

Security analysis – basic notions and ideas

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 - Ida Hogganvik, Mass Soldal Lund, Fredrik Vraalsen, Heidi Dahl
- The initial version of CORAS was jointly developed by the 11 partner in the CORAS project

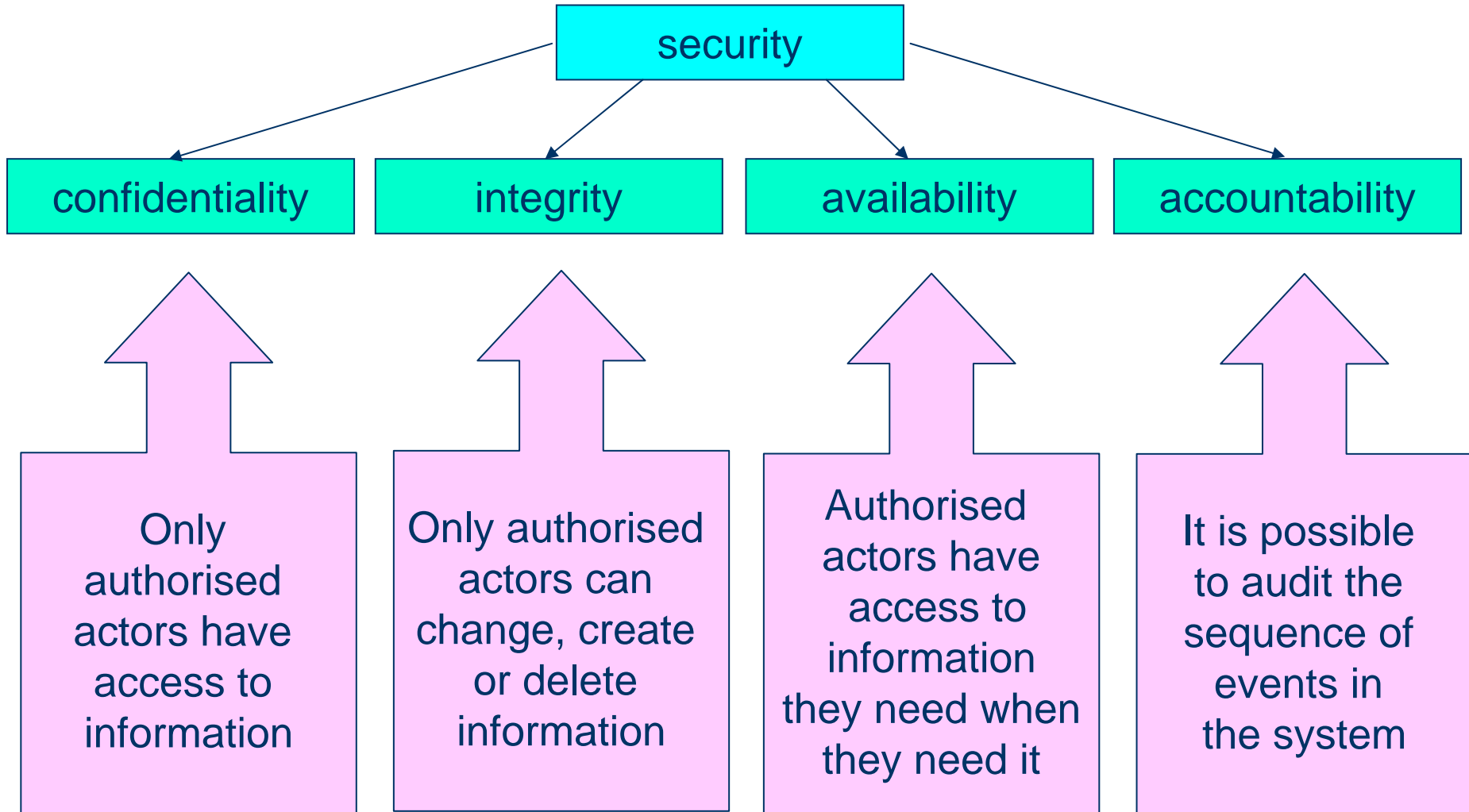
Objectives for the three lectures on security analysis

- Classify security concepts
- Introduce, motivate and explain a basic apparatus for risk management in general and risk analysis in particular
- Relate risk management to system development
- Describe the different processes that risk management involve
- Motivate and illustrate model based security analysis
- Demonstrate the use of risk analysis techniques

What is security analysis?

- Security analysis is a specialized form of risk analysis focusing on security risks

What is security?



What is risk analysis?

- Determining what can happen, why and how
- Systematic use of available information to determine the level of risk
- Prioritisation by comparing the level of risk against predetermined criteria
- Selection and implementation of appropriate options for dealing with risk

Security is more than technology

- From a technical standpoint, security solutions are available – but what good is security if no one can use the systems?
- Security requires more than technical understanding
- Security problems are often of non-technical origin
- A sound security evaluation requires a uniform description of the system as a whole
 - how it is used, the surrounding organisation, etc.

