Context-Sensitive Requirements and Risk Management with IRIS

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The Problem ? Many secure systems are not designed for their environments; defending against attacks in one context does not guarantee success in another.
? Risk analysis can supplement security requirements, but reasoning about assets, threats, and vulnerabilities in different contexts of use is hard.

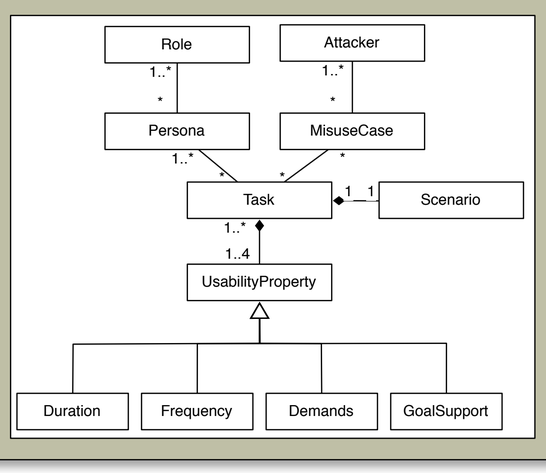
Our Approach IRIS (Integrating Requirements and Information Security) is a framework for designing secure and usable systems.
IRIS consists of a meta-model integrating the notion of environment with concepts from requirements and risk management, together with tool-support.

The IRIS Meta-Model

- The IRIS meta-model consists of 4 sub-models, bound together in a common environment.
- Each sub-model relates to a different view of the context of use.

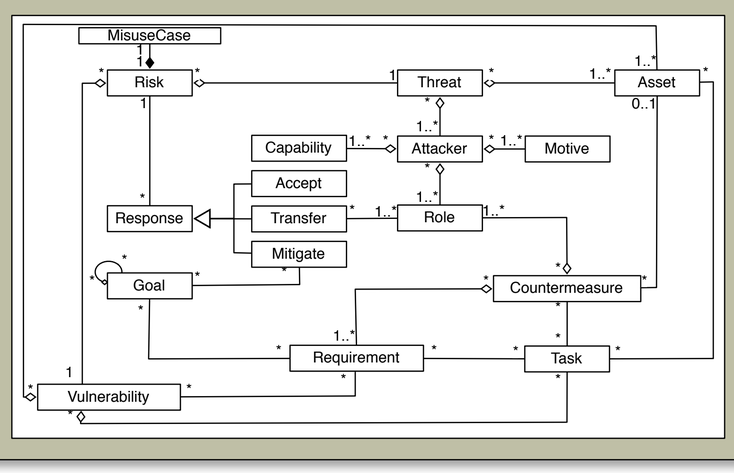
Task Sub-Model

- Tasks and scenarios model work performance.
- Properties relate task usability to *personas*.
- *Misuse cases* [6] validate rather than elicit risks.



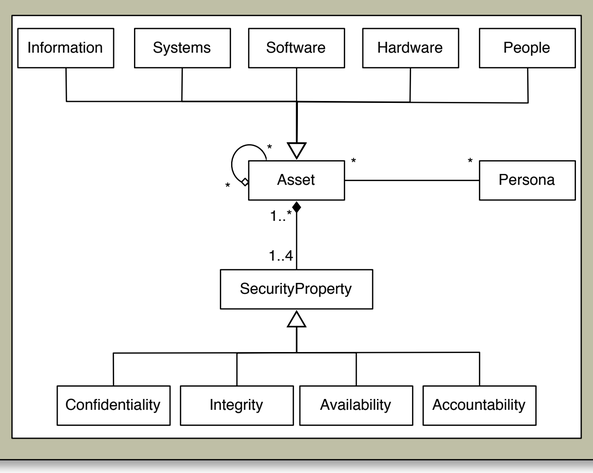
Risk Analysis Sub-Model

- Attackers are modelled as well as threats.
- Asset, threat, and countermeasure properties facilitate risk scoring.
- Roles capture responsibilities.



