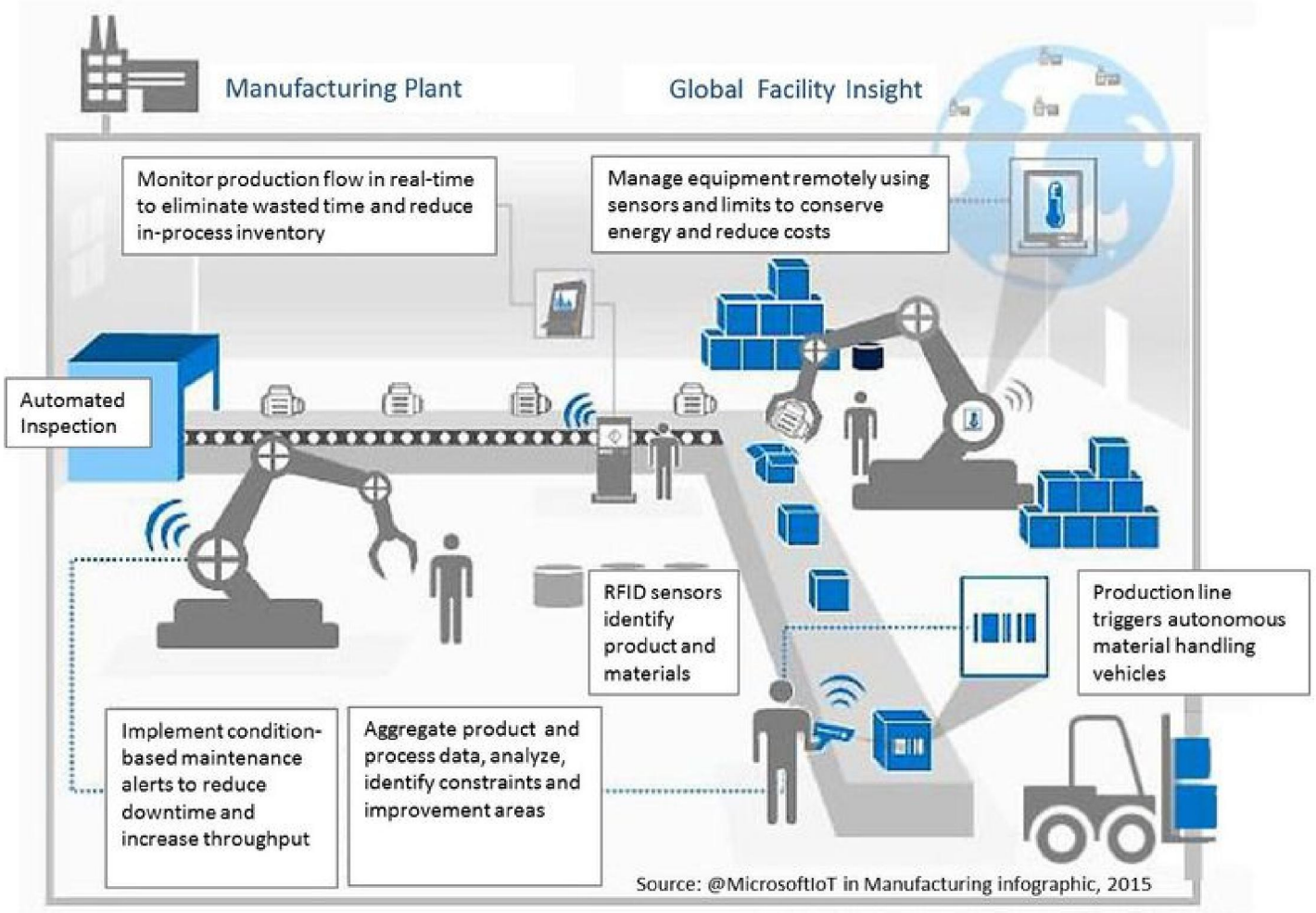
Smart Industry



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The Role of Cybersecurity

- Advanced functions and Smart Networked services -> considerable exposure security problems.
- Secure communication systems between the devices that carry the information and adequate protection up to the final user (home – mobile devices now at the center of our daily life).
- Huge amount of interconnected devices, from the simplest to the most complex, with different structures and features, each of them producing a considerable amount of data over time.

