Cyber-risks as a threat to critical infrastructures and the functioning of Switzerland

National Cyberstrategy and countermeasures by FONES

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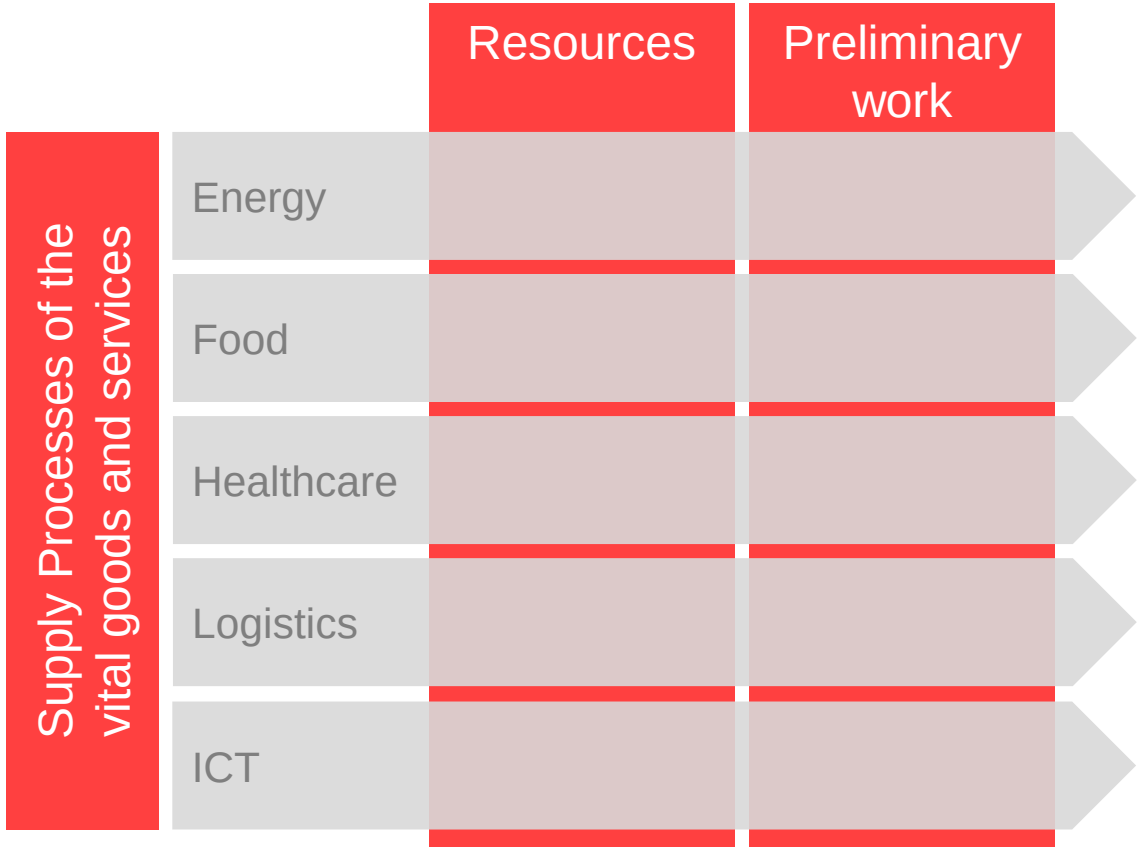
Mandate

- Federal Constitution of the Swiss Confederation Art. 102
- National Economic Supply Act
- Mandate to increase the resilience of supply infrastructure

CIP vs. Supply-Chain-Perspective



- ICT is a critical service by itself
  - Telecommunication infrastructure
- ICT is also a critical resource for other sectors
- Necessity to secure both: the critical telecommunication infrastructure, as well as the critical ict-resources for other sectors
- Interdependency is rising with automation.
- A more Supply-Chain-oriented perspective is necessary. Nevertheless: Risk appetite needs to be defined. i.E: Electricity in Switzerland: Maximum acceptable loss: 50 GWatt

Shared and distributed responsability in the area of cyber

Cyberdefence

DDPS

Cybercrime

FDJP

Cybersecurity

FDFA / FDF / EAER

Duties:

- Cyberdefence (Departement of Defence, Civil Protection and Sport)
- Cybercrime (Departement of Justice and Police)
- Cybersecurity / Critical infrastructure protection (Multiple departements)
- Organisational separation, but close cooperation

Real-life example:
Attack on the water-supply of a Swiss municipality

Abo

«Hacker haben unsere Wasserversorgung angegriffen»