Security – part of system development

- Security is traditionally added as an “afterthought”
 - Solutions often reactive rather than proactive
 - Security issues often solved in isolation
 - Costly redesign
 - Security not completely integrated
- Requirements analysis and risk analysis are two sides of the same coin and should be integrated
 - Focus on desired and undesired behaviour, respectively

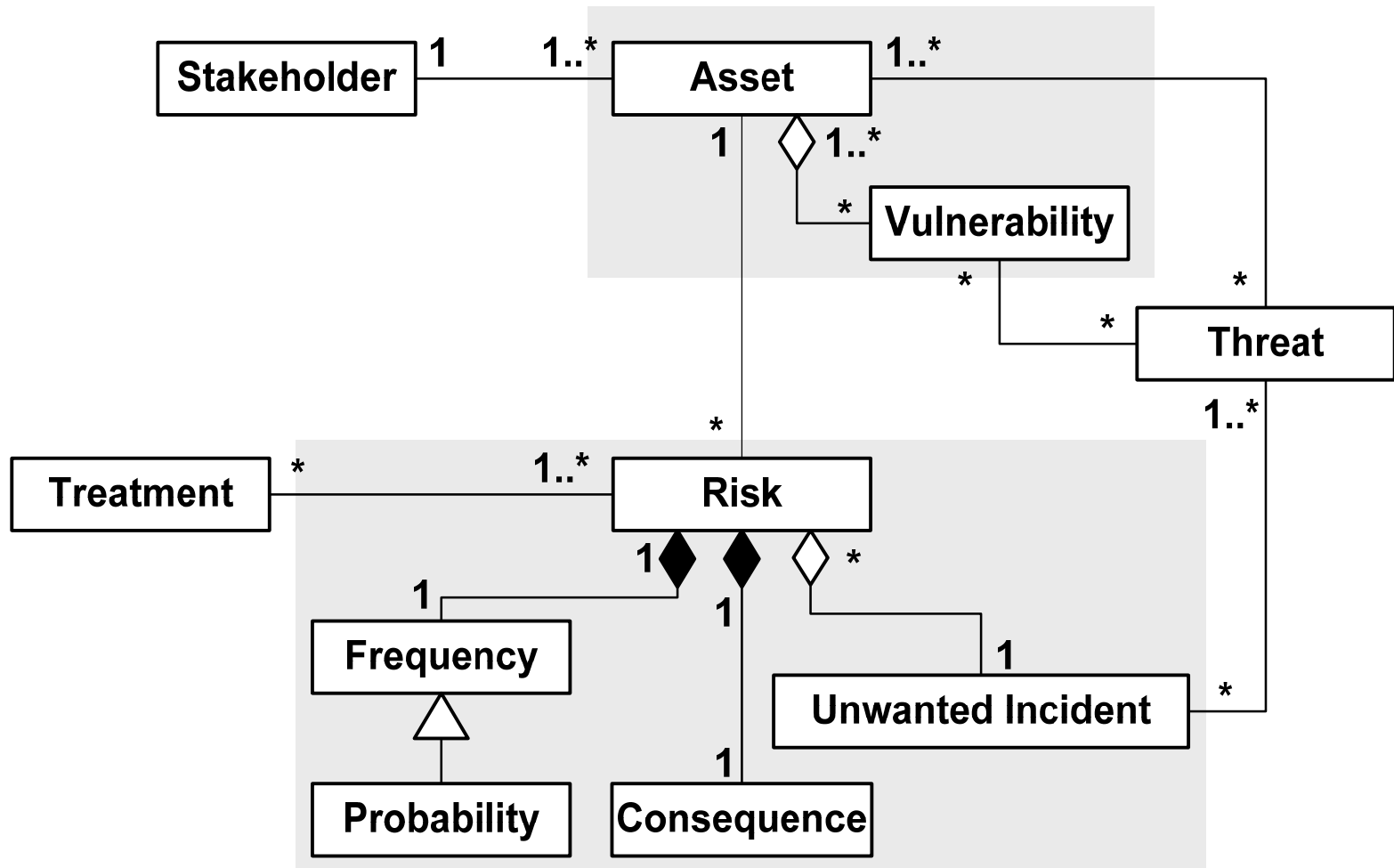
In what way is “security” related to

- safety
- reliability
- dependability
- maintainability
- data protection
- privacy
- trustworthy
- trust
- public key infrastructure based on trusted third party
- authentication and authorization

Øversettelse av terminologi

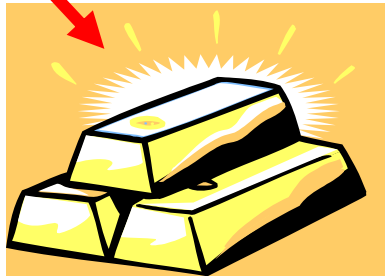
asset	aktivum (noe med verdi)
threat	trussel
unwanted incident	uønsket hendelse
risk	risiko
vulnerability	sårbarhet
consequence	konsekvens
probability	sannsynlighet
frequency	frekvens/hyppighet
treatment	behandling

