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Adaptive CPS architectures, methods and tools:
the CERBERO project
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# Formal Methods in the CERBERO Toolchain

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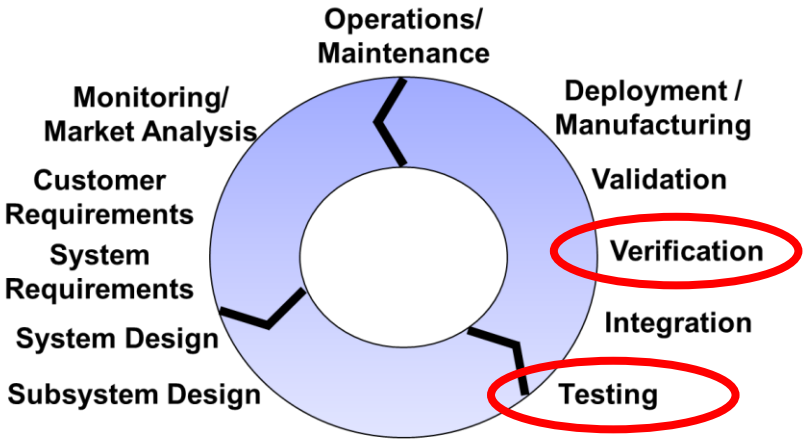
# Formal Methods


From aeronautic standard DO-178C:
*"Descriptive notations and analytical methods used to **construct, develop and reason about mathematical models of system behavior**. A formal method is a **formal analysis** carried out on a formal model"*

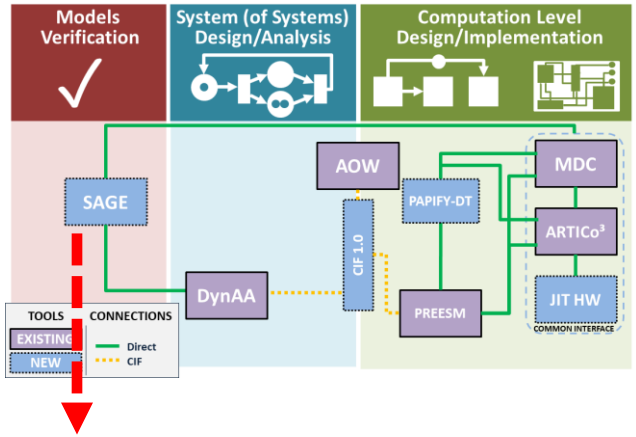
- Mathematically based techniques for the specification, development and verification of SW and HW systems.

- **Appropriate mathematical analysis can contribute to the reliability and robustness of a design**.

# Formal Methods (tools) in CERBERO




Continuous Model Based Engineering

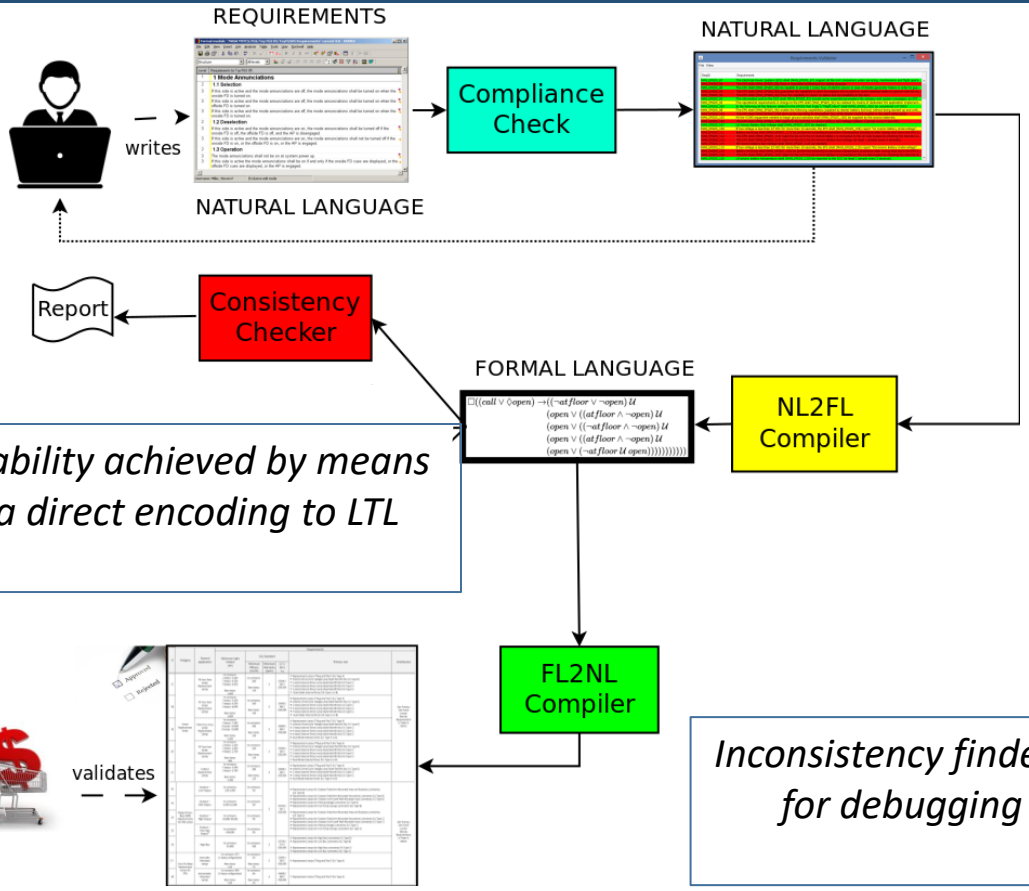



- **ReqV**: automatically check consistency of a set of requirements provided by the user.
- **ReqT**: requirement-based automated test generation.
- **HyDRA**: automated syntesis of high-level policies.