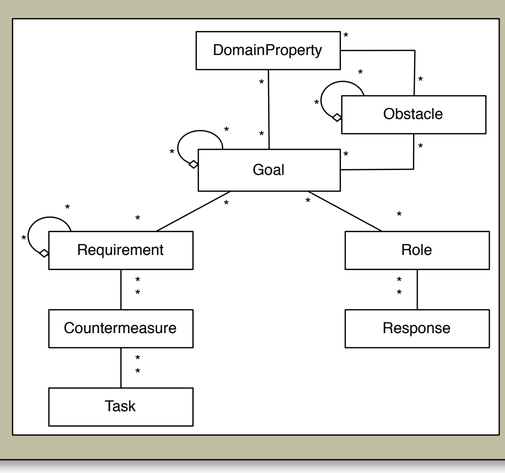
Asset Sub-Model

- Asset types inspired by OCTAVE [1].
- Multiple security properties explore asset values.
- Assets used by *personas* rather than users.



Goal Sub-Model

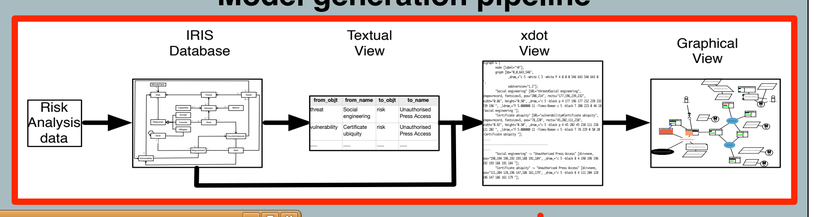
- Goals are boundary objects.
- Goal and *obstacle* refinement elicit risks and their responses.
- Goal sub-model based on KAOS [2].



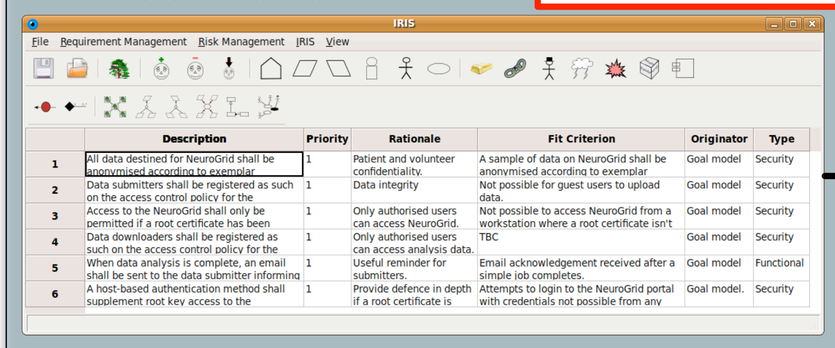
Tool-Support

- IRIS also includes a requirements & risk management tool.
- Provides explicit support for usable security design.
- Asset, Task, Goal, and Risk Analysis models automatically generated.

