TECHNISCHE UNIVERSITÄT WIEN

Institut für Computertechnik
Institute of Computer Technology

In-field Simulation Considering Considering Analog Variability

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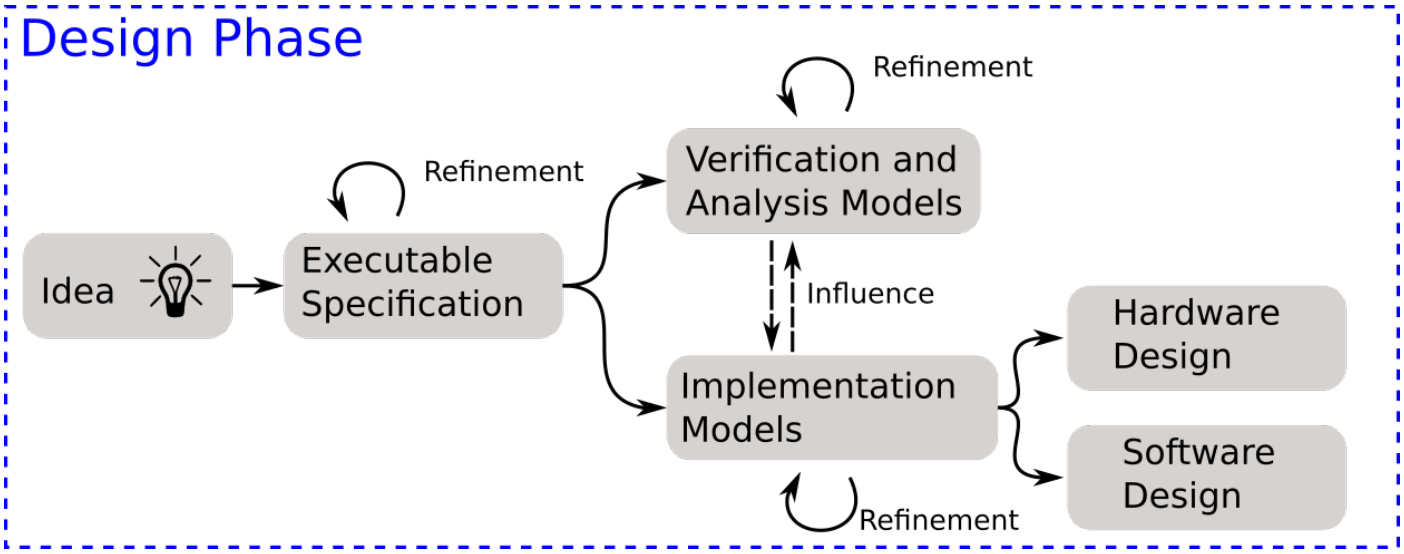
Motivation

- System simulation processes during the design phase
- Model driven design
- Verification and implementation models
- Extend simulations to the operation phase