Open-source implementations (see the CERBERO web site)

# ReqV

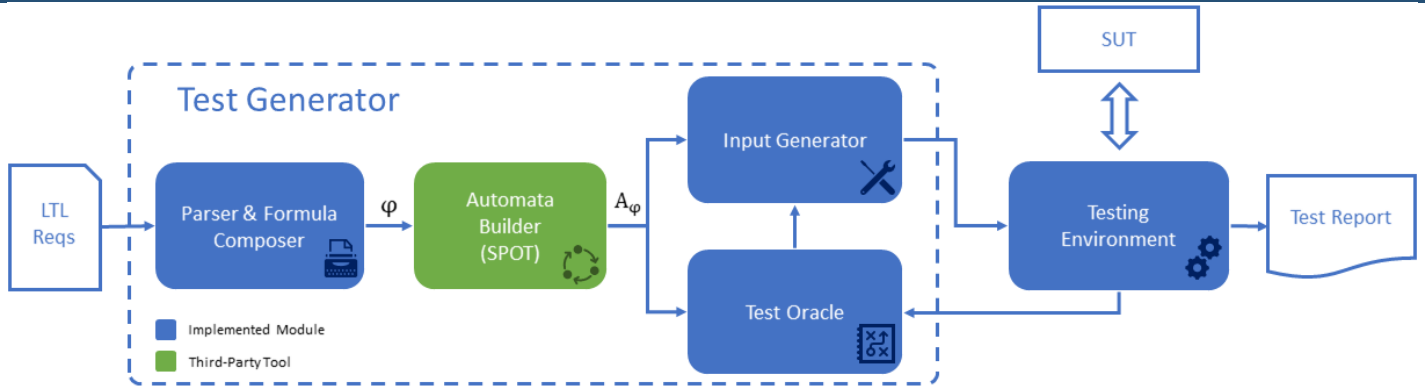
*Property Specification Patterns for Linear Temporal Logic with numerical constraints*



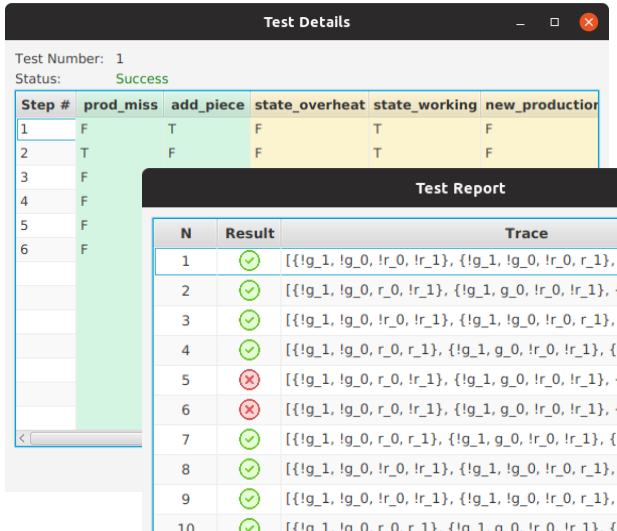

*Scalability achieved by means of a direct encoding to LTL*

*Inconsistency finder procedure for debugging purpose*

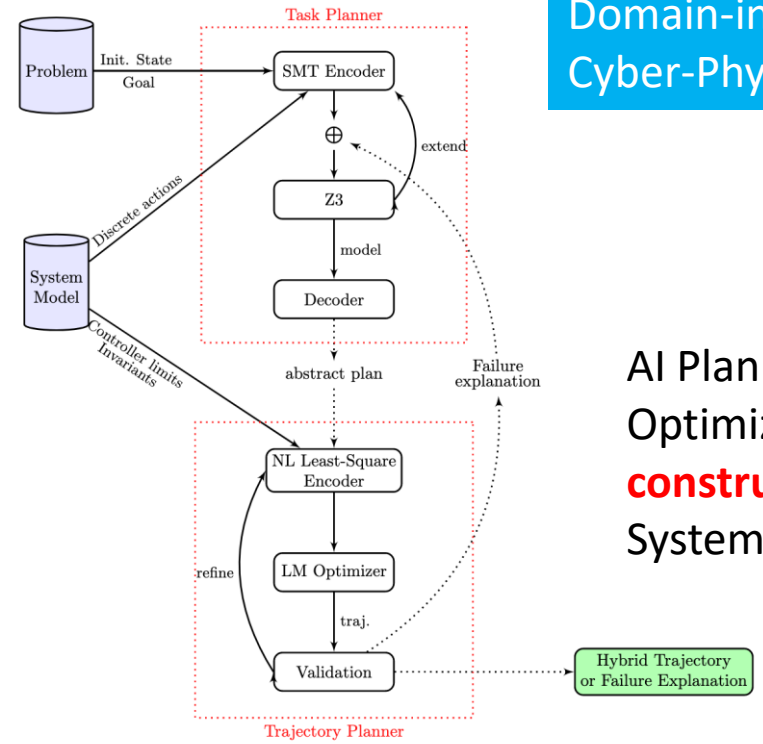
# ReqT




- Focus on black-box testing
- The quality of the generated test suite is comparable to the one obtained with MBT
- Formal assurance of the testing coverage



# Hydra




Domain-independent tool for Goal-Oriented control of Cyber-Physical Systems.

AI Planning + Satisfiability Modulo Theories + Numeric Optimization => derivation of goal-oriented, **correct by construction** strategies from high-level model of Hybrid Systems.

# References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