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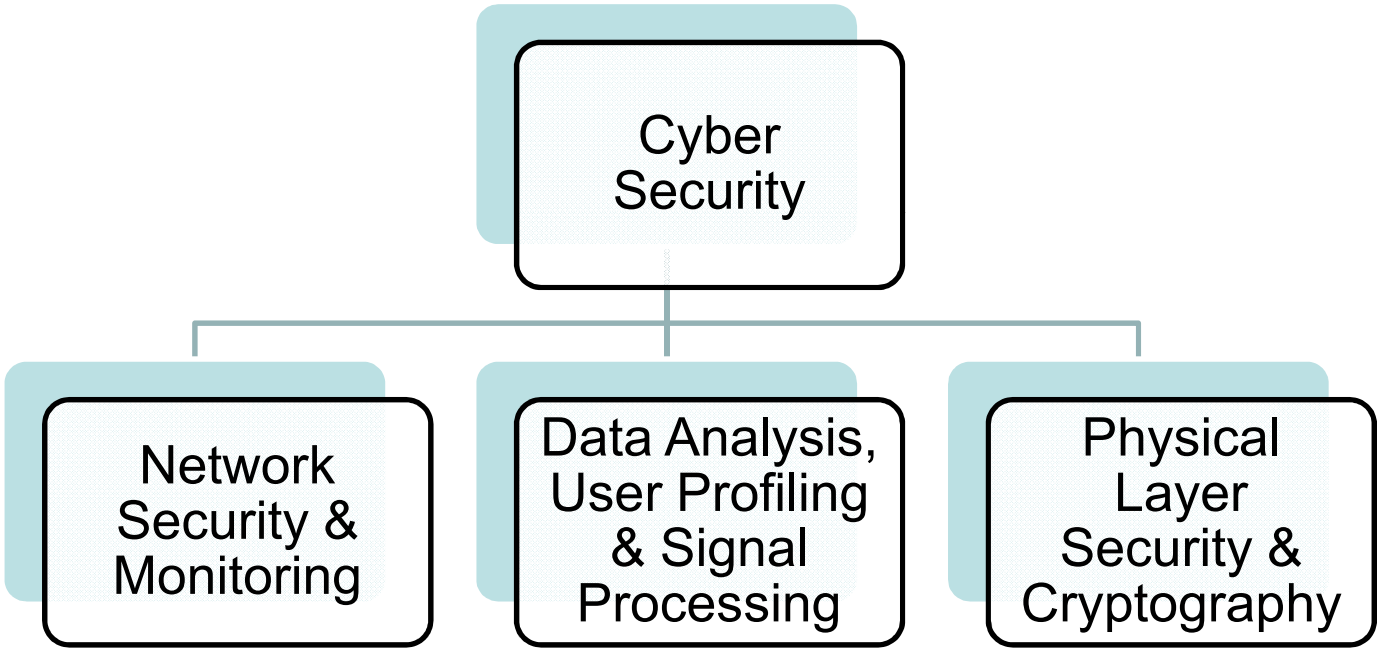
Intervention Areas

Investigation about Italian TLC research group



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Bits of Open Technological Problems Reference Points

- "Analysis of future 5G application scenarios and of related security levels of communication protocols" – OpenFiber
- Energy Building, Savona Campus, University of Genoa

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Bits of Open Technological Problems

- It is key to design IDS systems (Intrusion Detection Systems) with the purpose of analyzing and detecting safety issues, quickly and efficiently, allowing the identification of malevolent behaviors at the level of the network equipment before they can reach the devices terminals.
- Given the number of traffic flows involved, it is important to evaluate the possibility of designing a system based only on the statistical survey of traffic, avoiding, as far as possible, a detailed analysis of the content of the information flow (deep packet inspection).
- Interaction with Software Defined Networking (SDN)