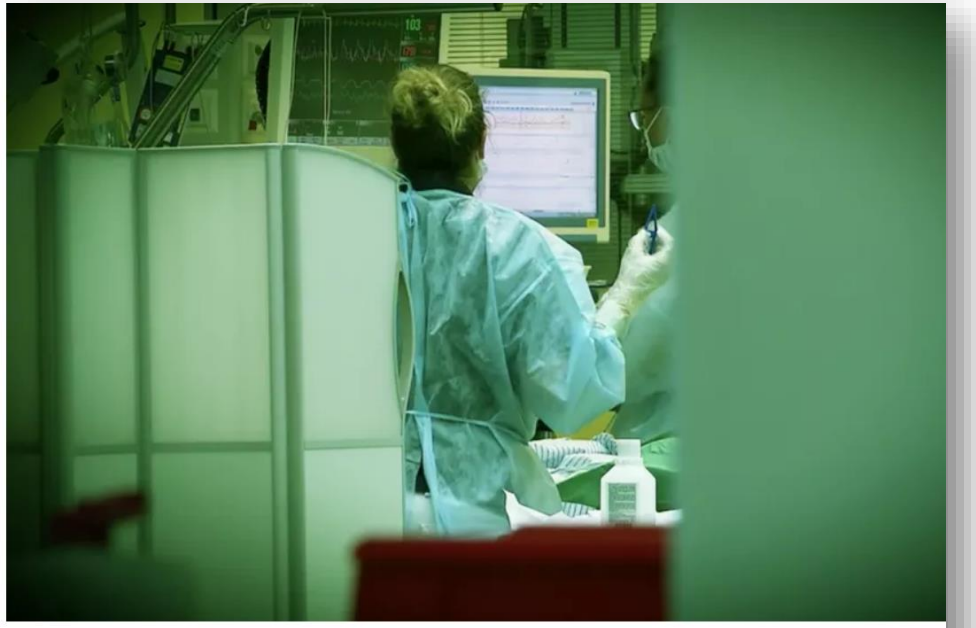
Ebikon meldete jüngst eine IT-Attacke. Wie gefährdet ist unsere Infrastruktur wirklich? Diese Lecks und Schwachstellen könnten zur Bedrohung werden.

Beat Metzler, Christian Zürcher
Aktualisiert: 12.03.2019, 23:43

Unpraktisch, aber sicher vor Hackern: Walter Zürcher erklärt die analoge Wasserversorgung von Schwarzenegg. Foto: Christian Pfander

- In 2018, an attack against a Swiss water utility (municipality of Ebikon) became known.
- The attack was not successful, but showed that even smaller operators of critical infrastructures can nowadays become the target of cyber attacks.
- Since the attack was directed against the control systems, there was also a supply risk for the population.
- Such attacks are particularly critical for interconnected companies that are responsible for several supply processes (e.g., electricity, water, natural gas).

Real-life example:
Cyberattack on a Swiss hospital (one of many attacks)



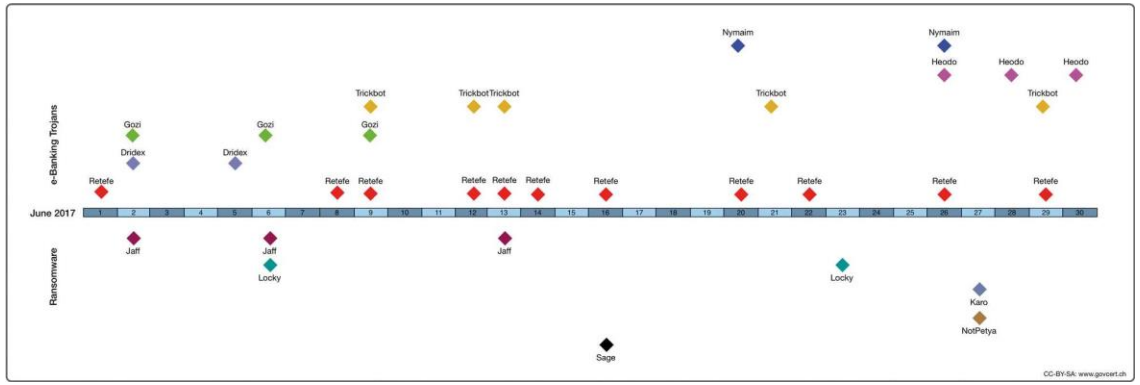
Krankenhäuser geraten zunehmend ins Visier von Cyberkriminellen.

«Gefährlichste Malware der Welt» attackiert Zürcher Spital – das musst du wissen

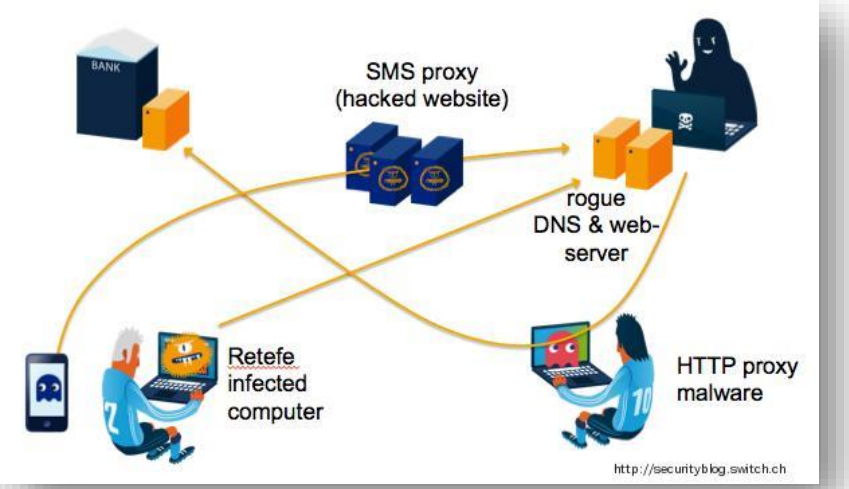
Fachleute bezeichnen Emotet als derzeit gefährlichste Schadsoftware der Welt. Kürzlich hat es ein Spital im Kanton Zürich erwischt. Hier sind die wichtigsten Fragen und Antworten rund um den Cyberangriff.

