Fraunhofer IESE

SMART Ecosystems

Safety und Security in der Industrie 4.0

GI Architekturen 2014, 7. Juli 2014, ABB Ladenburg

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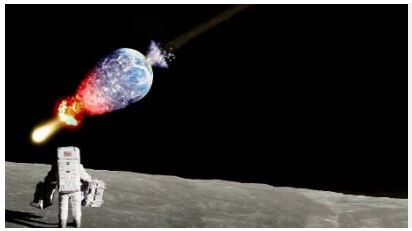
Overview



What are the Challenges?

How to assure Safety?

How does Security influence Safety?

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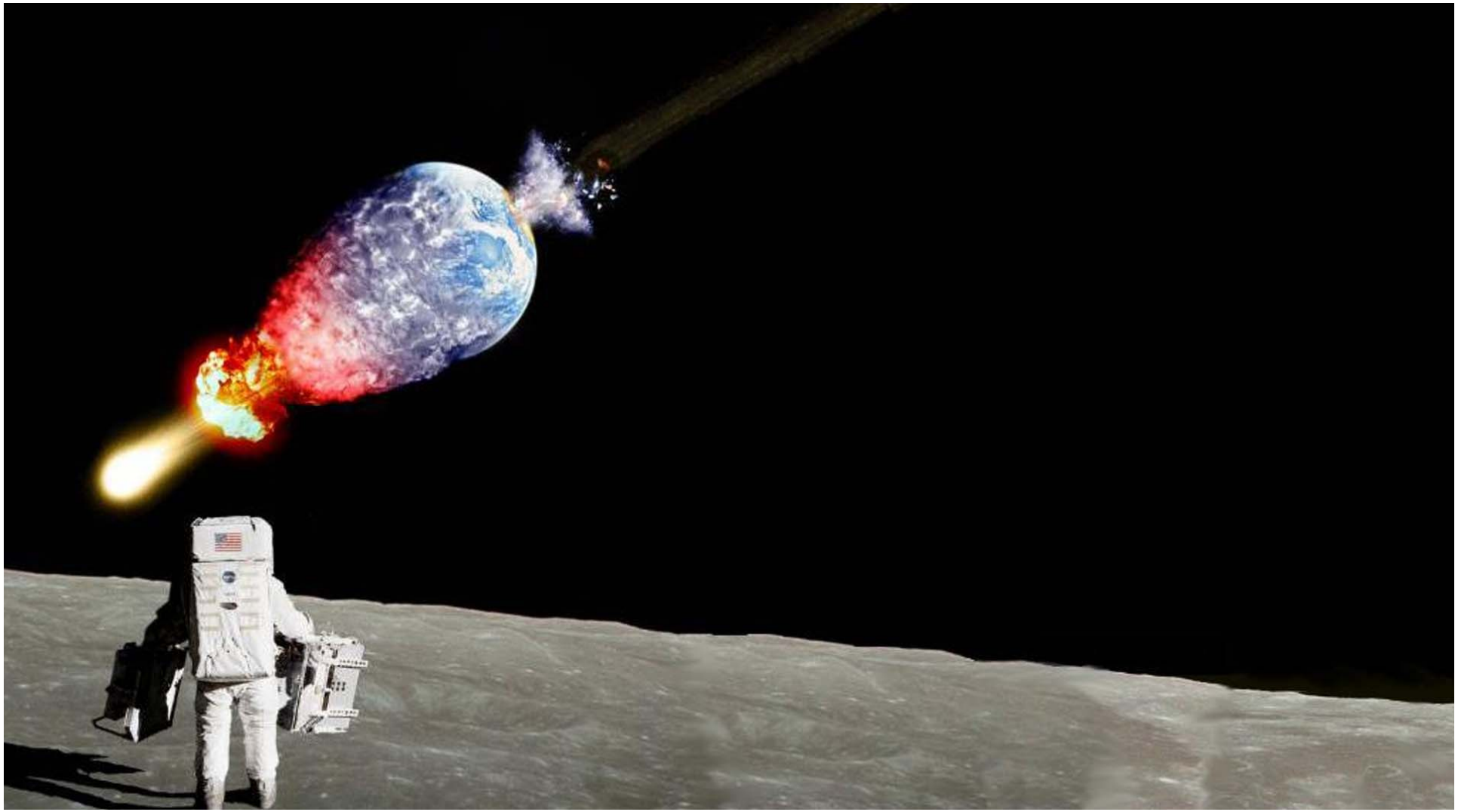