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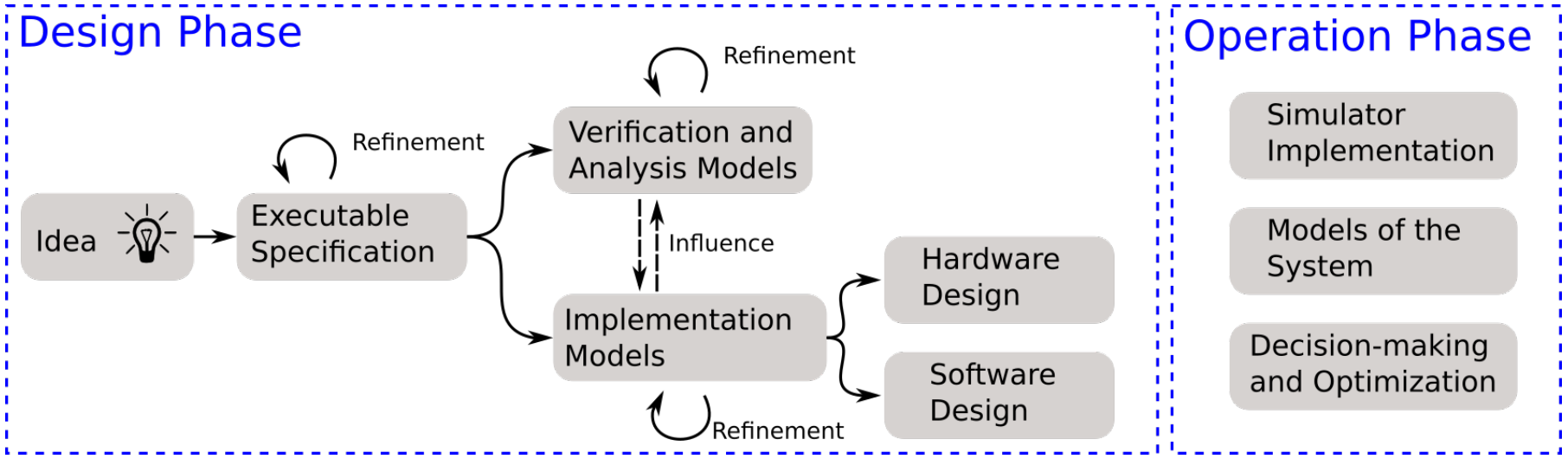
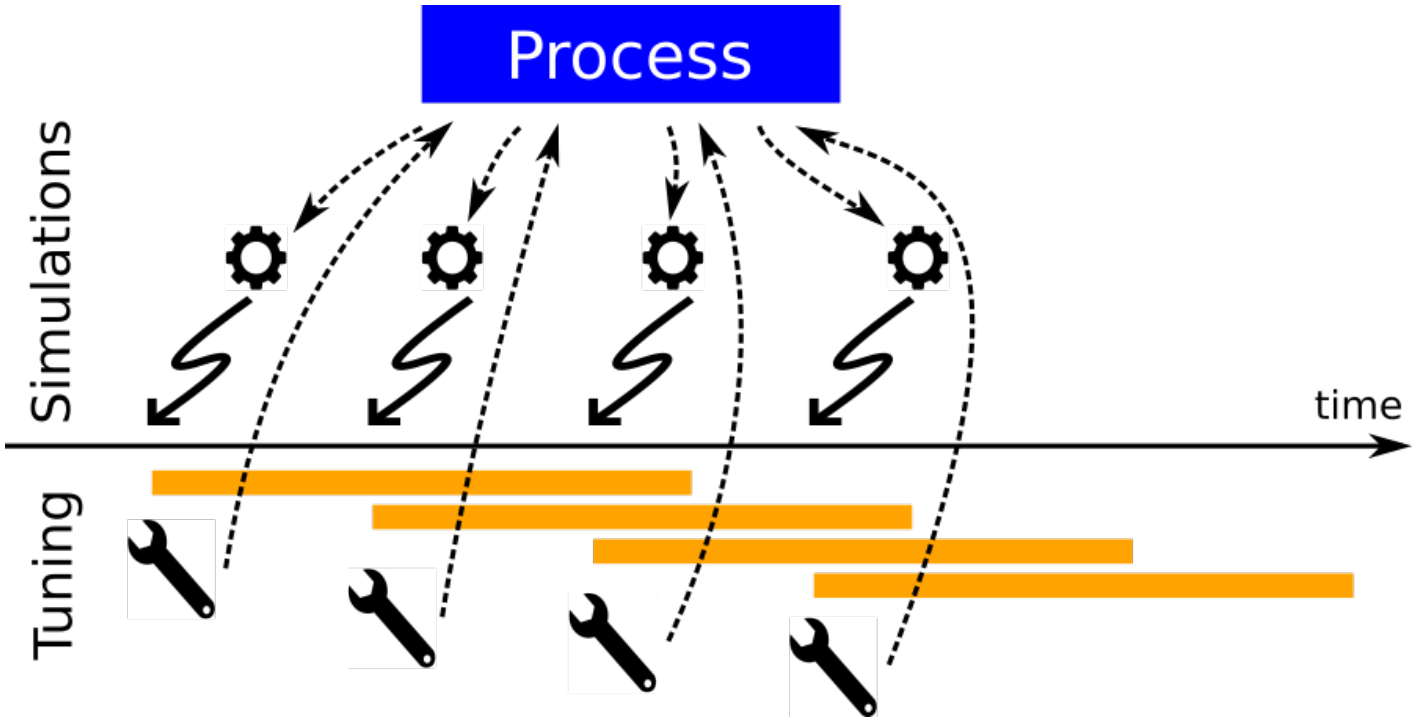