- Unlike other critical infrastructure, hospitals are openly accessible
- There are systems, such as heart-lung machines, where cyberattacks are potentially lethal to patients.
- A hospital sometimes has hundreds of different devices from different manufacturers in use. Maintenance and oversight are extremely difficult.
- Certification of medical devices prohibits subsequent modification of software no updates possible.
- In hospitals, critical systems are often operated by doctors and nurses. Not by cyber professionals.

Real-life example: Banking Trojans



- Most often, not banks are attacked, but customers
- Combination of various techniques: Technical (i.e. Keylogger, MiM, RATs) and social (Social Engineering, Phishing)
- Lots of banks pay, but demand secrecy



ICT minimum standard

- The standard is generic and universally applicable
- It's primary focus is on critical infrastructures
- The standard specifies *what* to do, but leaves the user the freedom to decide *how* he wants to do it
- The standard is based on the NIST-Framework, but compatible with other industry standards, such as ISO, Cobit, ITIL…

How does the standard work?

- Developed by FONES with experts from the National Economic Supply (Private Sector)
- 5 chapters, each with designated chapters.
- 106 activities in total. Rating from 0 to 4.

Example: Adaption for the food-sector (1/2)

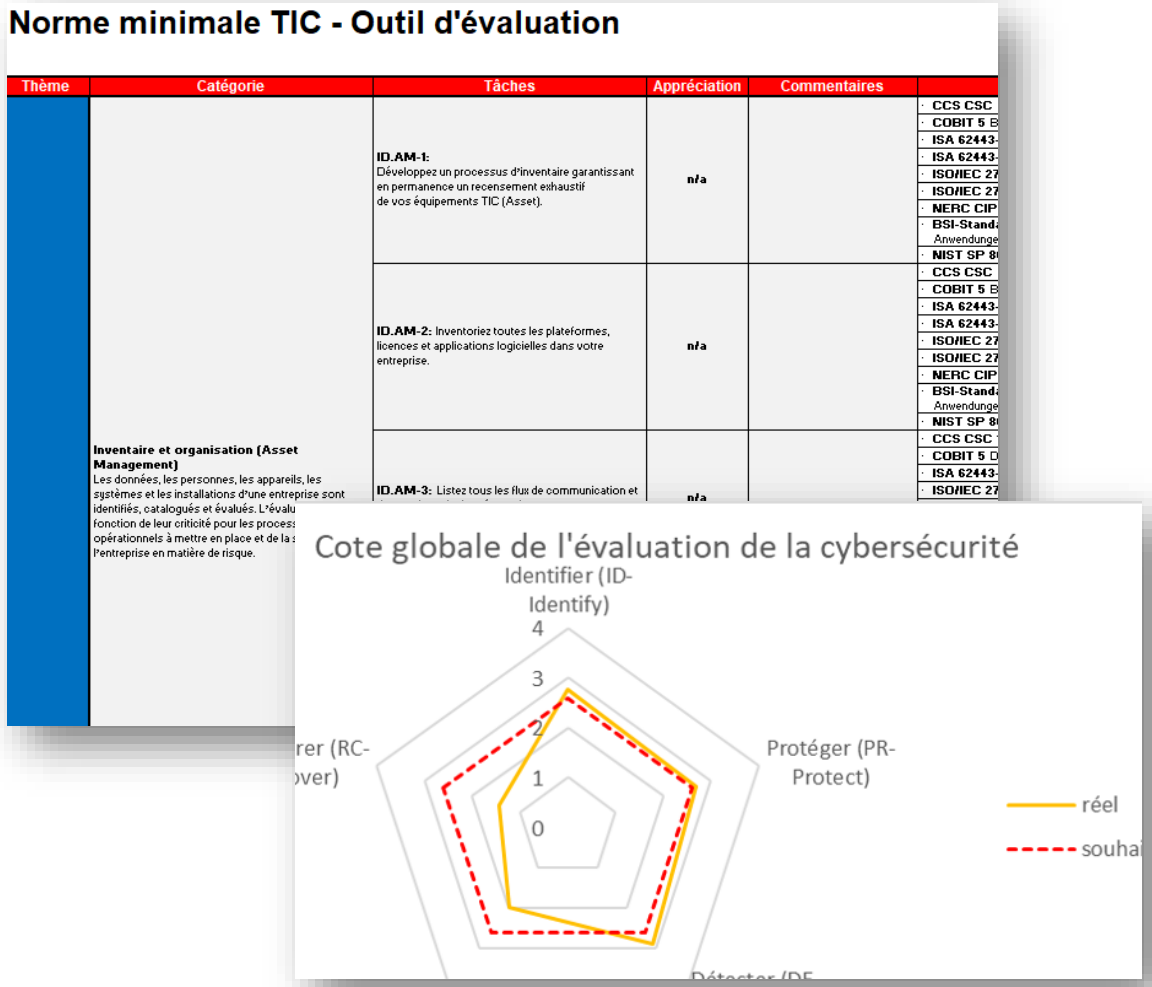
- Businessprocess-analysis, including identification of actors
- Identifying mission-critical tasks
- Identifying ICT-dependencies of mission-critical tasks
- Identifying vulnerabilities