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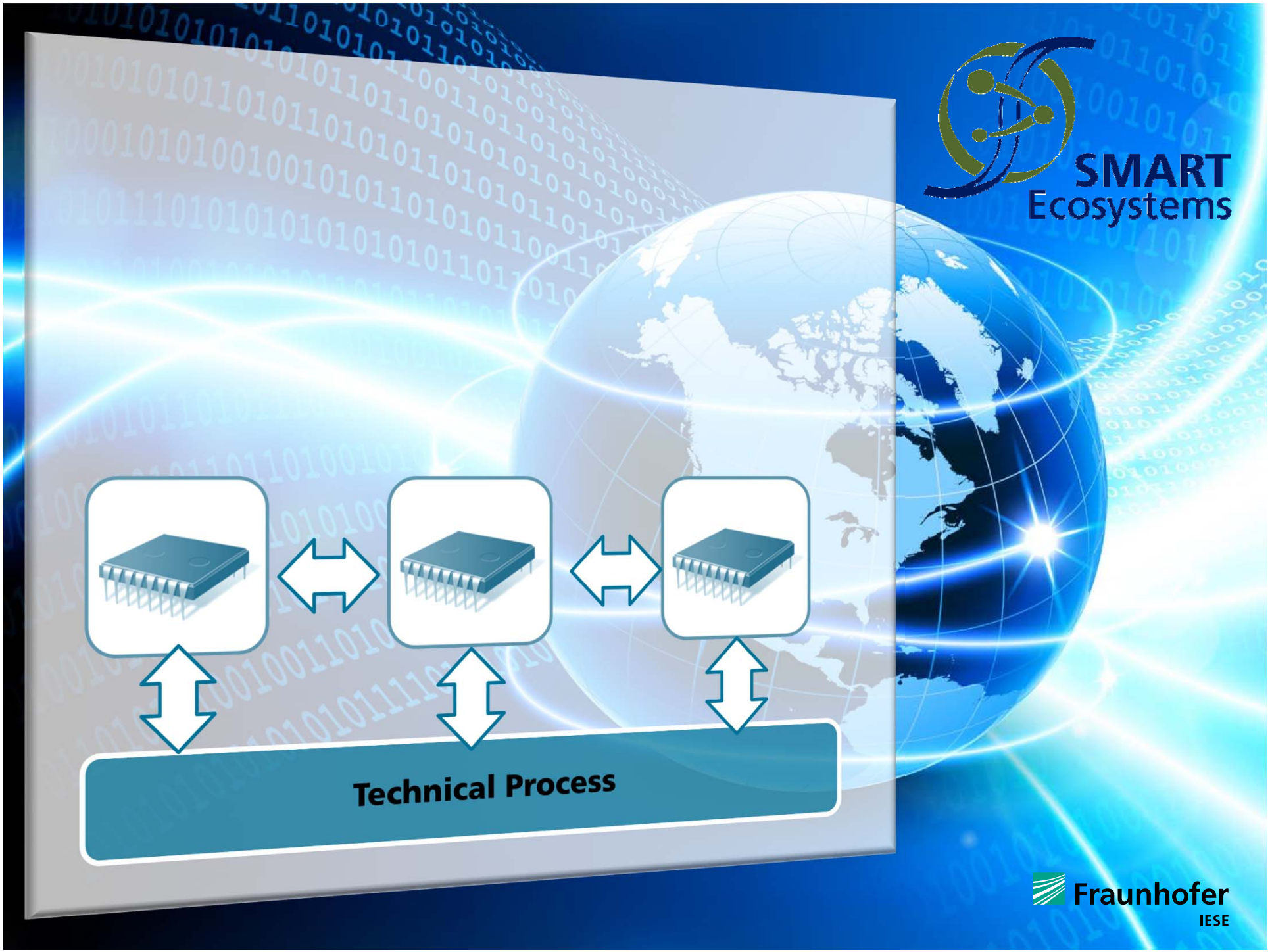
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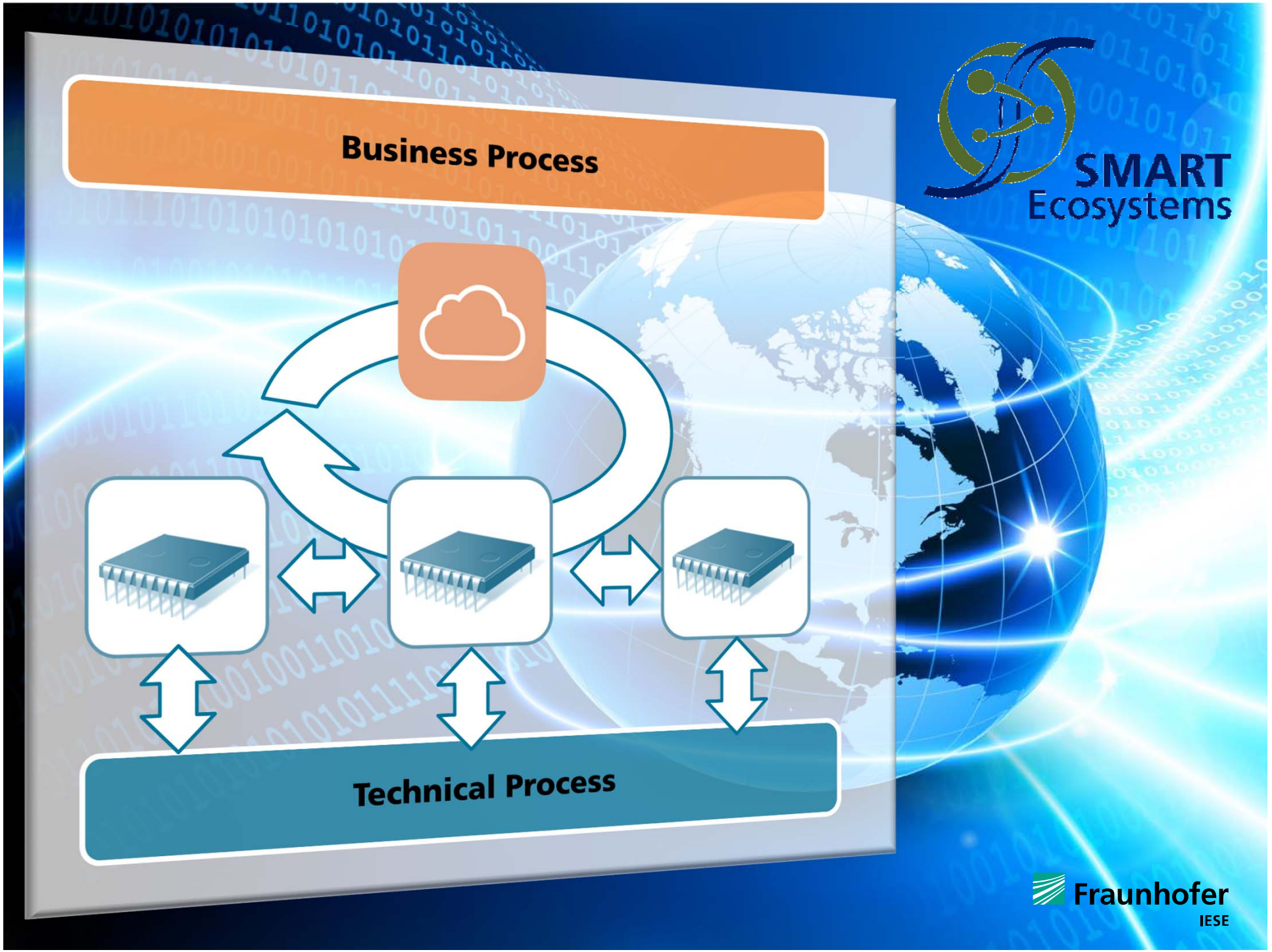
Business Process