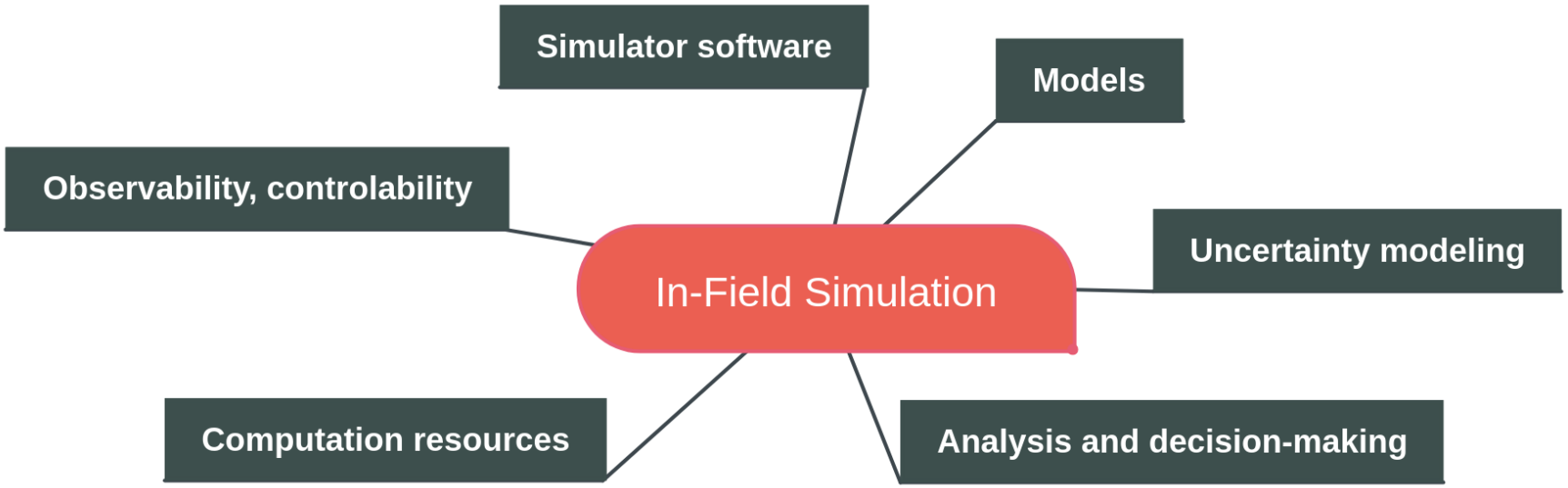
Concept and Approach

- Compute simulation results during runtime
- Added value for process control
- Dynamic environment facing uncertainty
- Feedback loops