Example: Adaption for the food-sector (2/2)

Critical tasks	ICT-Systems	K	G	A	R	V
• Production	• Feeding systems	3	3	1	1	9
• Logistics	• Phone	5	1	1	1	5
• Orders	• ERP (SAP)	3	3	3	1	27
• Procesing & packaging	• SCADA	5	3	5	3	225
• Storing	• SCADA	3	3	5	1	45
• Picking	• Picking System	3	3	3	1	45
• Distribution	• Touring-Planing-System	5	3	3	1	45
• Communication	• Phone and mail	5	1	5	3	75
• Order	• Point of Sale (checkout)	5	3	5	3	225
• Import	• ERP (SAP)	5	3	3	1	45
• Goods management (ERP)	• Inventory management	5	3	5	1	75
• Selling (POS)	• Phone and mail	5	3	5	3	225
• Communication		5	1	5	3	75

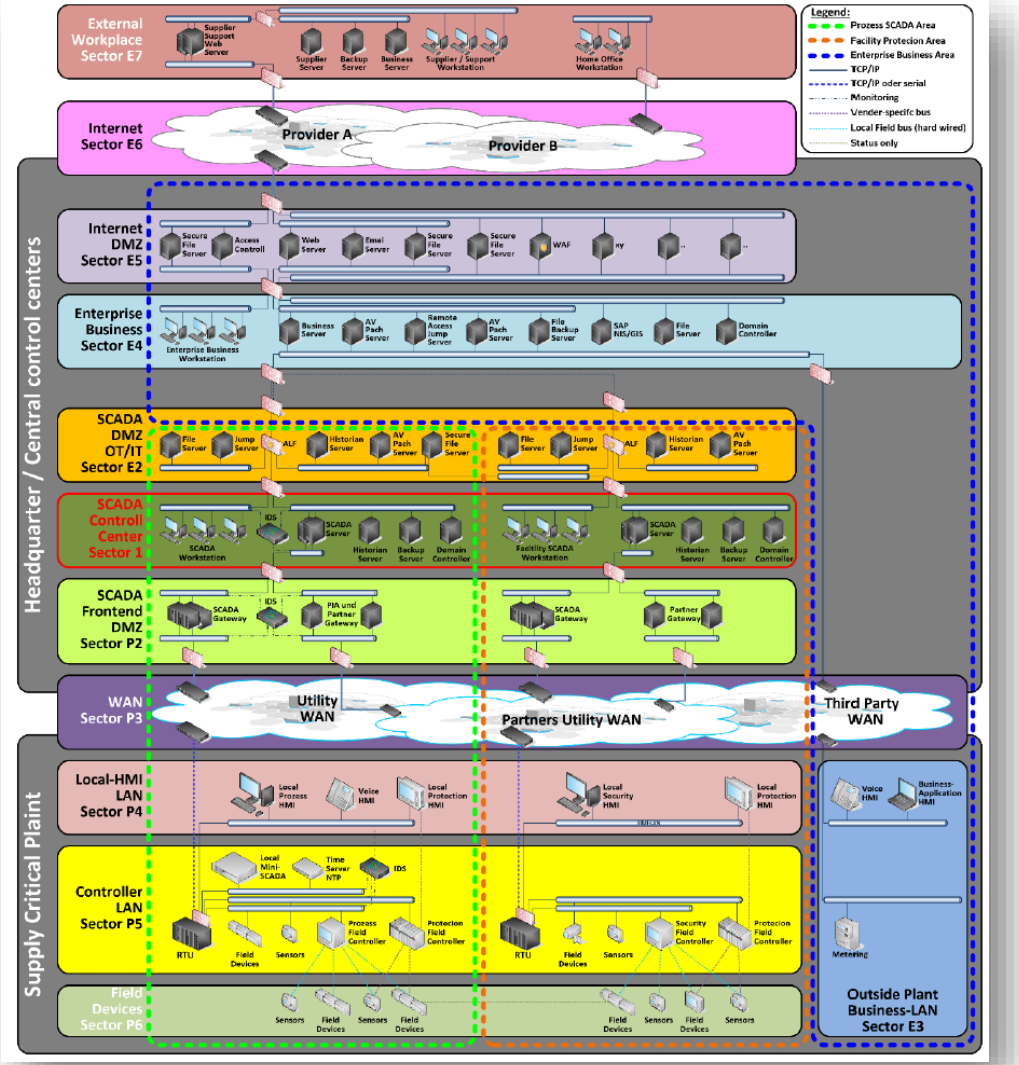
K = Kritikalität, G = Gefährdung, A = IKT-Abhängigkeit, R = Resilienz, v = Verwundbarkeit

How does the standard work?