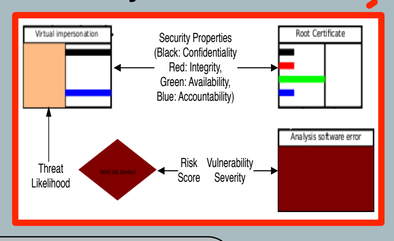
Model generation pipeline



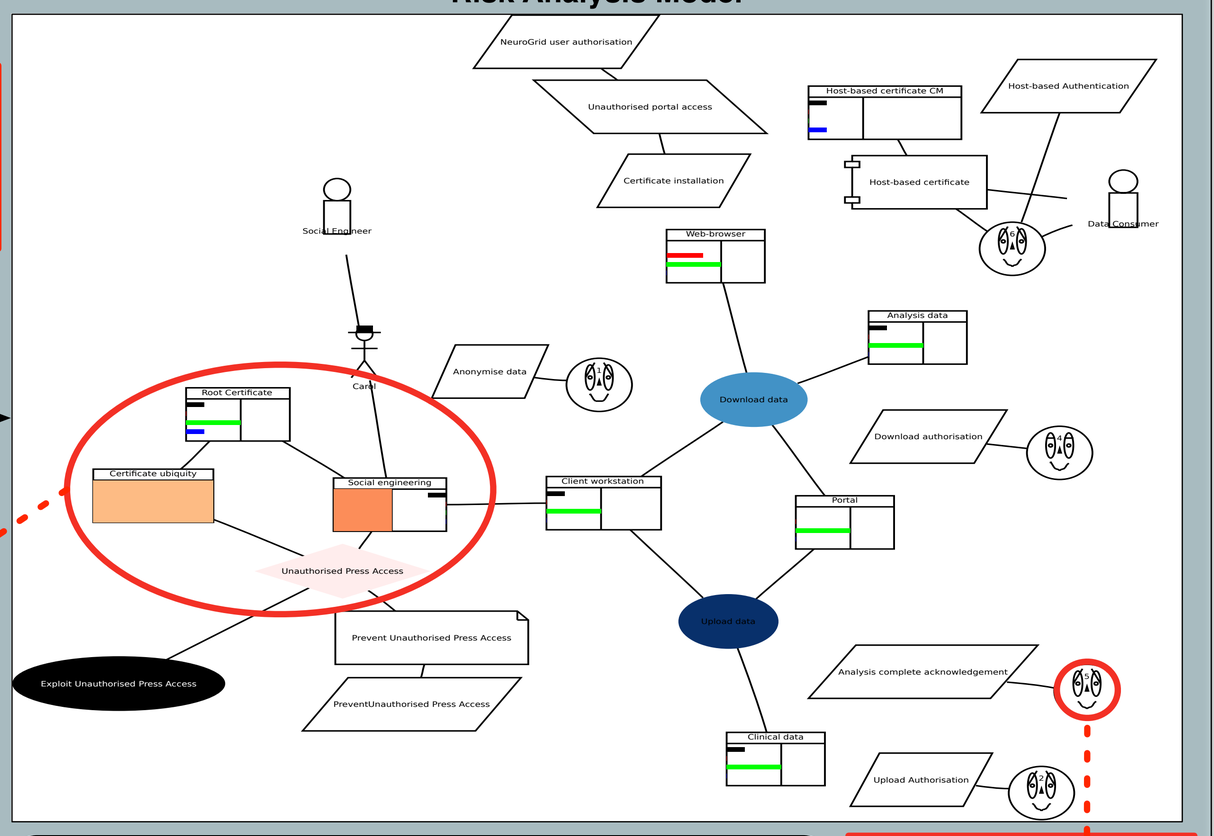
IRIS User Interface



Security artifact colours

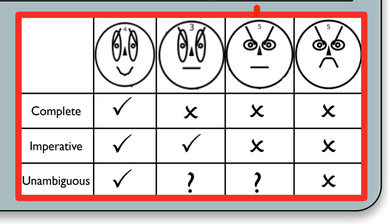


Risk Analysis Model



- The Risk Analysis Model is a quick-look view of the current risk analysis.
- Nodes and associations are generated automatically.
- Risk analysis artifacts are colour coded to quickly visualise their properties.

- Requirement quality is visualised by Chernoff Faces [3].
- Quality is assessed by:
  - requirements completeness,
  - the presence of an imperative mood phrase,
  - lack of ambiguity [7].



References

[1] Alberts, C.J., Dorofee, A. J., *Managing Information Security Risks: The OCTAVE Approach*, Addison-Wesley, Boston, 2002

[2] Dardenne, A., van Lamsweerde, A., Fickas S., Goal-Directed Requirements Acquisition. *Science of Computer Programming 20*, 1993, pp. 3 - 50

[3] Chernoff, H., The Use of Faces to Represent Points in K-Dimensional Space Graphically. *Journal of the American Statistical Association (1973)*, p. 68

[4] Fléchais, I., Mascolo C., Sasse , M.A., Integrating Security and Usability into the Requirements and Design Process. *International Journal of Electronic Security and Digital Forensics 1*, 2007, pp. 12-26

[5] van Lamsweerde, A., Letier E., Handling Obstacles in Goal-Oriented Requirements Engineering. *IEEE Transactions on Software Engineering 26 (10)*, 2000, pp. 978-1005

[6] Sindre, G., Opdahl L., Eliciting Security Requirements with Misuse Cases. *Requirements Engineering 10 (1)*, 2005, pp. 34-44

[7] Wilson, W., Rosenberg, L., Hyatt L., Automated Quality Analysis of Natural Language Requirement Specifications. *Proceedings of Fourteenth Annual Pacific Northwest Software Quality Conference*. 1996

Acknowledgements

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