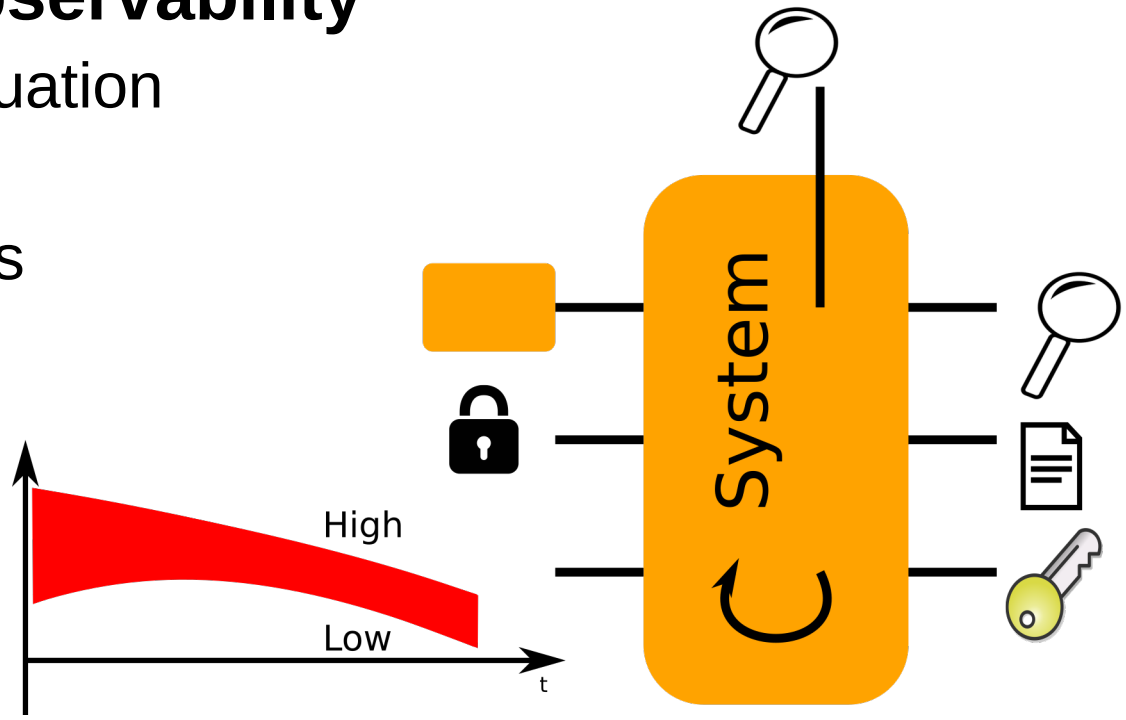
Requirements

- Challenges and requirements – a wish list
- Meet-in-the-middle design approach



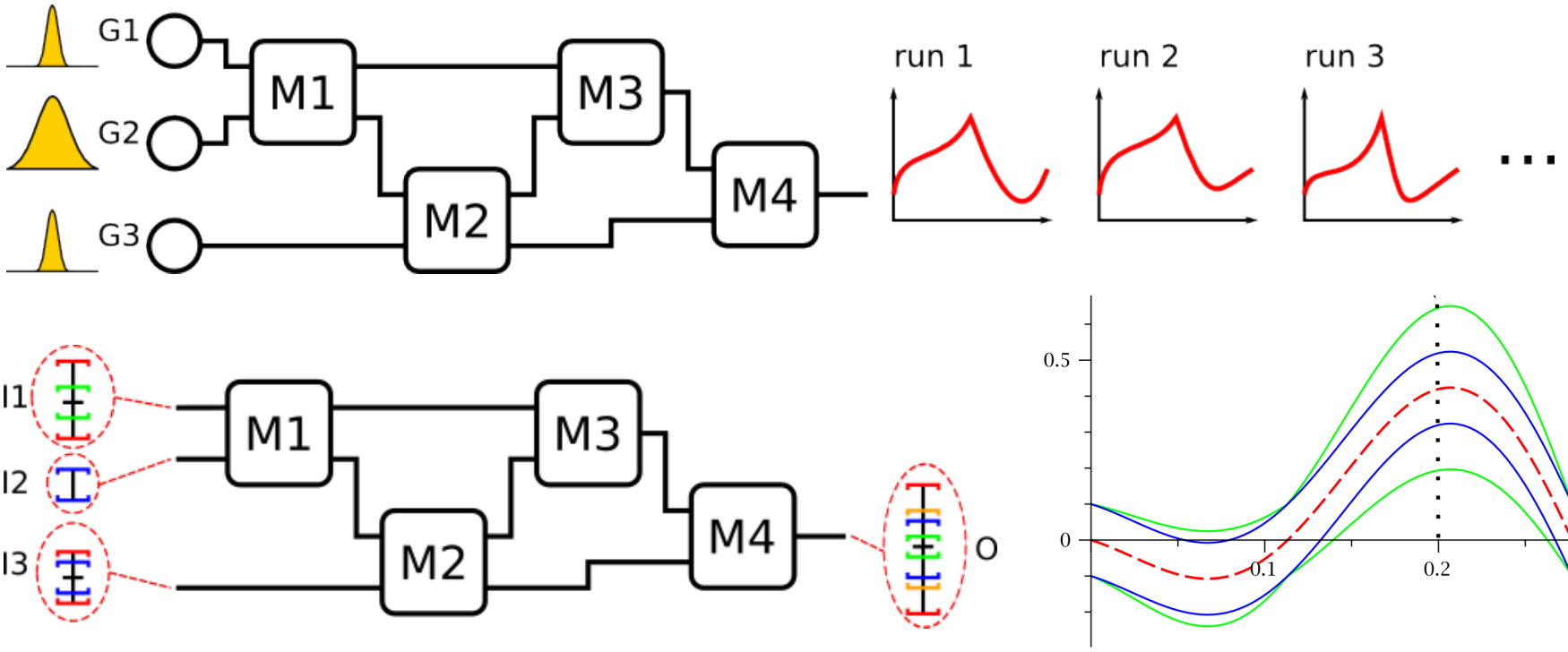
Requirements

- **Models**
  - C/C++ based descriptions
  - Use of verification and implementation models
  - Models of the environment
- **Controlability / Observability**
  - Process state evaluation
  - Parameter tuning
  - Operational bounds