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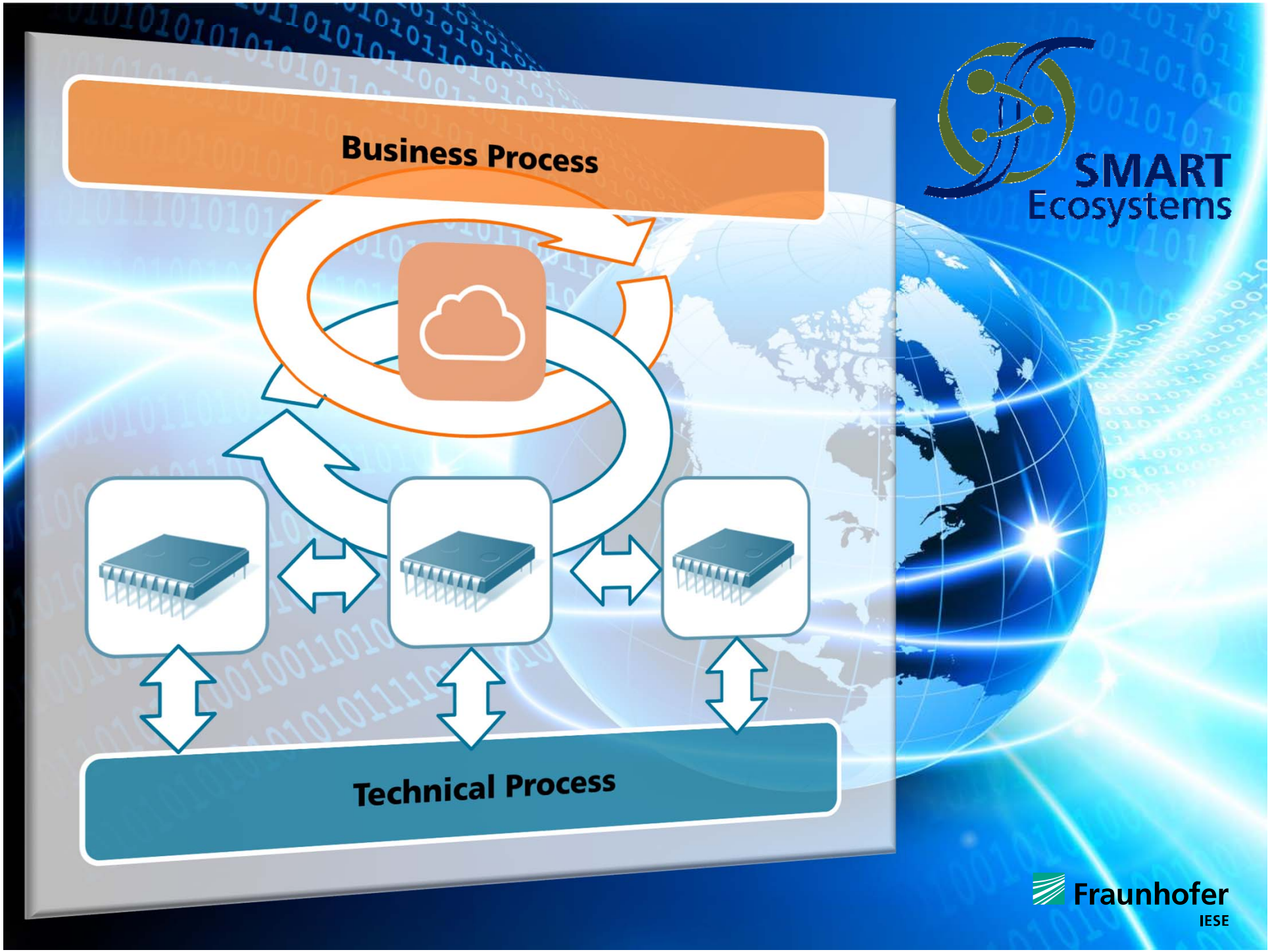
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Safety
Security