Conceptual model for risk analysis

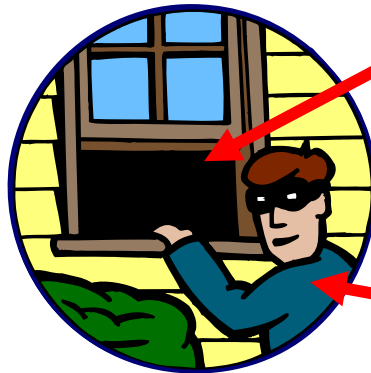


Terms

asset, something of value



vulnerability



threat

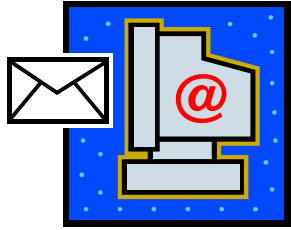
reduced security risk

Risk with respect to security

need to introduce security mechanisms

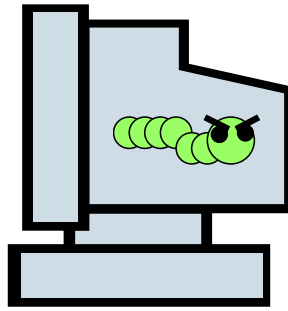


Terms



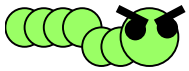
Computer running Outlook

Vulnerability



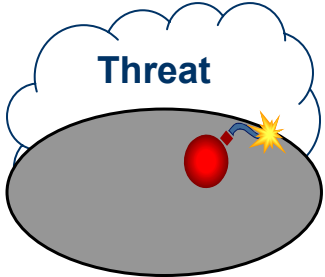
Infected PC

Unwanted incident



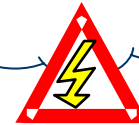
Worm

Threat



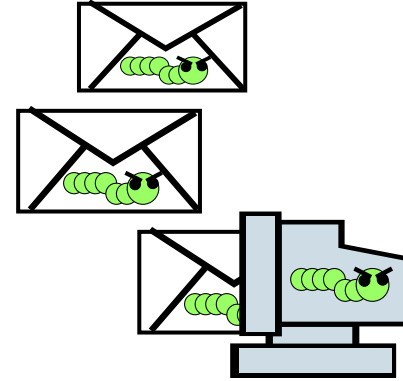
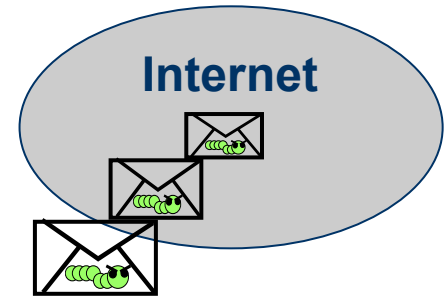
- Infected twice per year
- Infected mail send to all contacts