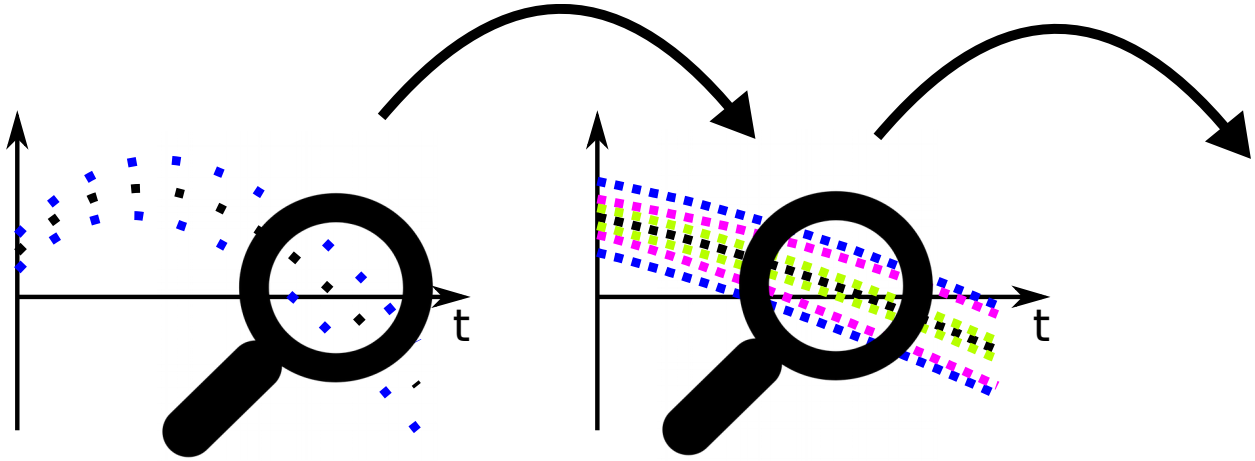
Requirements

- **Uncertainty modeling**
  - Impact of parameter deviations
  - Increasingly challenging
  - Multi-run methods vs. Affine Arithmetic Forms



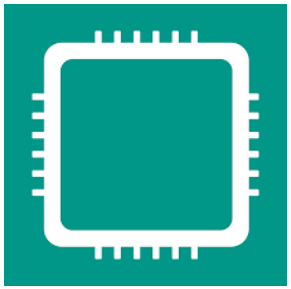
Requirements

- **Analysis and decision-making**
  - Objective -driven system analysis
  - Application specific algorithms
  - Expert-knowledge
  - Machine-learning approaches