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Bits of Open Technological Problems

- Pervasiveness of the electronic / computer technologies synthesized in the Internet of Things (IoT) paradigm -> it is of fundamental importance to equip devices with adequate communication and protection systems.
- Since these are often very low-cost sensors, it is rare to find appropriate security implementations. These devices are often exposed to attacks, interception of information and/or forwarding on third-party malicious systems.
- It is important to make an analysis of the protocols at lower layers (**physical and data link**).

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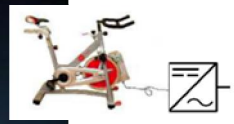
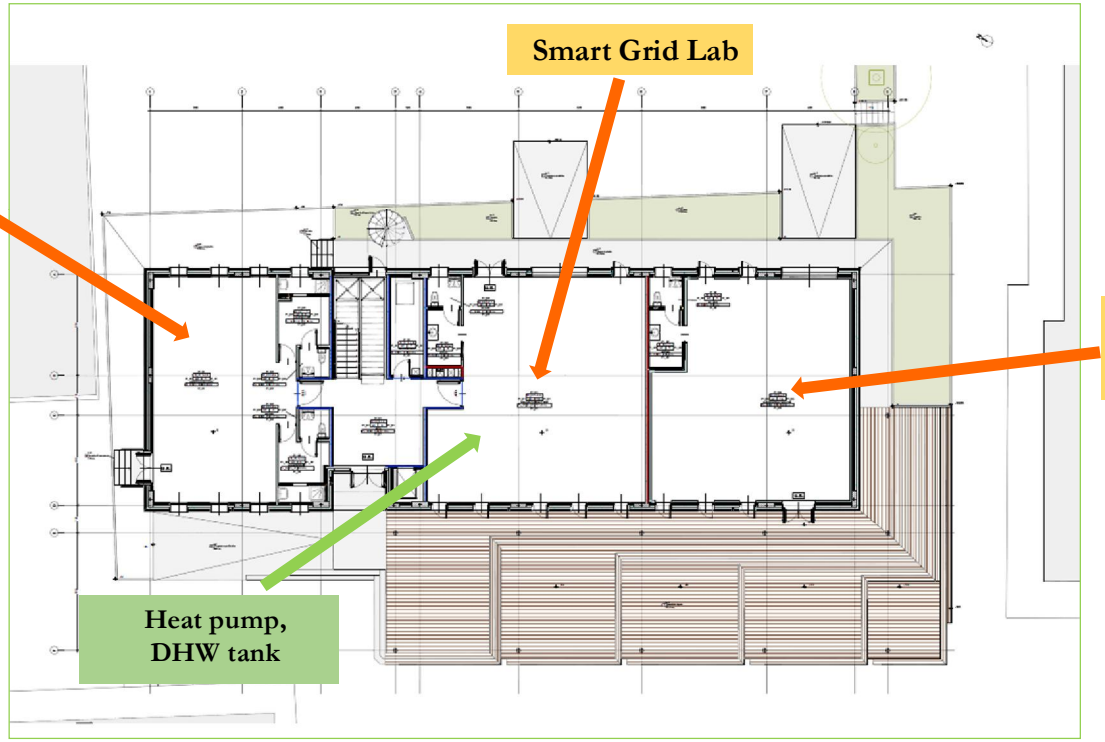
Operative Example: Energy Building, Savona Campus