Risk



Install virus scanner

Treatment

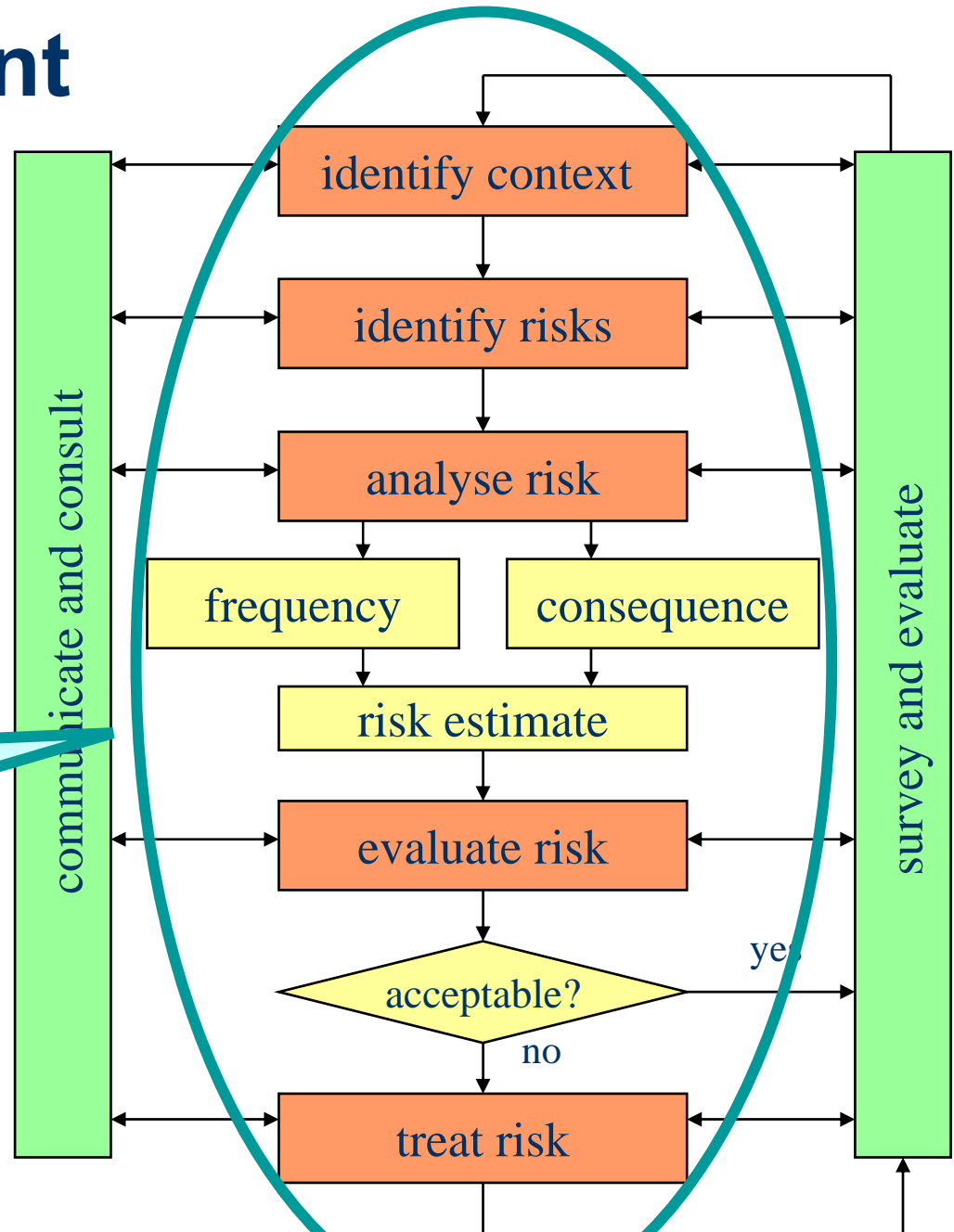


Risk management

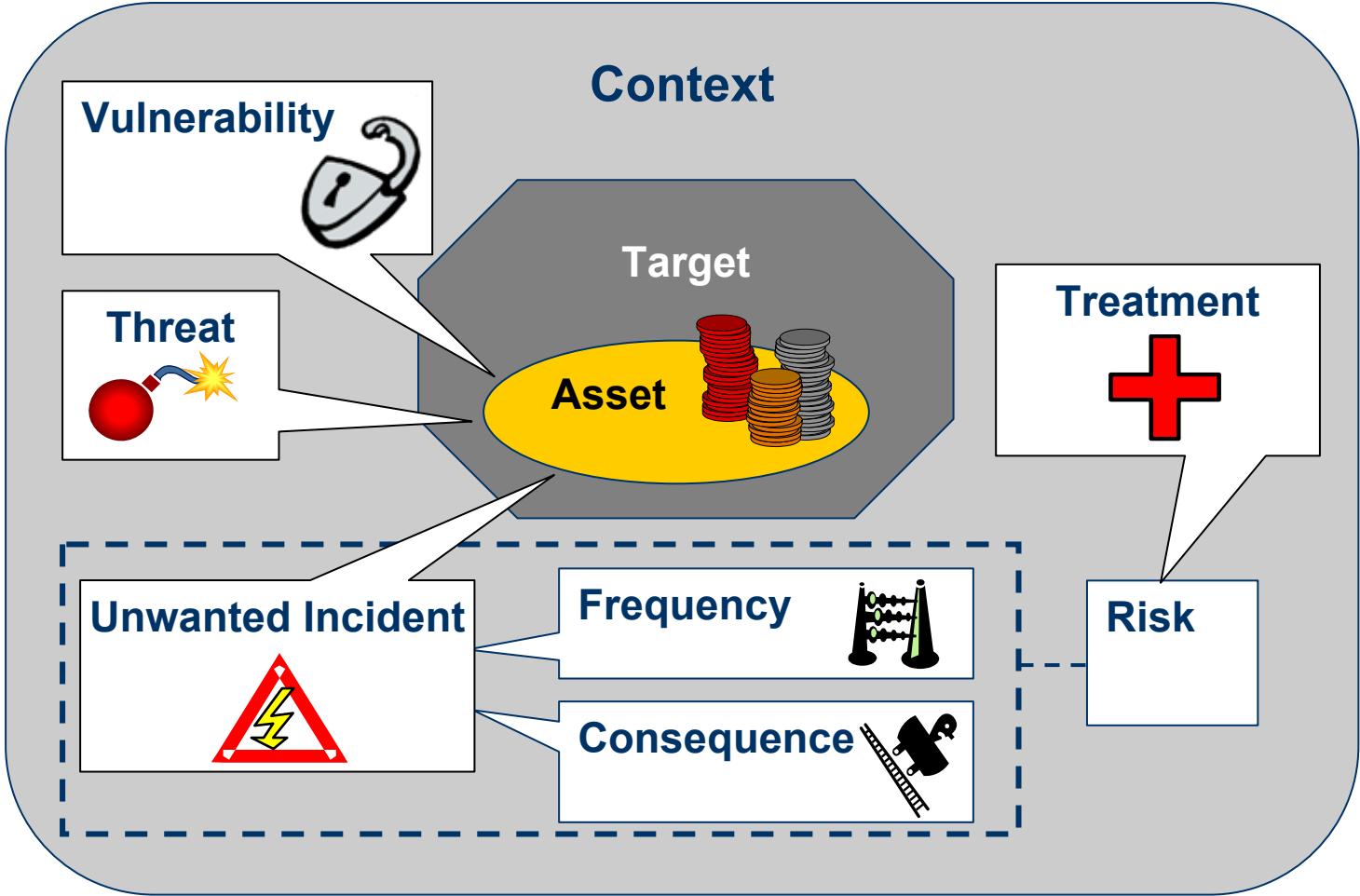
Risk management is the culture, processes and structures that are directed towards realizing potential opportunities whilst managing adverse effects