- Excel-based assessment-tool available (Open Source, free for everyone).
- 106 activities, to be rated from 0 – 4 .
- The standard is risk-based, scalable and auditable.
- Compatibility to various industry-standards (ISO, IEC, ITIL, COBIT…)
- → To be replaced by a webbased tool (work in progress)

Example: ICS / SCADA – Security for the electricity supply



- Recommended network architecture and segmentation
- Different segments with predefined communication table

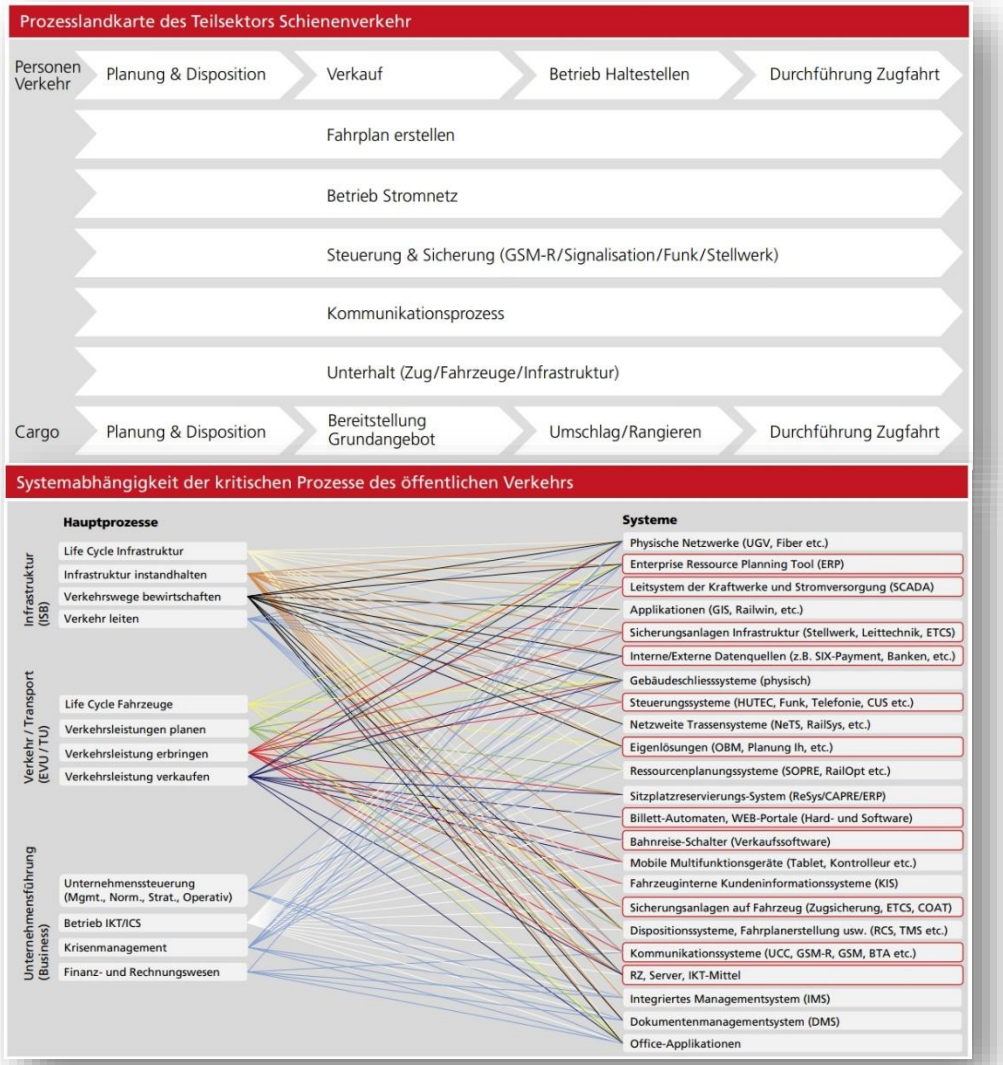
Interne Verbindungsmatrix für die den Sektor P5 Basic Control in einer versorgungskritischen Anlage