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Engineering/
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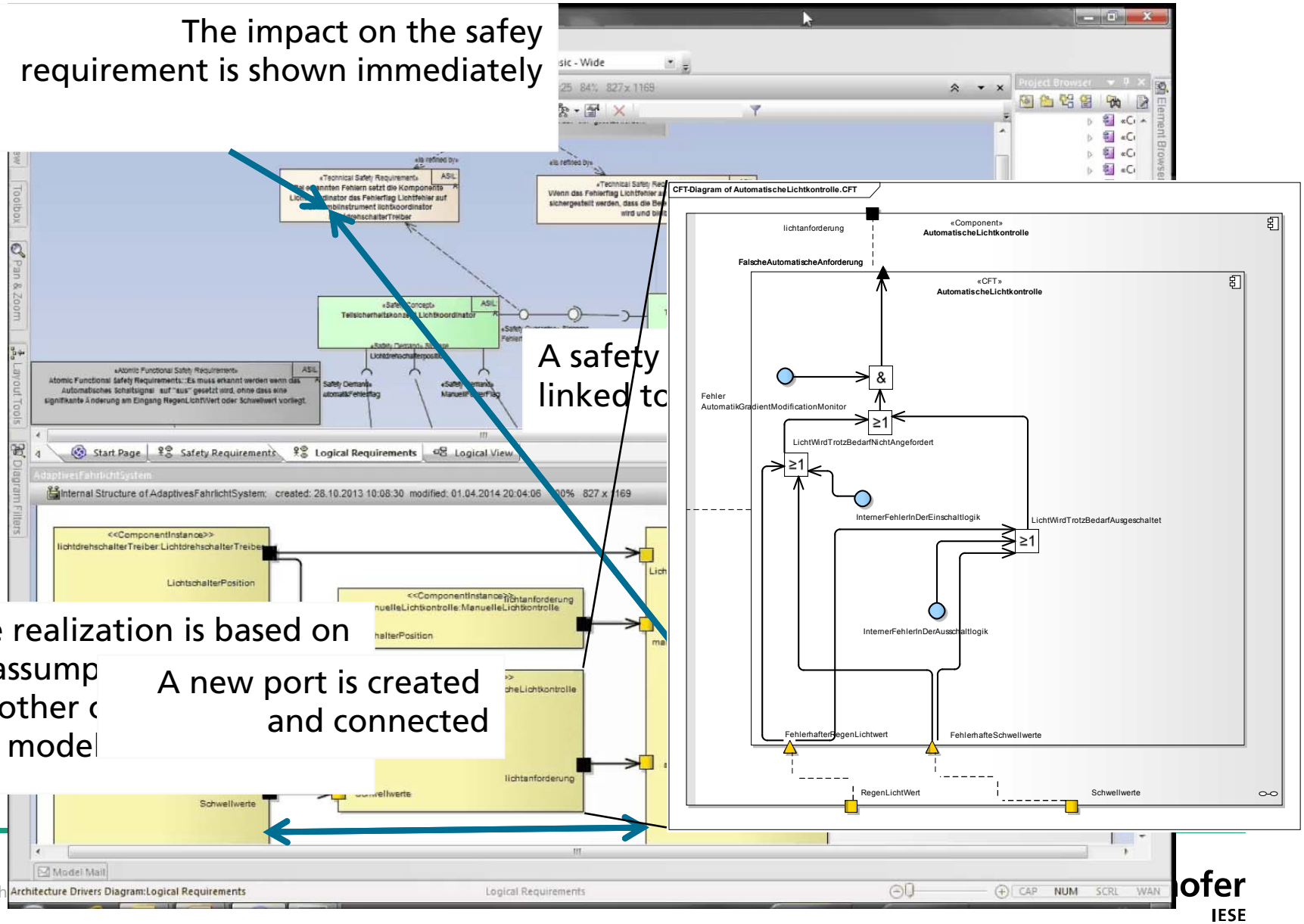
Challenges: Openness and Adaptivity leading to Uncertainties