Our focus:

**Risk
Analysis**

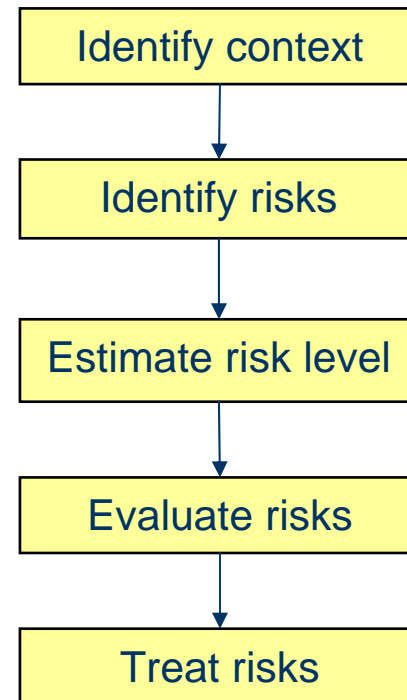


Elements of risk analysis

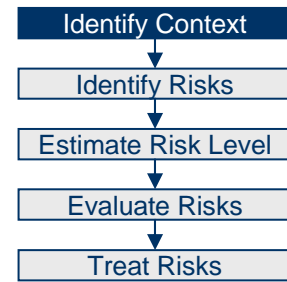


The CORAS process

- Risk management process based on AS/NZS 4360
- Provides *process* and *guidelines* for risk analysis

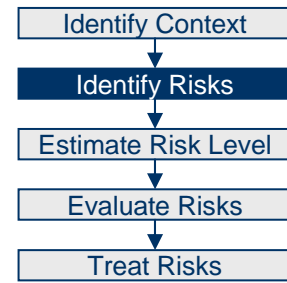


Context identification



- Characterise target of analysis
 - What is the focus and scope of the analysis?
- Identify and value assets
 - Asset-driven risk analysis process
 - Business oriented, e.g. availability of services generating revenue
- Specify risk evaluation criteria
 - There will always be risks, but what losses can the client tolerate?
 - Similar to requirements in system development

Risk identification



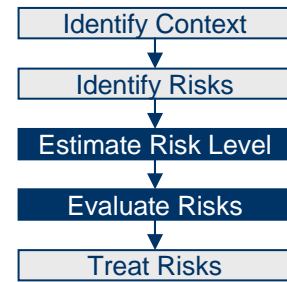
- Identify threats to assets through structured brainstorming
 - Hazard and Operability analysis (HazOp)
 - Involving system owners, users, developers, domain experts, risk analysis experts, etc. (typically 5-7 people)

- Identify vulnerabilities of assets
 - Questionnaires and checklists

Equipment physical security

- Is equipment properly physically protected against unauthorised access to data or loss of data?
- Are power supplies handled in a manner that prevents loss of data and ensures availability?
- ...