von \ nach		Gateway	Gateway	Gateway	Field Device 1	Field Device 2	Field Controller 1	Field Controller 2	Field Sensor 1	Protection Sensor 1	Protection Sensor 2	Protection Field Controller 1	Protection Field Controller 2	Local HMI
		Direction Field	Direction Protection	Direction HMI	Direction Field	Direction Field	Direction Field	Direction Field	Direction Field	Direction Protection	Direction Protection	Direction Protection	Direction Protection	Direction HMI
Gateway	Direction Field	x	Nein	Nein	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein
Gateway	Direction Protection	Nein	x	Nein	Nein	Nein	Nein	Nein	Nein	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	Nein
Gateway	Direction HMI	Nein	Nein	x	Nein	Nein	Nein	Nein	Nein	Nein	Nein	Nein	Nein	tcp/102 udp/123
Field Device 1	Direction Field	tcp/102 udp/123	Nein	Nein	x	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein
Field Device 2	Direction Field	tcp/102 udp/123	Nein	Nein	tcp/102 udp/123	x	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein
Field Controller 1	Direction Field	tcp/102 udp/123	Nein	Nein	tcp/102 udp/123	tcp/102 udp/123	x	tcp/102 udp/123	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein
Field Controller 2	Direction Field	tcp/102 udp/123	Nein	Nein	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	x	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein
Field Sensor 1	Direction Field	tcp/102 udp/123	Nein	Nein	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	tcp/102 udp/123	x	Nein	Nein	Nein	Nein	Nein
Protection Sensor 1	Direction Protection	Nein	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein	Nein	x	tcp/102 Goose	tcp/102 Goose	tcp/102 Goose	Nein
Protection Sensor 2	Direction Protection	Nein	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein	Nein	tcp/102 Goose	x	tcp/102 Goose	tcp/102 Goose	Nein
Protection Field Controller 1	Direction Protection	Nein	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein	Nein	tcp/102 Goose	tcp/102 Goose	x	tcp/102 Goose	Nein
Protection Field Controller 2	Direction Protection	Nein	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein	Nein	tcp/102 Goose	tcp/102 Goose	tcp/102 Goose	x	Nein
Local HMI	Direction HMI	Nein	Nein	tcp/102 udp/123	Nein	Nein	Nein	Nein	Nein	Nein	Nein	Nein	Nein	x

Resilient Public Transport Systems
Example: Strengthening availability of ICT-infrastructure

- ICT Minimum to strengthen resilience in public transport
- Identification of processes, vulnerabilities and risks
- Raising awareness
- Prevention: Reduce risk-probability
- Resilience: Preparedness, measures, training
- Identify, Detect, React, Respond, Recover
- Security is not a state to achieve, but a constant process
- Developed in cooperation between private sector and federal office → Public Private Partnership

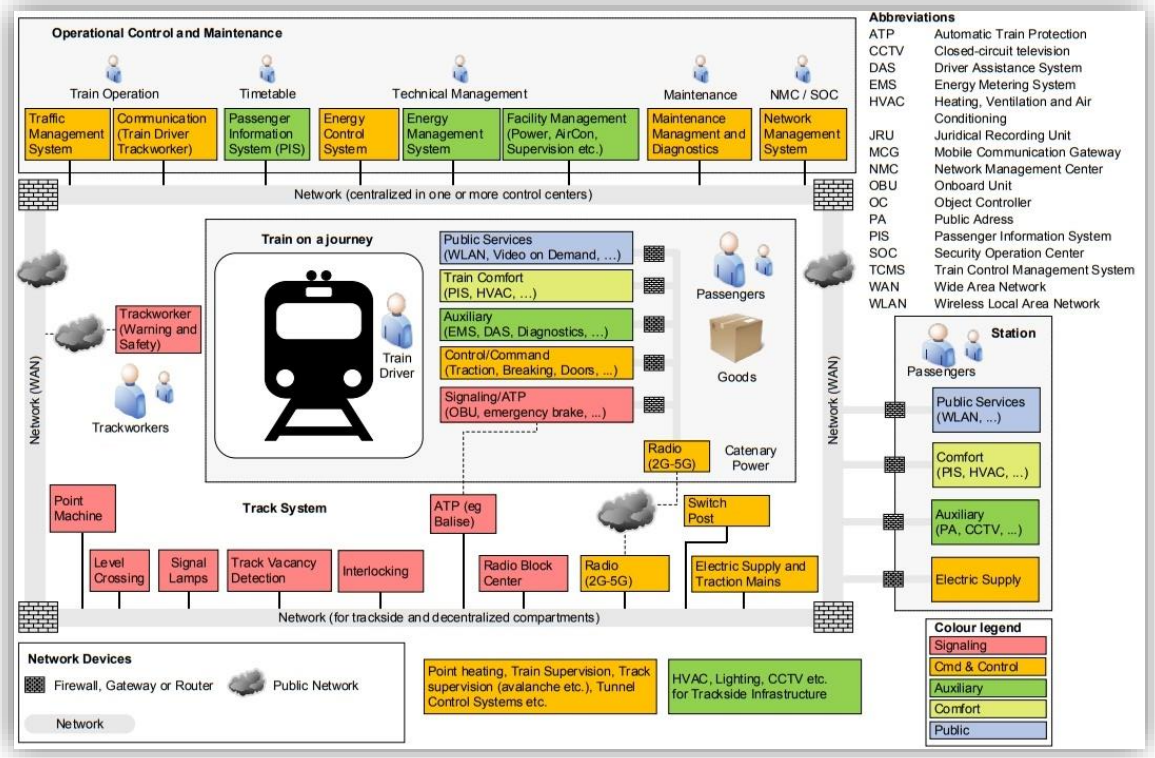
Resilient Public Transport Systems: How to