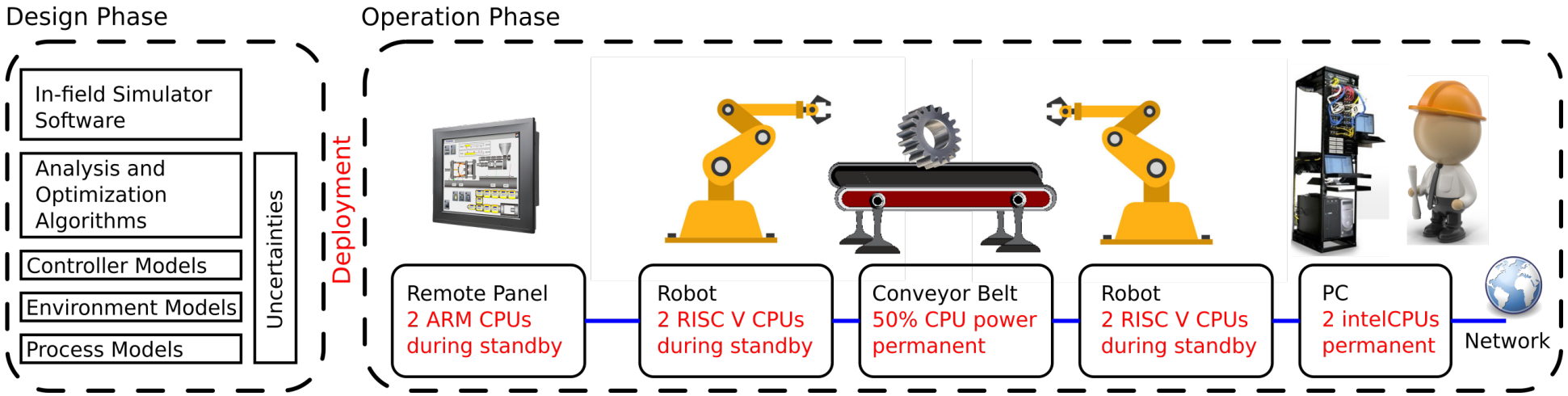
Requirements

- **Simulator Software**
  - Discrete-event simulator
  - Parallel and distributed
  - C/C++ language
  - Build-management
- **Deployment**
  - Usage of permanently or partially free resources
  - Coordinated integration of the simulation software