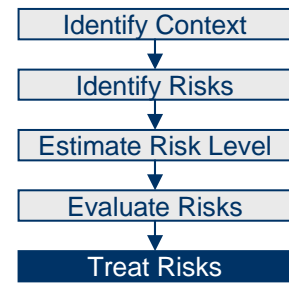
Risk evaluation



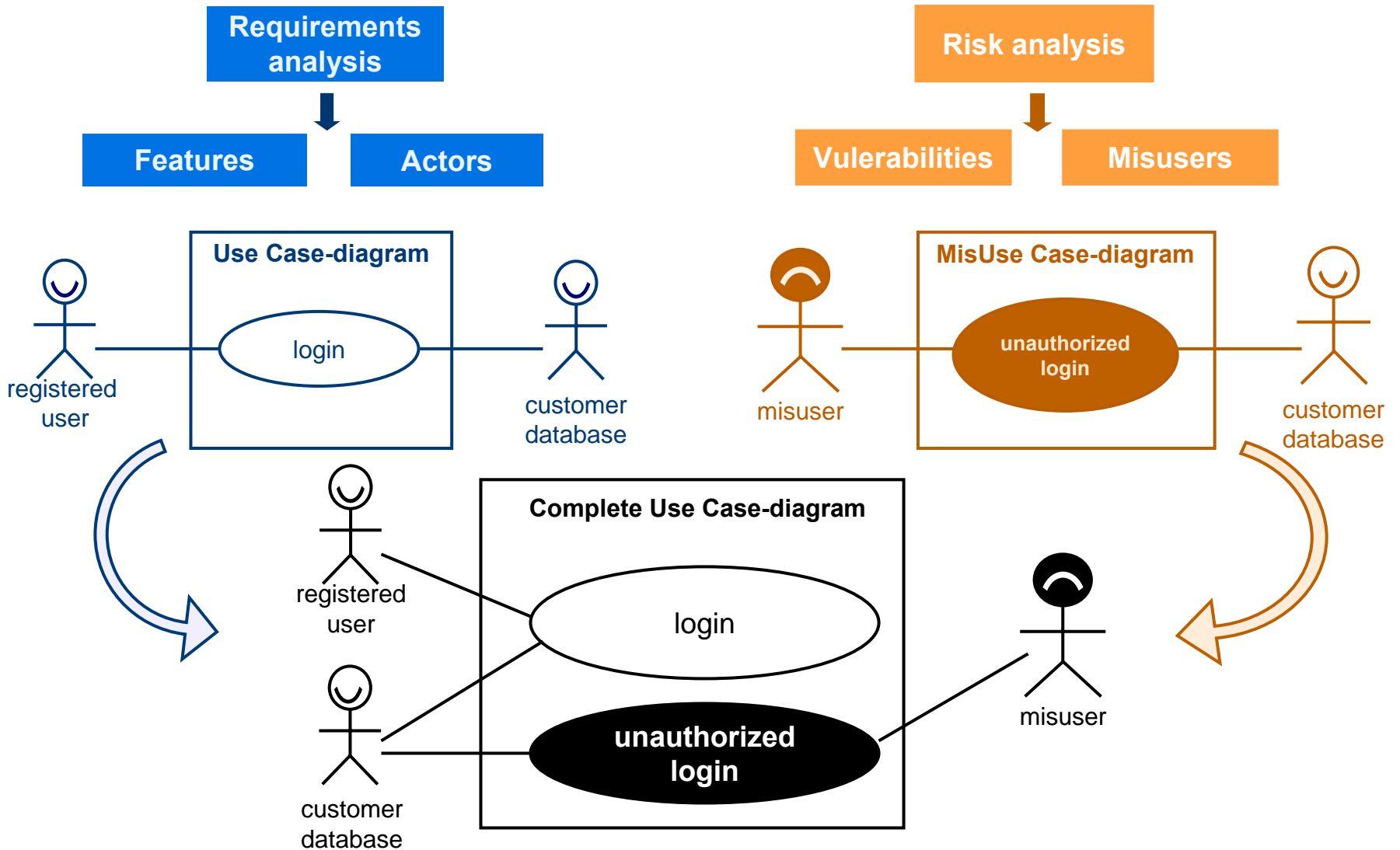
- We cannot completely eliminate all risks
- Determine which risks need treatment
 - We need to know how serious they are so we can prioritise
- Risk level is determined based on analysis of the frequency and consequence of the unwanted incident
 - Quantitative values: e.g., loss of 1M€, 25% chance per year
 - Qualitative values: e.g., high, medium, low

Risk treatment

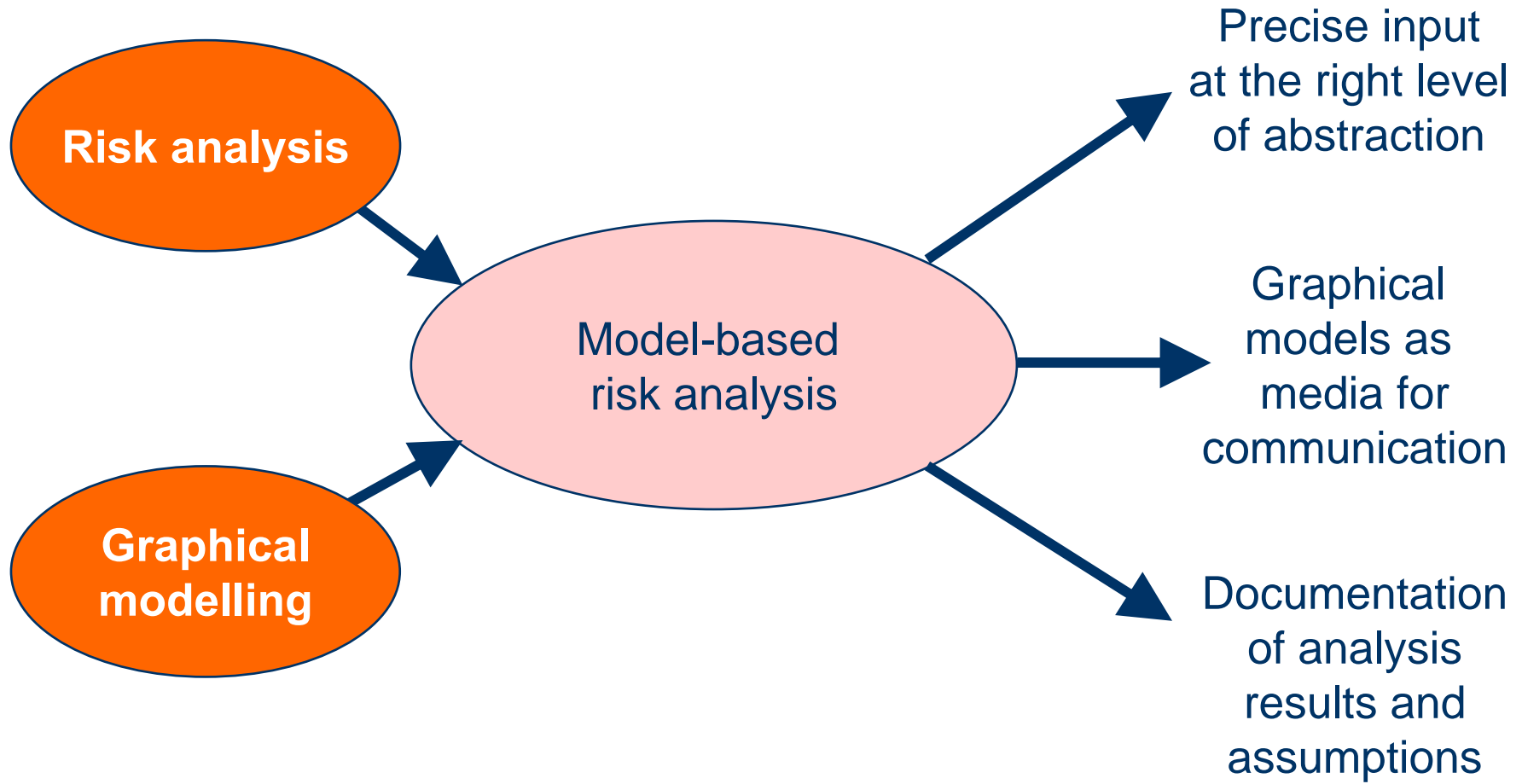
- Identify treatments for unaccepted risks
- Evaluate and prioritise different treatments