- Evaluation of (core)processes and actors

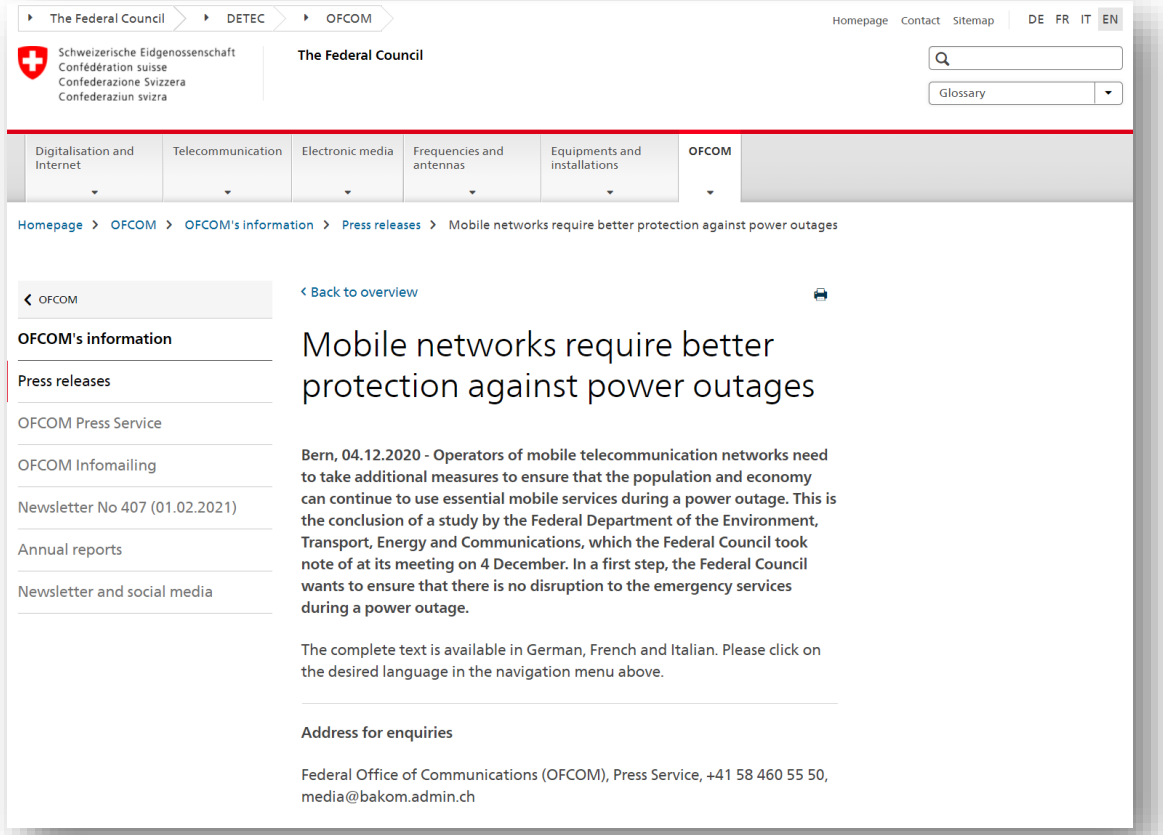
- Evaluation and documentation of dependencies between critical processes and critical ICT-resources
- Know your assets, know your critical systems and dependencies
- “Learning by doing” → Developing standards helps to ask the right questions and to raise awareness.

