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Automotive Cybersecurity

Methods and Tools for Enabling Secure Automotive Systems

A Model-Based PhD

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coventry.ac.uk/research/areas-of-research/institute-for-future-transport-and-cities/our-research/systems/

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INCOSE UK MBSE Interest Group
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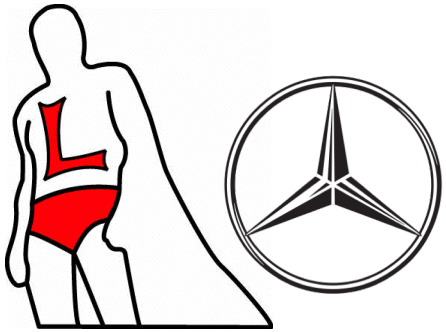

Mercedes-Benz

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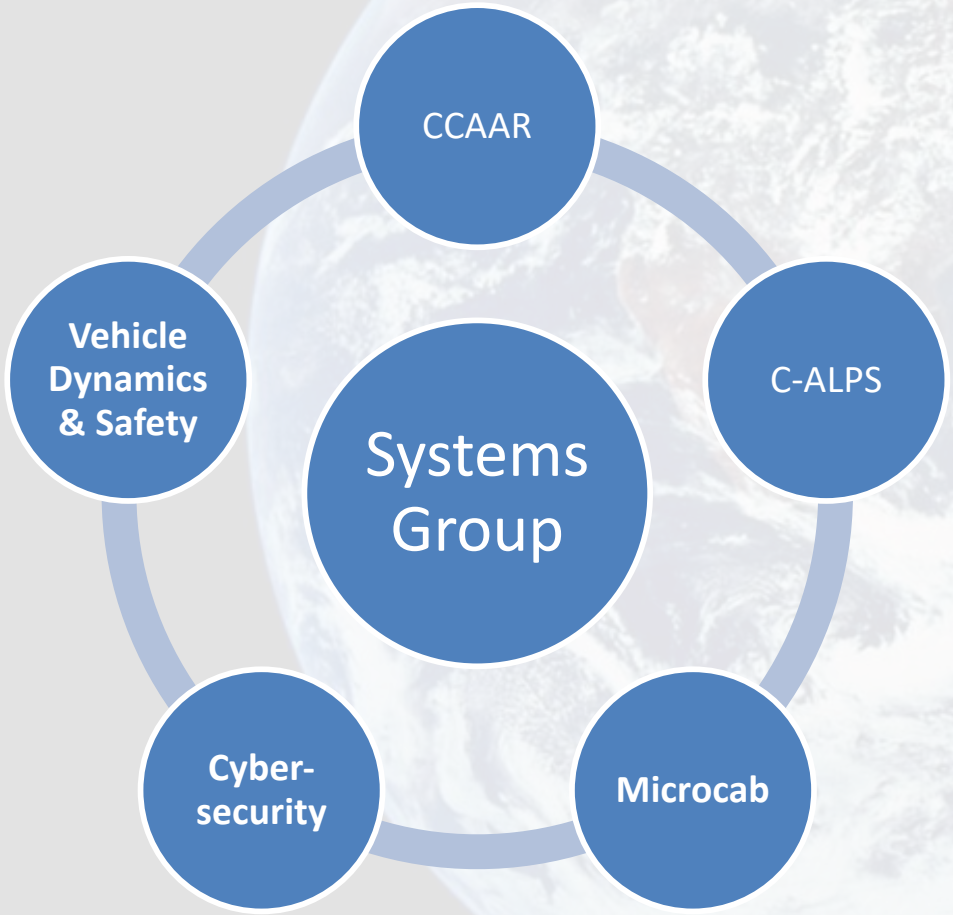
6 groups:

Design, Systems, Manufacturing, Supply Chain, Materials & Structures, Business Environment



Systems Group

CCAAR

Centre for Connected Autonomous Automotive Research
(partnership with Horiba-MIRA)

C-ALPS

Centre for Applied Low Carbon Propulsion Systems
(partnership with FEV)

Microcab

Hydrogen Fuel Cell vehicles (spin-out)

Cybersecurity

Systems security for automotive, rail and connected infrastructure

Vehicle Dynamics and Safety

Reducing collisions, injuries and emissions in future traffic

SAIC MOTOR

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Automotive Cybersecurity – Current Activity

- Project with MIRA on vehicle component testing using simulation tools – PhDs
- ECSEPA - Evaluating Cyber Security Evidence for Policy Advice. Interpreting, evaluating and understanding evidence about cyber security.
- Looking ahead to Innovate UK's CAV4 call due in summer

Methods and Tools for Enabling Secure Automotive Systems

- Connected and autonomous vehicles (CAVs)
  - Communication between CAVs and complex, interconnected environments in which they operate more significant than autonomy (for security)
- System of Systems (SoS) includes…
  - Physical systems connected at a given moment
  - Enabling system(s)
- Consider security best-practice
  - End users, employees, manufacturers, regulators, shareholders, road users, infrastructure systems, connected vehicles, emergency services, app developers, governments, malicious actors, …

ENABLING SYSTEMS ENGINEERING

Enabling **systems engineering**

by

engineering **enabling systems**

enabling system

A system that creates some or all of conditions necessary for the creation, existence, and/or destruction of one or more other whole or part systems

Typically represents a set of organisations, individuals, tools, processes, and activities involved in conceiving, developing, maintaining, retiring, and destroying a purposeful system (or systems) or part thereof

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RESEARCH QUESTION

How can cooperating organisations ensure that their enterprise system of systems, comprising human and automated processes, is fit for the purpose of ensuring the security of the CAV throughout its lifecycle?