- **Openness**
  - Systems are opened for supporting dynamic collaborations with other systems from different vendors / domains
  - Elements of the SoS can hardly be predicted at development time
  - Systems become vulnerable for security attacks
- **Adaptivity**
  - Systems dynamically adapt to their current runtime context (collaboration partners and their current quality of service, environmental conditions etc.)
  - Systems dynamically adapt their structure and / or behavior
- **Intelligent Behavior**
  - Systems are implemented using cognitive / intelligent behavior
  - Traditional quality assurance / runtime monitoring is insufficient
- **Uncertainty**
  - Resulting changes in the SoS‘s structure and / or behavior due to openness and adaptivity can hardly be predicted (at least: state space explosion)
  - At traditional certification / assessment times not all relevant facts are known

How to assure Safety?

A key to success: Integrated model-based Safety Engineering (i-SafE)

The impact on the safey requirement is shown immediately



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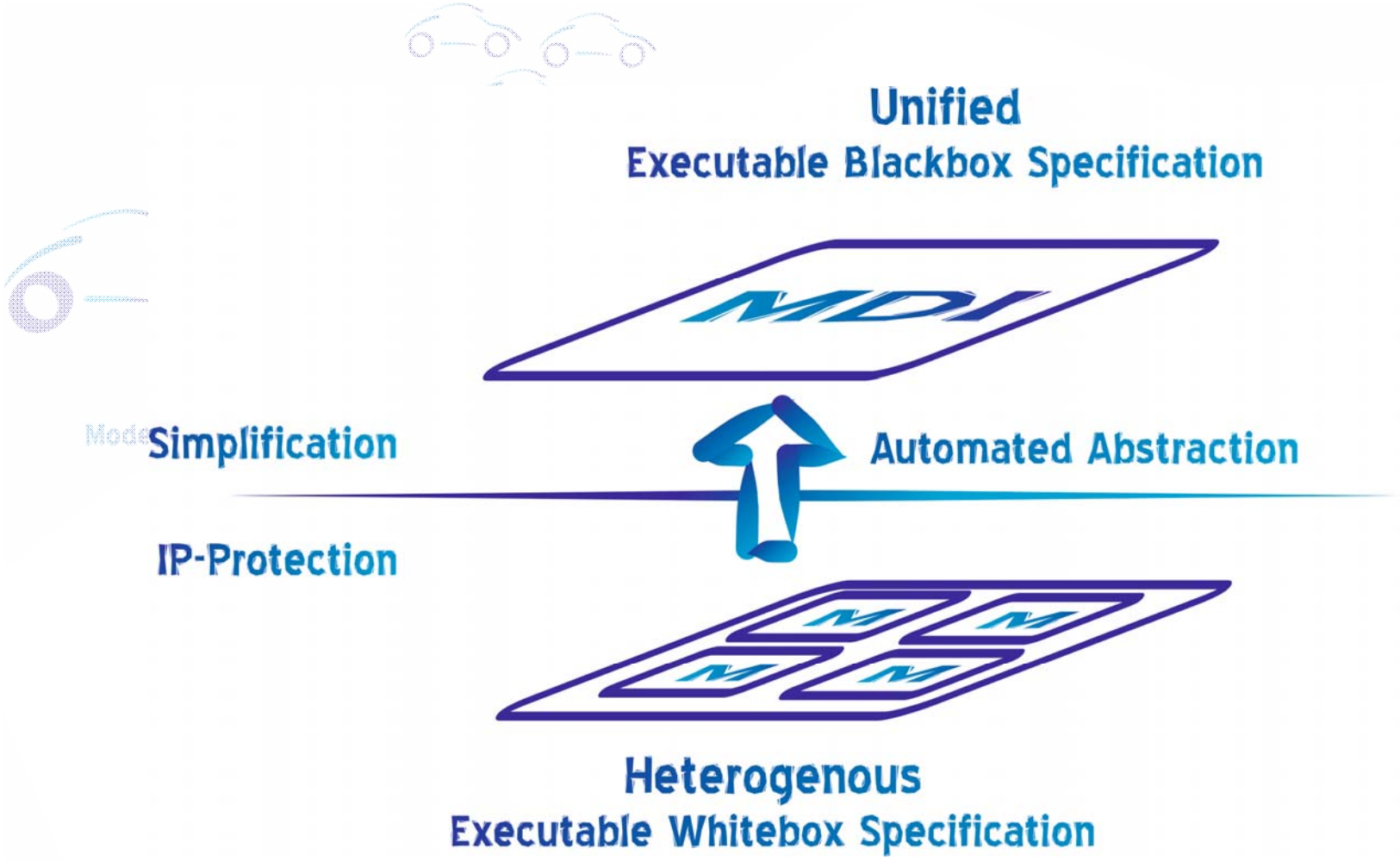
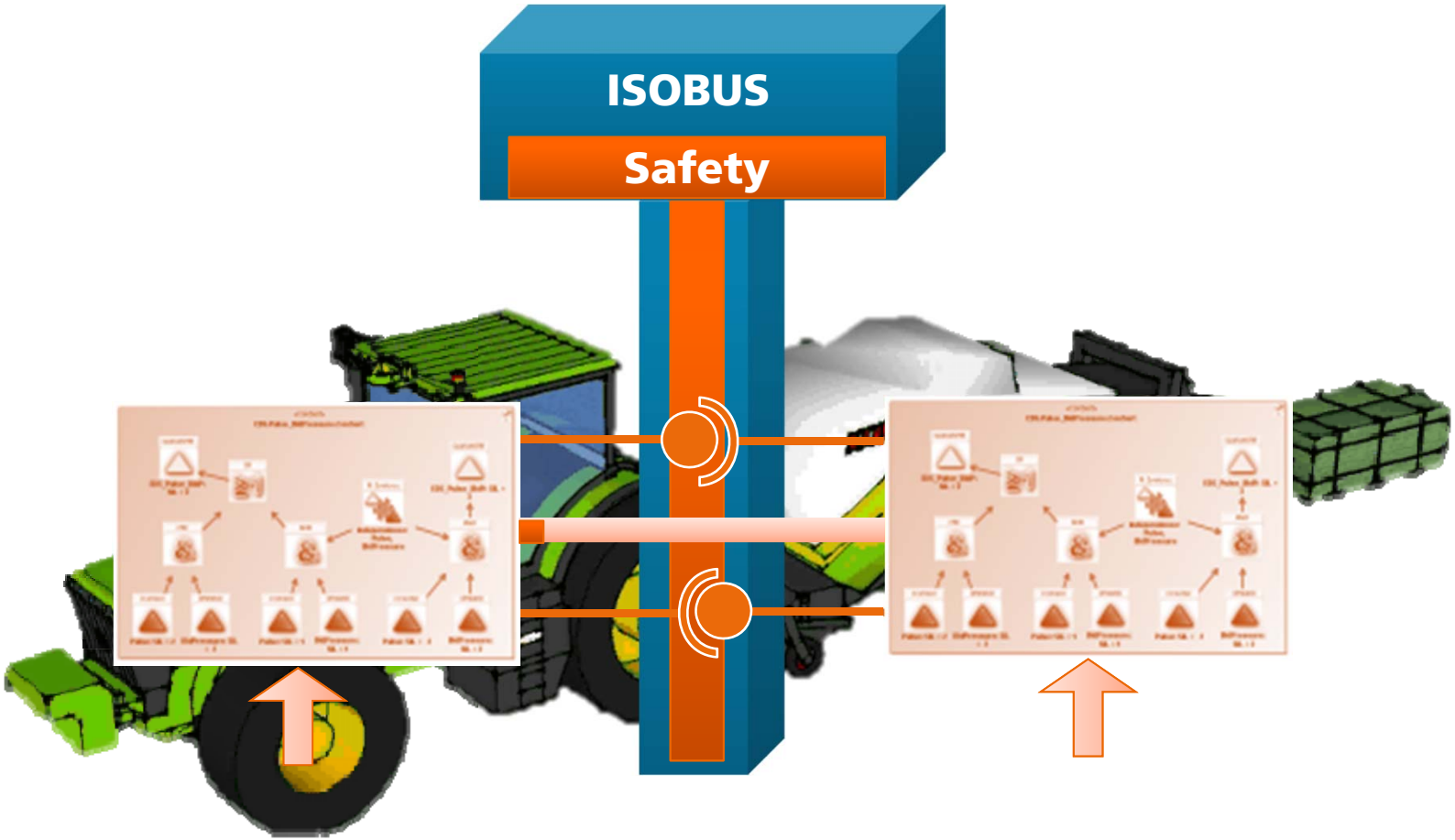
Virtual CPS-Integration



Conditional Safety Certificates – ConSerts
A Safety Model @ Runtime (SM@RT) as part of an MDI