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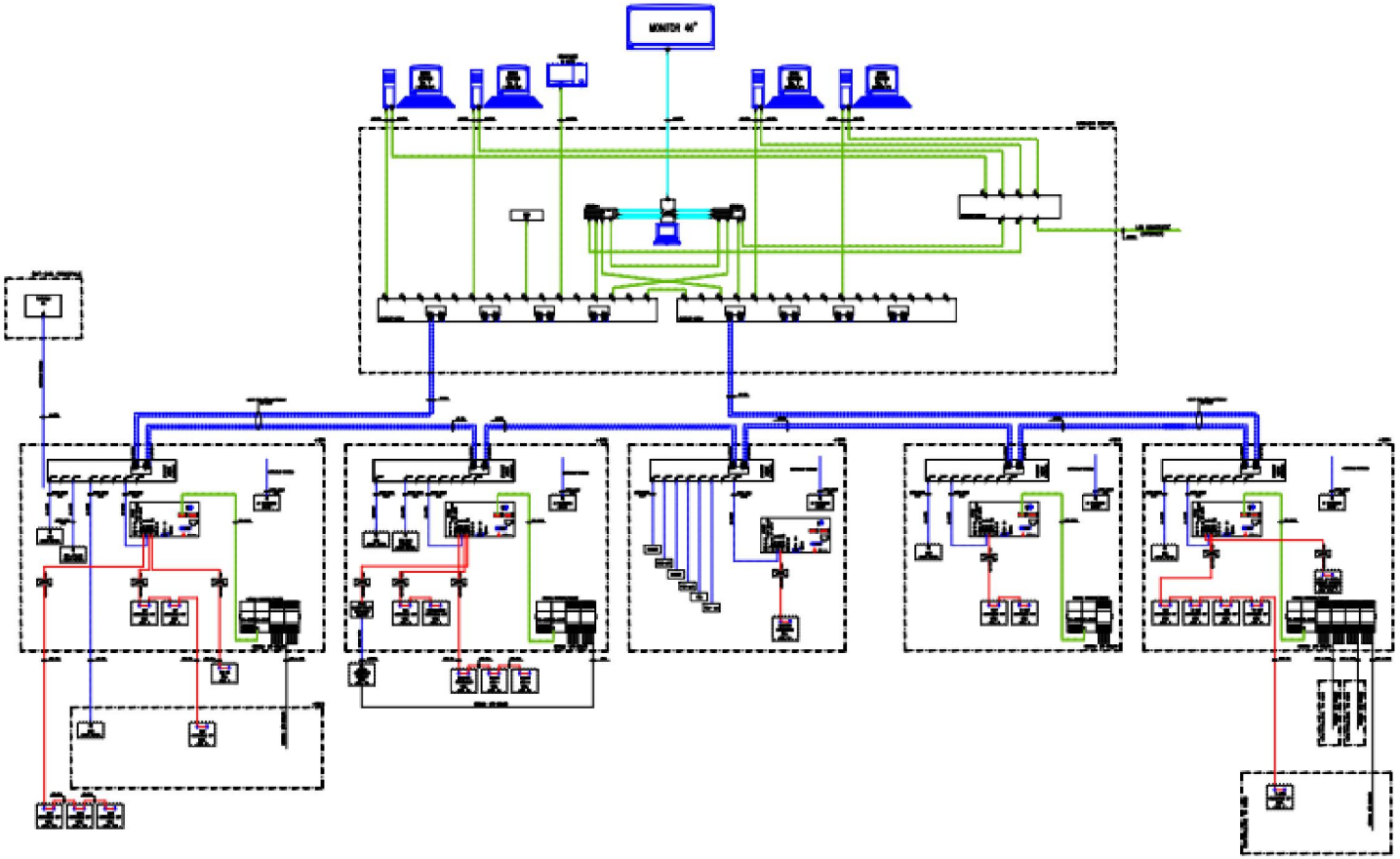
Operative Example: Control Network, Savona Campus