Model-based risk analysis



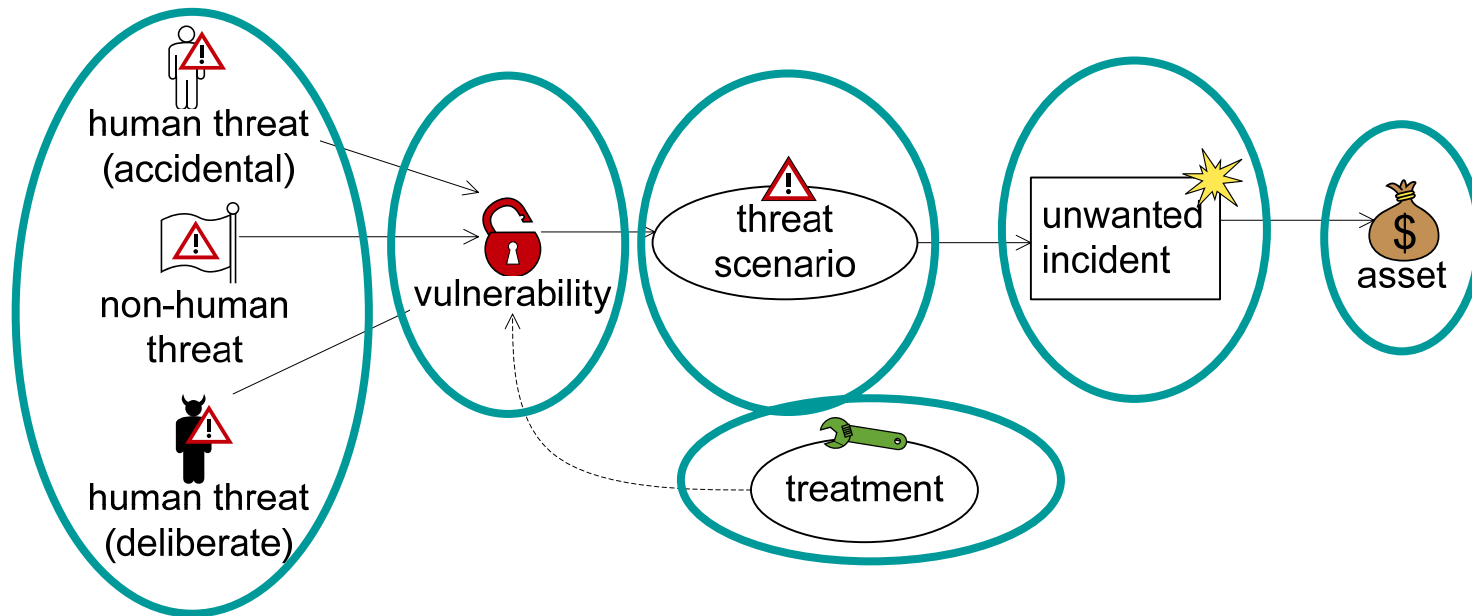
Model-based risk analysis



What is CORAS?