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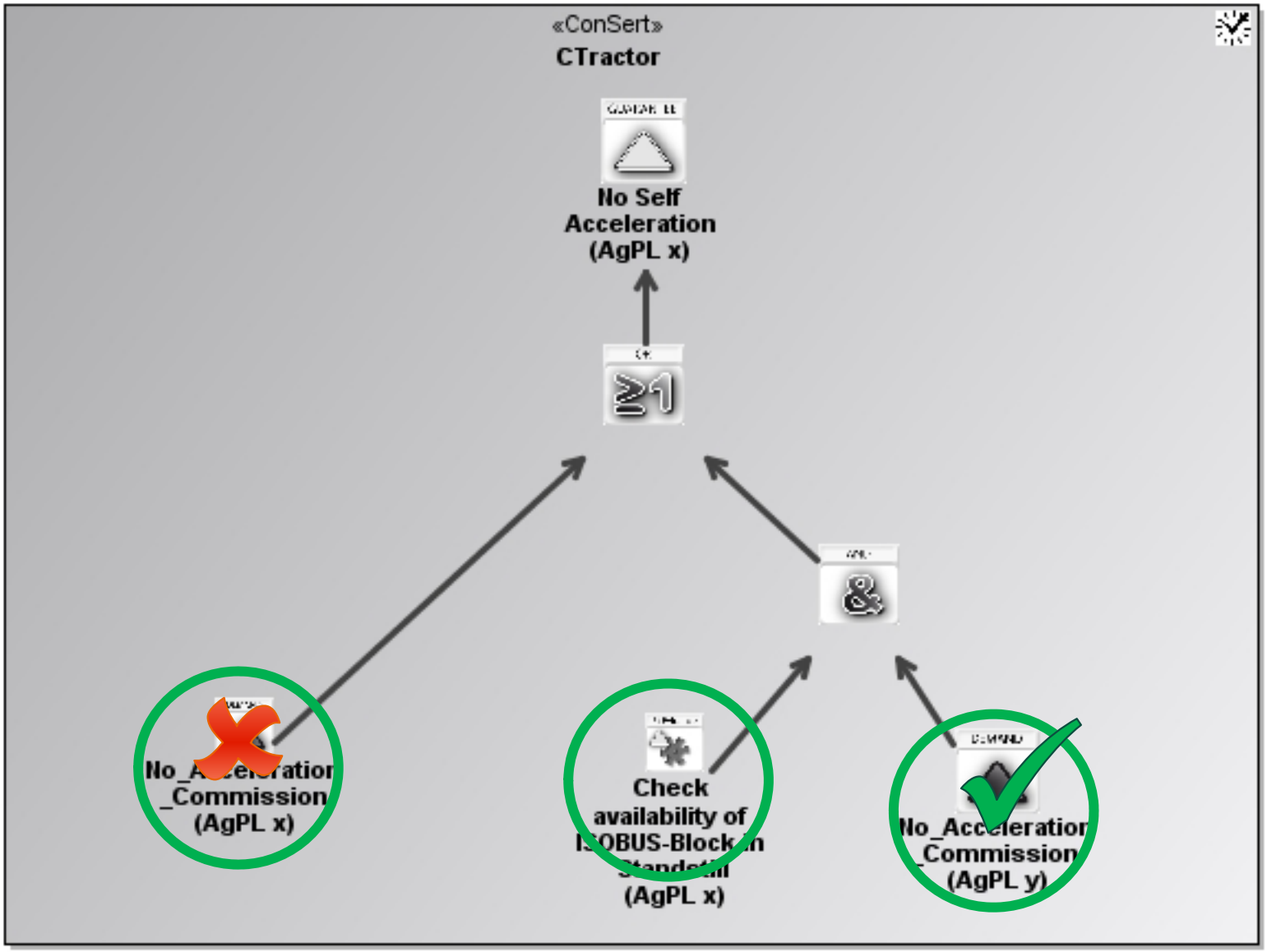
Basic Idea