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ATHEORETICAL PRAGMATISM

SCIENCE VERSUS ENGINEERING

Getting on with the job and iterating

versus

Extensive treatment of methodology

Have to justify systems thinking – not a given

Have to justify model-based methods – not a given

Sciences dislike of atheoretical pragmatism does not extend to presentation of scientific work

- (Almost) always written form
- No need to justify use of written form

CROSS-INDUSTRY SECURITY BEST PRACTICE SURVEY

- Automotive OEMs
- Automotive supply chain
- Highways
- Communications
- Data centres
- City councils
- Infrastructure
- Standards bodies
- Mapping
- Industry bodies
- Universities
- IT services
- Industrial control systems
- Aerospace
- Rail
- Emergency services
- Insurance
- Policy
- Legislation
- Litigation
- Parking
- …

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MBSE Patterns

- Agreed plan to work with MBSE Patterns Working Group
- Develop novel patterns and adapt existing ones
- Provide resource to MBSE Patterns Working Group

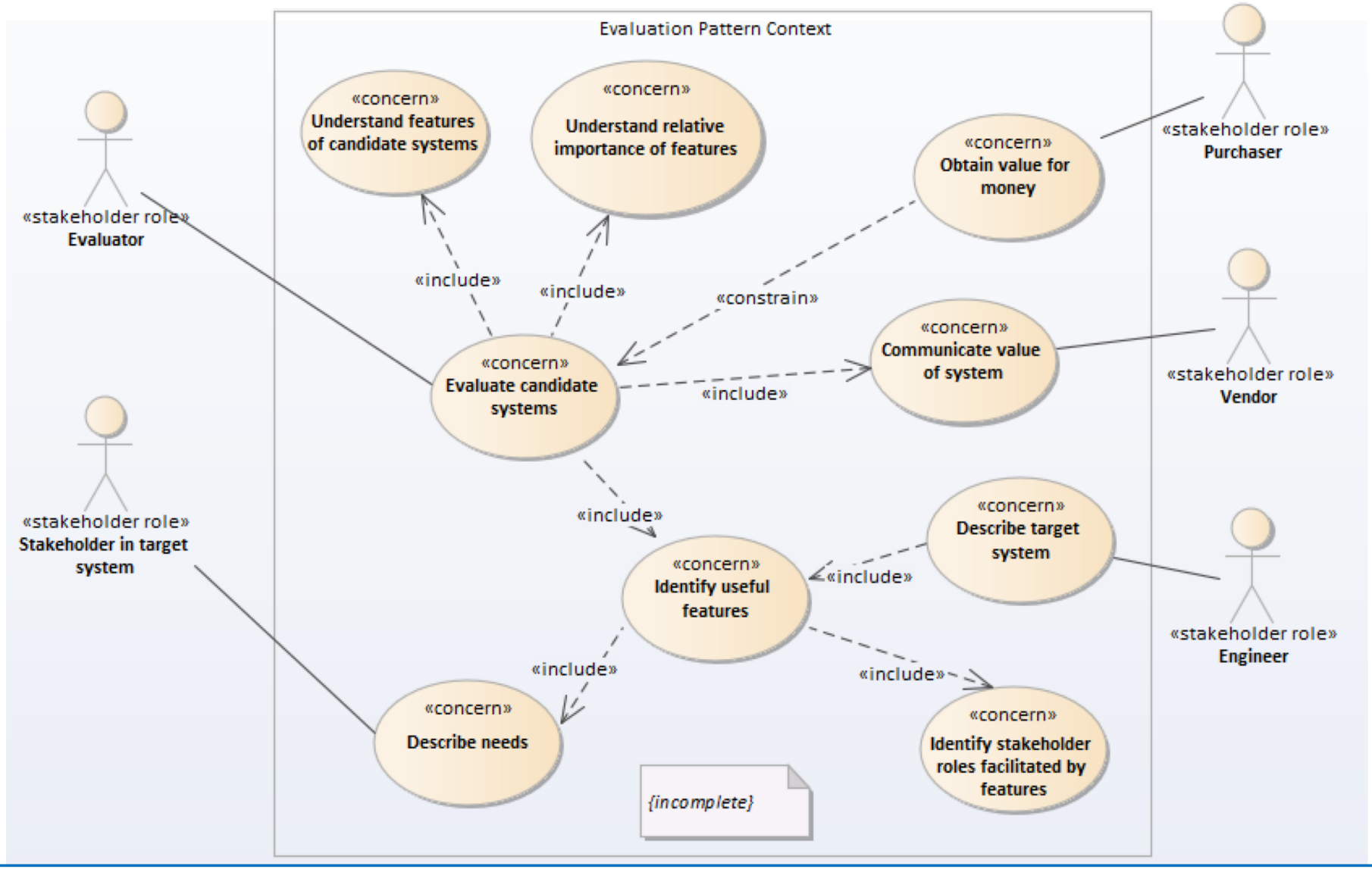
In development

Variance
Evaluation

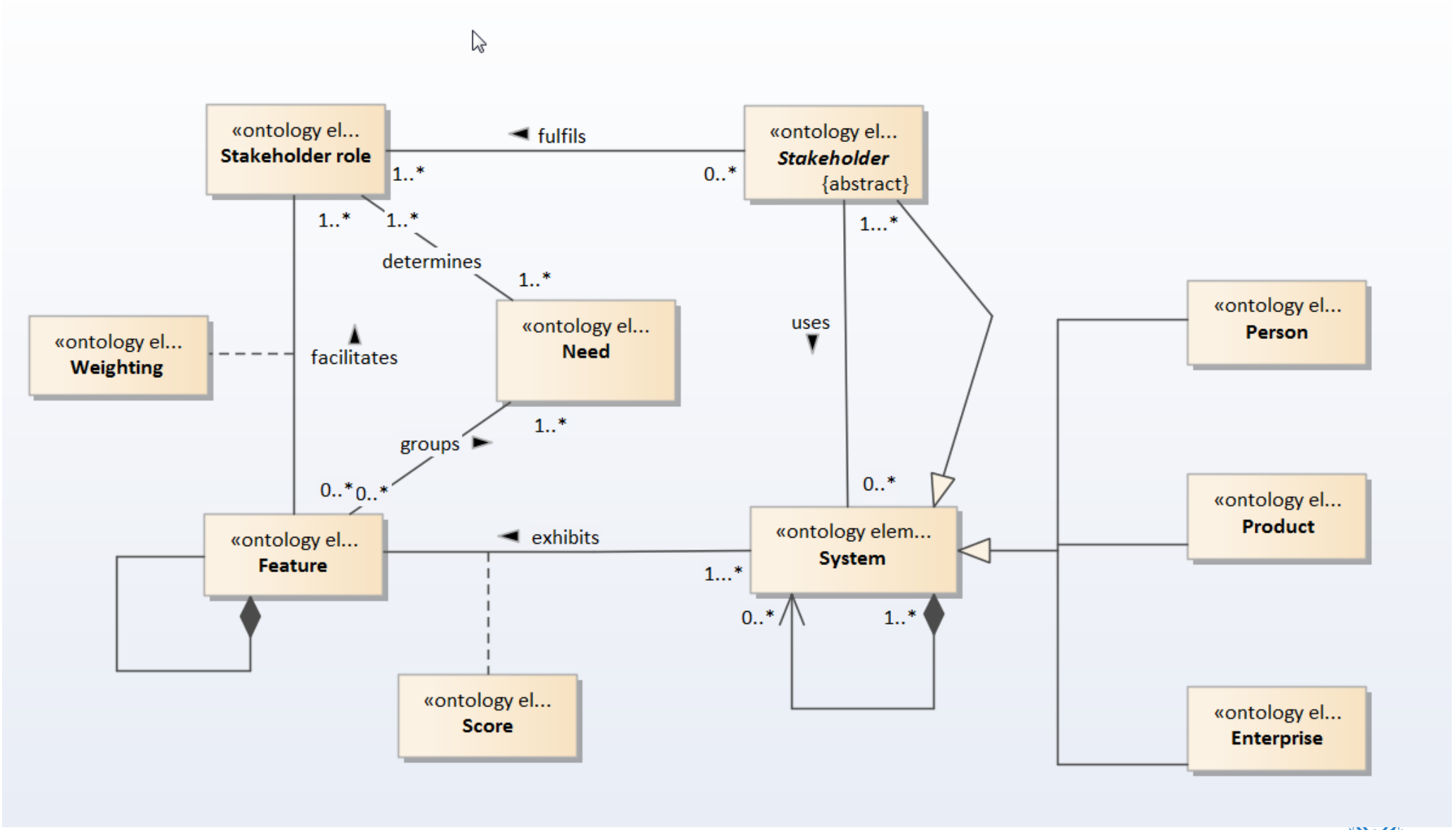
Ideas

Change (variance)
Adaptation (change)
Localisation (adaptation)
Evolution (adaptation)
Scalability (adaptation)
Accountability
Security
Ethics
Elegance
Configuration
Capability (maturity)
Disgruntlement
Deconfliction
Fortification
Professionalism
Confirmation
Trust
Privacy
Identity
Curation
Emotion
Hygiene
Inoculation
Attribution (traceability)
Sub-prime
Ratings
Incident

Evaluation Pattern Context



Evaluation Pattern Concepts



Help me to help you

Share your security needs and concerns (any industry)

Share your best practice (enabling systems or security)

Share your ideas for MBSE enabling patterns

Provide an enabling systems case study (vehicle security)

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http://www.coventry.ac.uk/research/areas-of-research/mobility-transport/cyber-security/

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