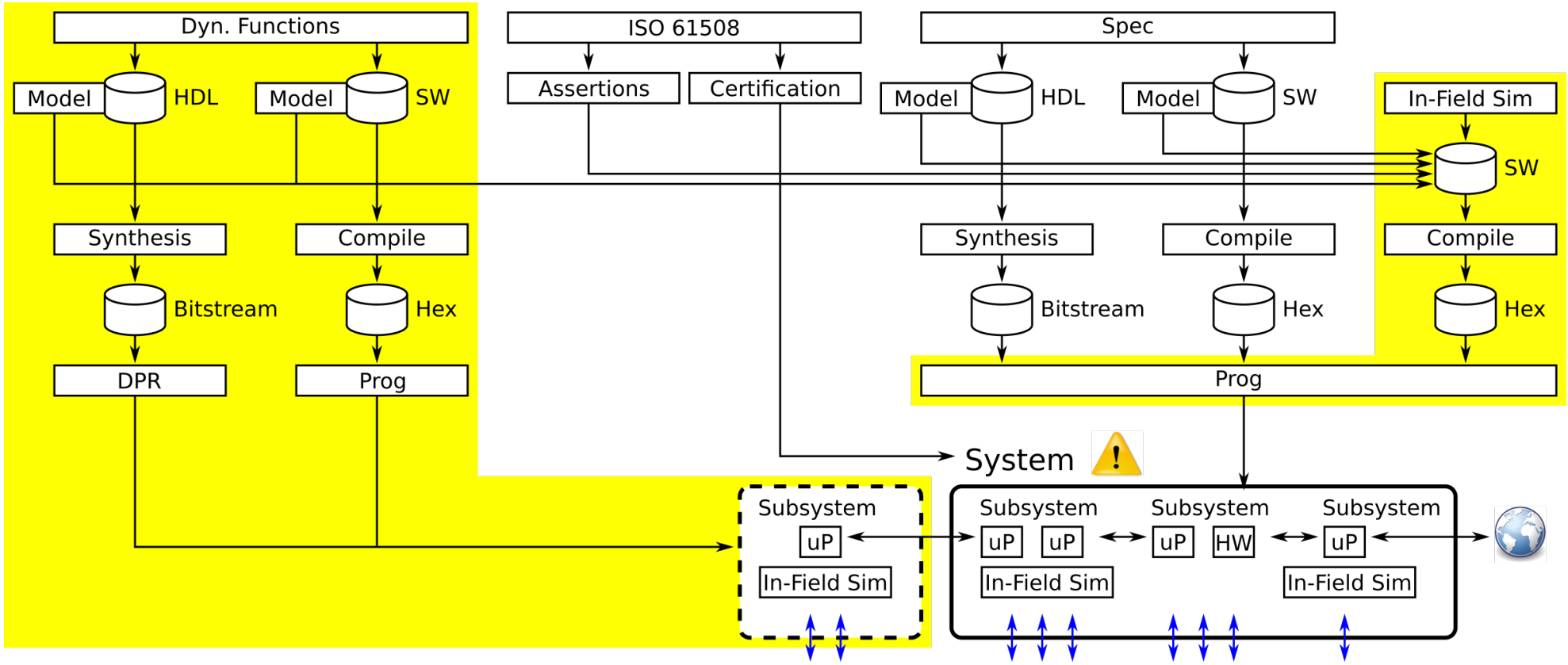


Example Use-case

- Analog behavior
- Optimize performance
- Industrial safety-critical application
  - Continuously observing safety properties
  - Re-Certification of configurable behavior