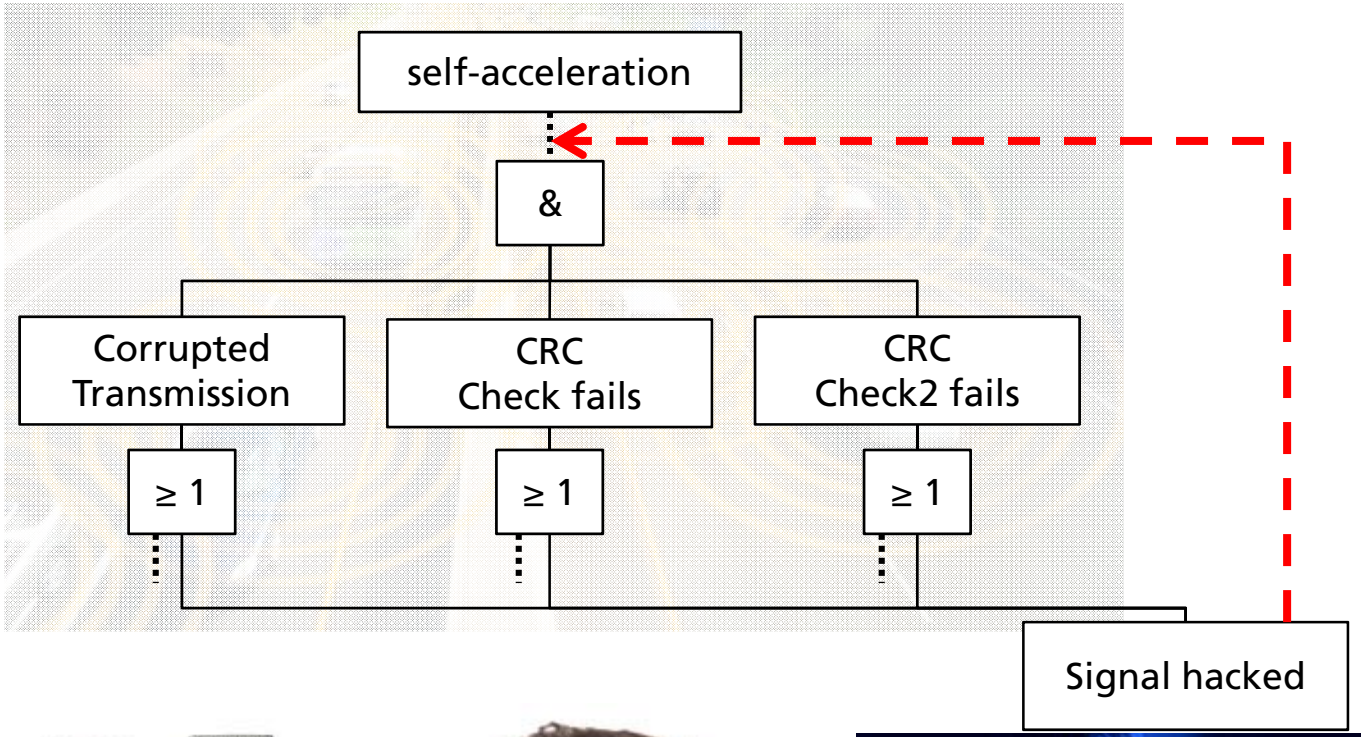


How does Security influence Safety?

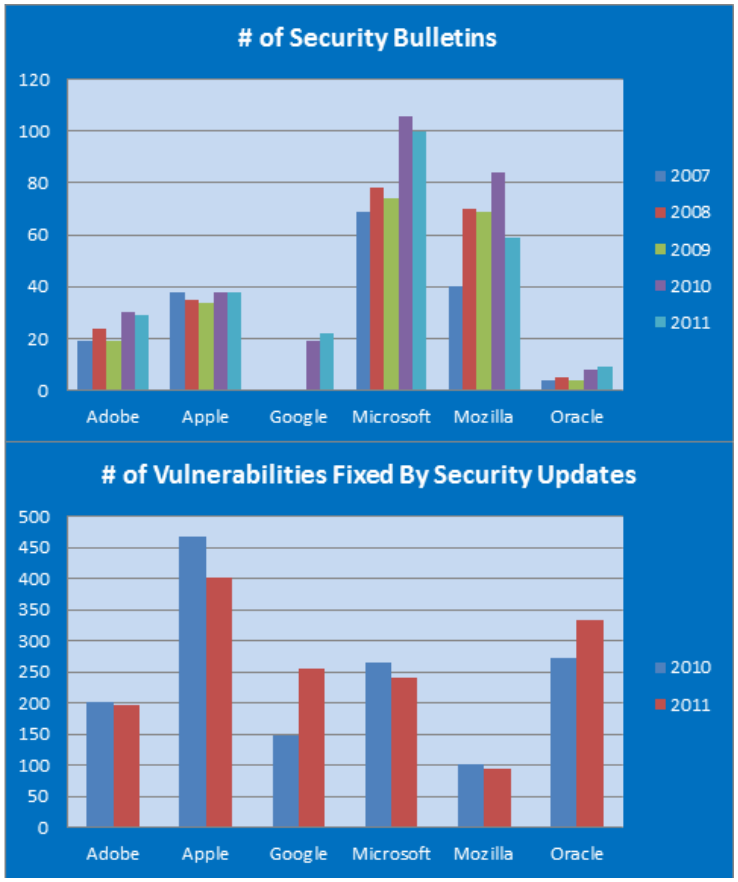
What‘s the difference – Just a matter of Probabilities?

- Safety is quantitative, security not?
  - No, safety is not quantitative if it comes to software
- Increasing the set of appropriate counter measures decreases the likelihood of safety-critical failures
  - This assumption does not hold for security
  - But how secure is safe enough then?
- If a system is safe at its release, its lifetime safety can be well-predicted
  - Even if a system is secure, this will not be true for a long time
  - Security is based on patches – Safety tries to minimize modifications

Hackers as neglected Common Causes



The Real Security Challenges take the Rear Entrance



- Embedded systems have reached comparable size
- Open systems will never be secure
  → how can they nonetheless be safe?
- Each patch means a software modifications
- How does a safety architecture look like enabling regular patches without requiring safety re-certification?

Summary

Safety

- Openness and adaptivity lead to uncertainty
- Behavior becomes more and more intelligent and partially indeterministic
- More intelligent safety monitors are required
- Safety Models @ Runtime provide an efficient and predictable means

Security as impact on Safety

- It is not only about qualitative vs. quantitative approaches
- Safety and security follow different basic „laws“
- Security has a far-reaching impact on safety assurance

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