# Model-Based Engineering Session

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**Abstract:**

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Safety-Critical Software, facts

Safety-Critical Systems are becoming software-based.
Today’s cars usually contain more software.
Application in all domain (avionics, aerospace, medical, etc.)
Software size is growing exponentially ...
... but validation/verification is still needed.
Increase in software size and complexity.
Less robustness and reliability.

Need to find new development methods and tools.
Understanding Actual Software Issues

High Fault Leakage Drives Major Increase in Rework Cost

- Aircraft industry has reached limits of affordability due to exponential growth in SW size and complexity.
- 70% Requirements & system interaction errors
- 80% late error discovery at high rework cost
- 70%, 3.5% 1x
- 10%, 50.5% 20x
- Major cost savings through rework avoidance by early discovery and correction
- A $10k architecture phase correction saves $3M

Rework and certification is 70% of SW cost, and SW is 70% of system cost.

Costly certification process leads to high percentage of operational work around.

Sources:
The Model-Based Approach

Abstract System Representation
   Hide and delegate implementation details to tools
   Highlight Software or System important concerns

Separate domains of engineering
   Functional models for representing control laws
   Architecture models to validation components deployment

Automate the development process
   Avoid manual efforts (code production, system validation)
   Support each development step (design, development, etc.)
Model-Based Cost Expected Benefits

Should-cost modeling identifies significant potential savings

15% to 45% total reduction
Model-Based, other benefits

Management of Product Lines
- Components variability
- Reuse of existing certification/validation artifacts

Detect components integration issues
- Before implementation efforts
- Check system requirements enforcement before testing

Facilitate validation/verification/certification activities
- Generation of documentation
- Use of Model-Based Verification
Model-Based Engineering at HILT2014

- “AADL and Model-Based Engineering” - Peter Feiler

- “Resolute: An Assurance Case Language for Architecture Models” – John Backes

- More to come after!

- 5 papers (almost 50%! ) have a focus on Model-Based Engineering

- Common objectives with the initial SIGAda conference
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