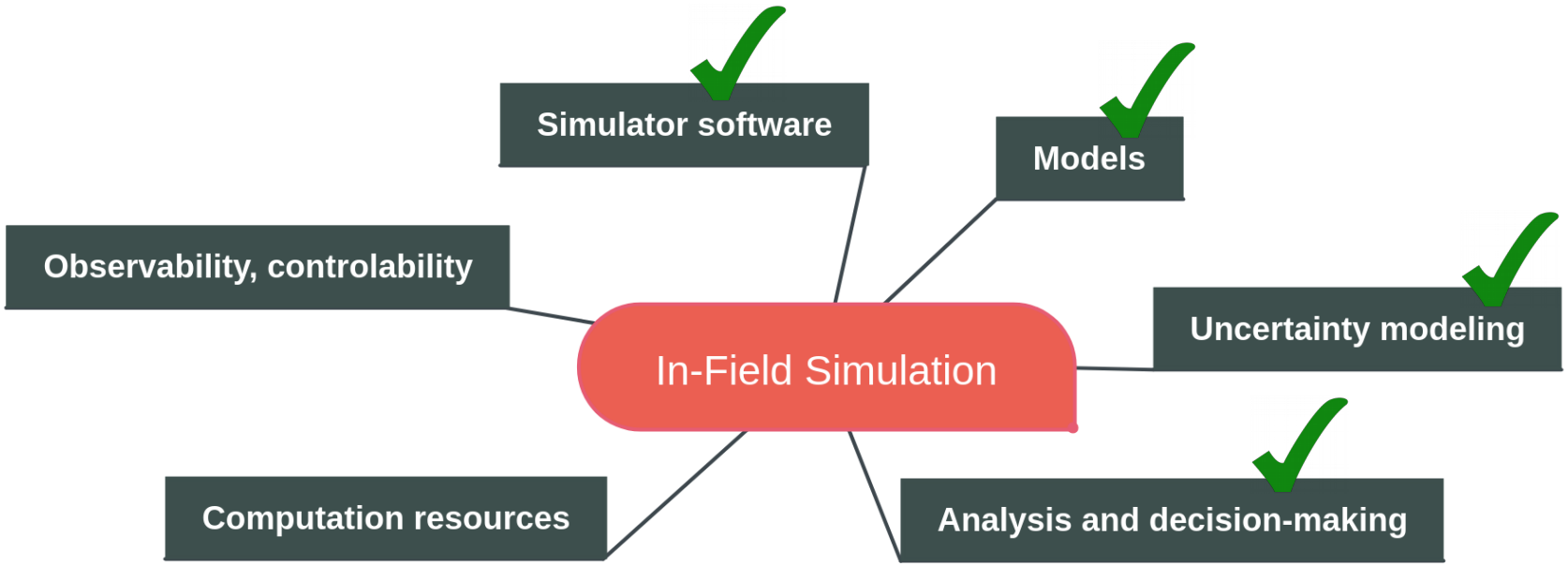


Development Flow



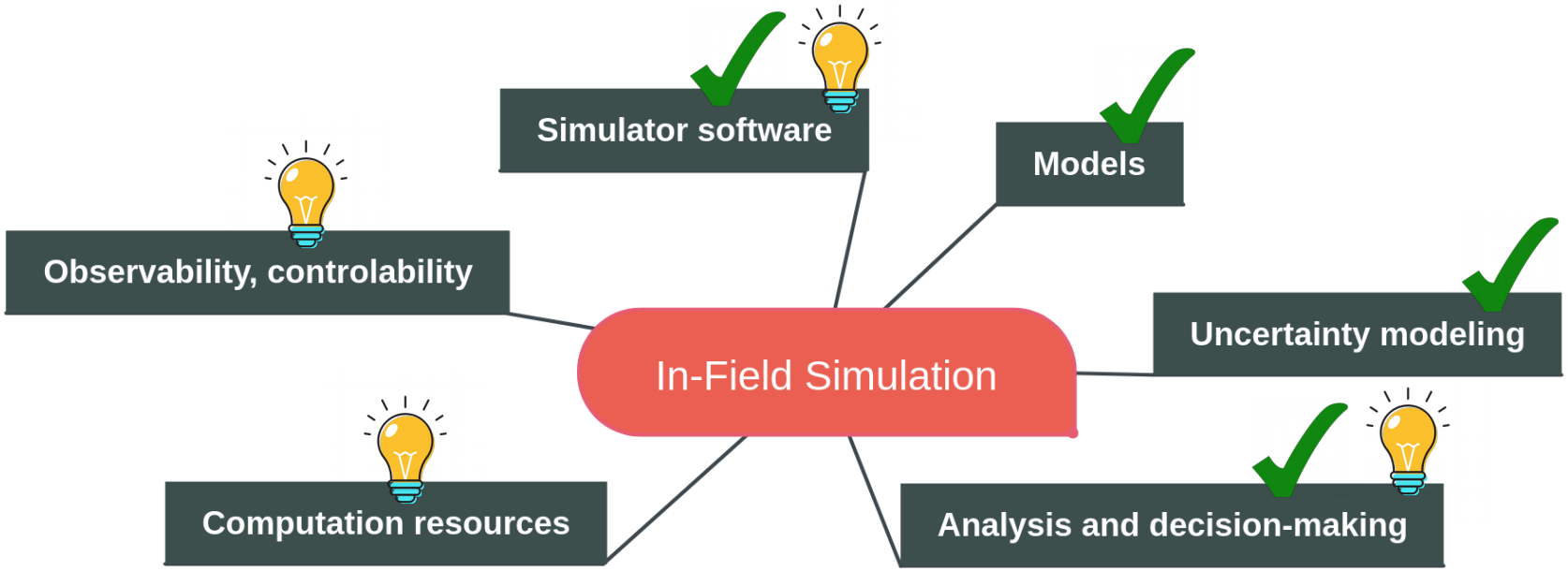
Work in Progress and Next Steps

- What we have:
  - Simulation core for analog systems
  - Design time verification models
  - C++ library for uncertainty representation
  - Objective driven system analysis



Work in Progress and Next Steps

- Next Steps:
  - Software build management
    - Platform / Library support
    - Dependable analysis and debug functions
  - Extend / modify the simulator core
  - Guided integration into an application



Conclusion

- Extend simulation processes to ***operation phase***
- Consideration of ***uncertainties*** and dynamic behavior
- Models used for design time verification
- ***Parallel and distributed*** simulation System
- ***Optimization and analysis***
  - Safety critical issues
  - Predictive maintenance
  - Etc.

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Thank you for your attention

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