Resilient Public Transport Systems: How to



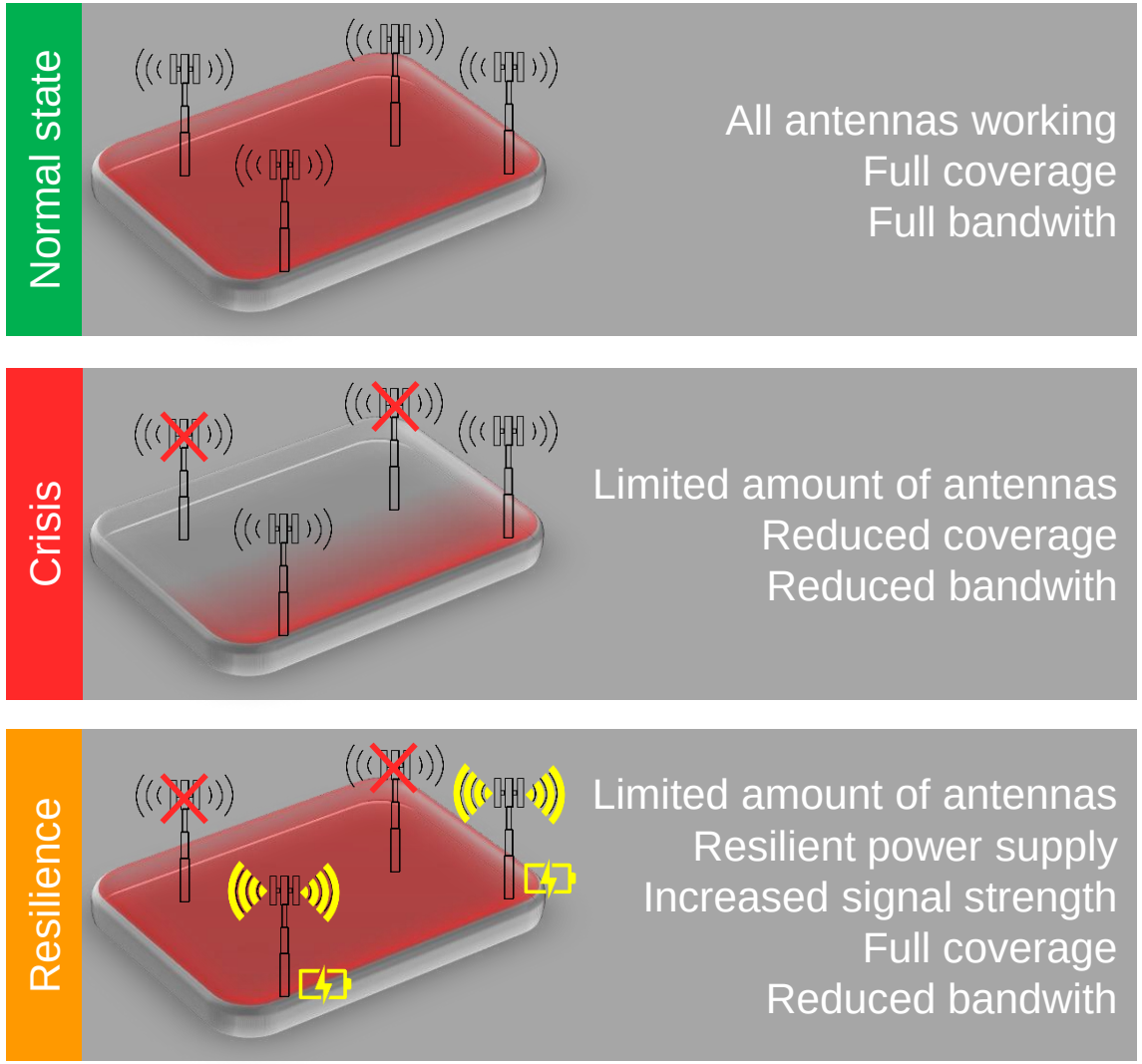
- Leverage generic ICT Minimum Standards into detailed network segmentation
- Public Transport Systems are connected systems over various enterprises, regulators and even nations
- Integrate cybersecurity into groupwide risk-management
- Safety > Security

Resilient Civil Communications Systems
Example: Strengthening availability of ICT-infrastructure



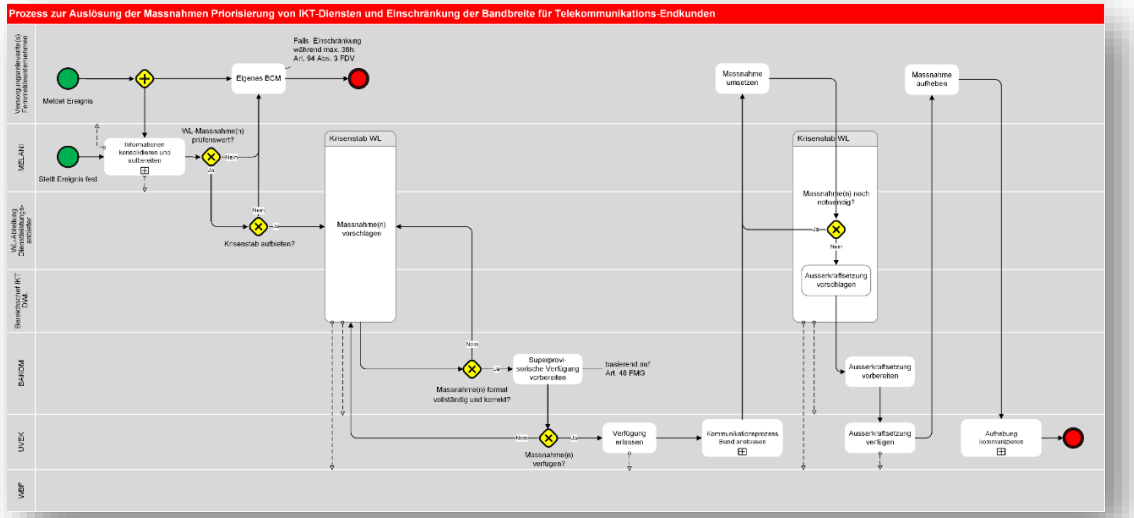
- Preparation against power outages
- Evaluating several possibilities to ensure power supply
- Defining key-infrastructure elements to ensure minimum coverage
  (→ need to be resilient!)
- Combination with other measures possible:
  i.e. Priority-Scheme

Resilient Civil Communications Systems: How to



- Prepare for alternative network-planing
- Evaluate / Define key-infrastructure elements *with potential for increased signal strength!*
- Evaluate possible solutions for resilient power supply (i.e. Diesel generators etc.)
- Deploy resilient power supply to key-antennas
- Define processes and prepare execution with ISPs to increase signal strength including alternative network balancing
- If necessary: Combine with other measures, i.e. priority-scheme

Reactive Measures to secure the Internet



- Sometimes, prevention is just not enough
- Time is crucial
- «Better safe than sorry»
- Switzerland has established a fully defined process between various state actors and major ISPs
- Adequate Measures for different scenarios are prepared and tested
- Example: Temporary suspension of net neutrality in case of a DDOS-Attack

Questions & Remarks

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