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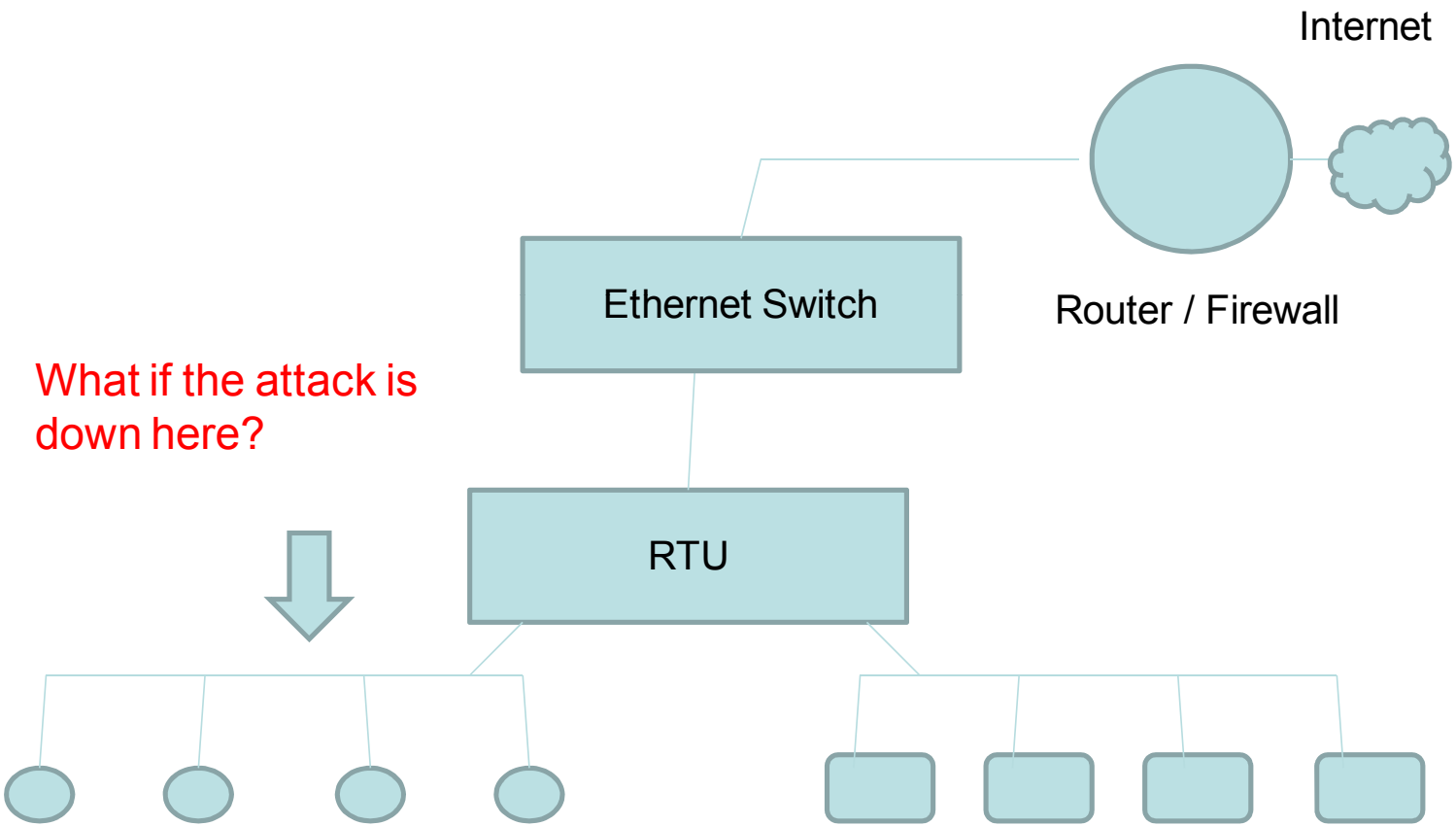
Operative Example: Control Network, Savona Campus



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Conclusions

- Need of security
- Introduction to Cybersecurity
- Critical Infrastructures - Smart City / Smart Industry
- The Role of Cybersecurity
- Intervention Areas
- Network Security and Monitoring
- Open Technological Problems

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