- The CORAS process
 - A process for security risk analysis
- The CORAS language (diagrams)
 - A graphical language that supports the analysis process
 - Basis for communication, documentation and analysis
- The CORAS semantics
 - A schematic translation of any CORAS diagram into English
- The CORAS guideline
 - A guideline for best use of the language within the process
- The CORAS tool
 - A computerized tool supporting the above

The CORAS language



The CORAS diagrams

- **Asset diagrams**

Describes the focus of the analysis

- **Threat diagrams**

Describes scenarios which may cause harm to the assets

- **Risk overview diagrams**

Summarises the risks presented in threat diagrams

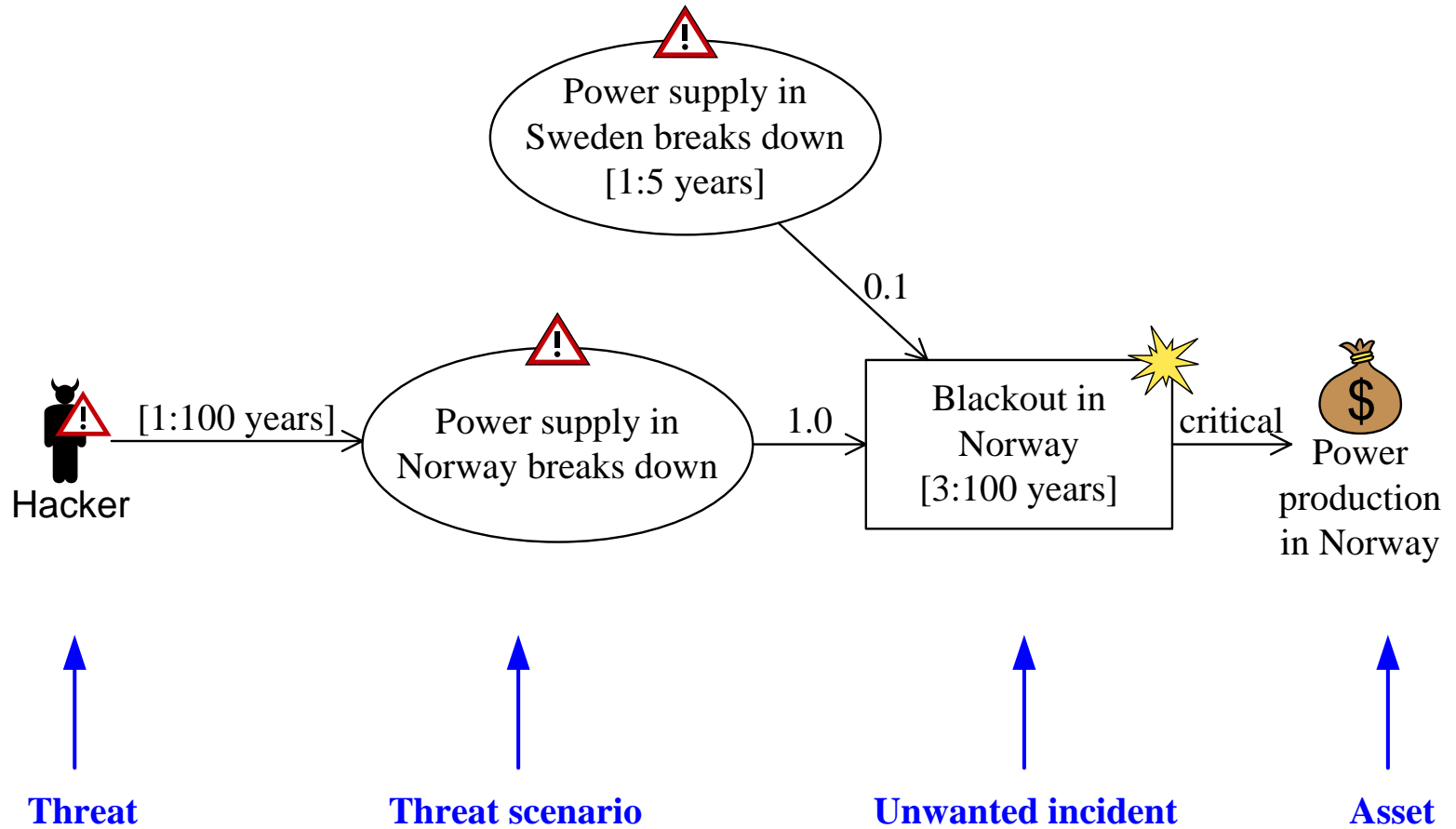
- **Treatment diagrams**

Adds proposed treatments to threat diagrams

- **Treatment overview diagrams**

Adds proposed treatments to risk overview diagrams

Threat Diagram



Semantics: Translation into English

■ Vertices

- "Hacker" is a deliberate threat.
- Threat scenario "Power supply in Norway breaks down" occurs with undefined likelihood.
- Threat scenario "Power supply in Sweden breaks down" occurs with likelihood "1:5 years".
- Unwanted incident "Blackout in Norway" occurs with likelihood "3:100 years".
- "Power production in Norway" is an asset.

■ Relations

- Hacker initiates "Power supply in Norway breaks down" with likelihood "1:100" years.
- "Power supply in Norway breaks down" leads to "Blackout in Norway" with conditional likelihood "1.0".
- "Power supply in Sweden breaks down" leads to "Blackout in Norway" with conditional likelihood "0.1".
- "Power supply in Norway breaks down" impacts "Power production in Norway" with consequence "critical".

Next Lecture on Security Analysis

October 31