Decision meeting on primary toolchain
WP7 Task 7.1

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Systerel

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ITEA 2
INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

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Outline

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Aim

- Identify the modelling languages
- Identify the modelling tools
- Identify the tool platform (see Block 2)

⇒ **Proposal** : Benchmark of means, tools and tool platform

ITEA reviewers conclusion

- Do not spare time to select methods and tools
- Keep the essential aim in mind

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- Inputs: WP2 deliverables
  - States of art: D2.1 and D2.2 (and partly D2.4)
  - OpenETCS design process: D2.3
  - Case studies proposal: D2.5
  - OpenETCS requirements: D2.6-9
- Outputs :
  - Set of models: O7.1.1, O7.1.5
  - Criteria template: O7.1.3, O7.1.7, O7.1.9, O7.1.10
  - Selection: O7.1.4, O7.1.8, O7.1.11
  - **Decision : D7.1**
- Key dates for T7.1
  - November 2012: start for first models
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OpenETCS criteria

- Criteria on means and tools for primary toolchain
  ### around 144

- Key criteria
  - Means and tools for design and modelling
  - From high level SRS specification to software code (non-vital or SIL4 compliant)
  - Open Source approaches
  - Interoperability of means and tools during design process
  - Interoperability with secondary means and tools (VnV, safety, requirement management,...)
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Outline

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# Benchmark activities

- 13 approaches proposed
- 15 partners involved
- Documented models available on github
- Criteria templates fill: O7.1.3-O7.1.7

	GOPRR	ERTMSFormalSpecs	SysML with Papyrus	SysML with EA	SCADE	EventB	Classical B	System C	Petri Nets	GNATprove
Documentation	3	7	6	7	8	7	0	0	2 (3)	2 (3)
Modeling	**9**	**9**	**9**	**9**	**9**	**9**	**9**	8	**6(9)**	2 (3)
Design	6	**9**	6	7	**9**	7	8	**9**	5(7)	3 (4)
Code generation	**9**	1	3	4	**9**	3	**9**	5 *	2 (3)	**6(9)**
Verification	0	7	6	3	8	**9**	**9**	4 *	**6(9)**	**6(9)**
Validation	0	**9**	5	4	8	**9**	4	7	**6(9)**	**6(9)**
Safety analyses	0	0	4 *	6	1	6	3	3 *	5(7)	2(3)

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OpenETCS Design Process
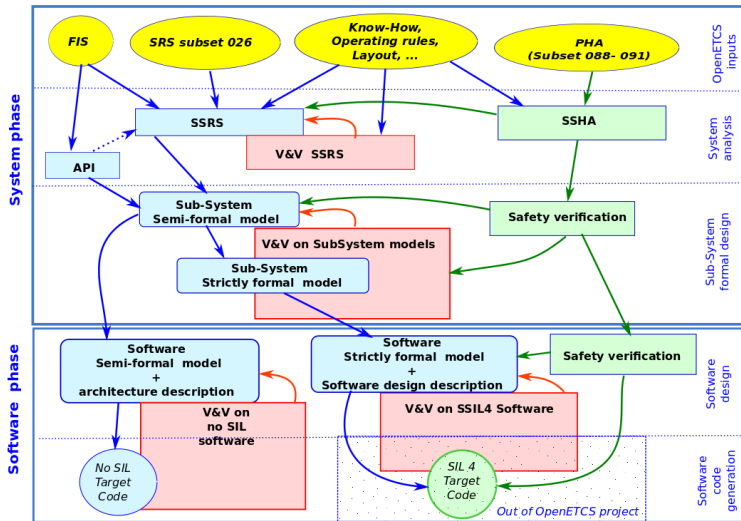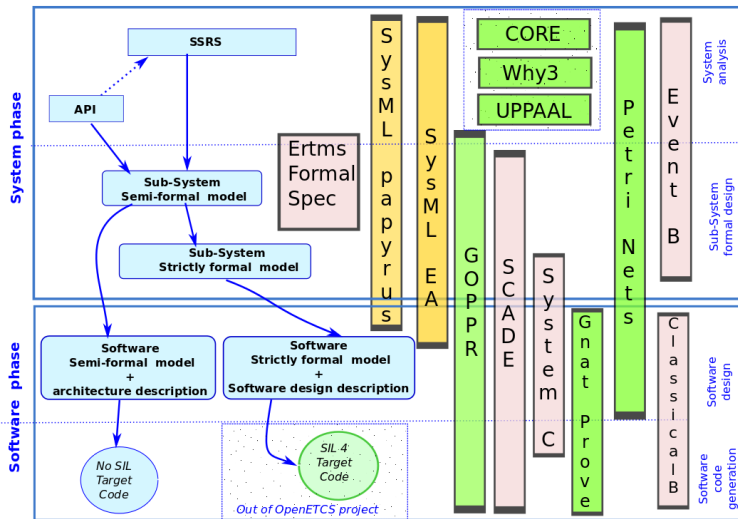
Benchmark results (2)
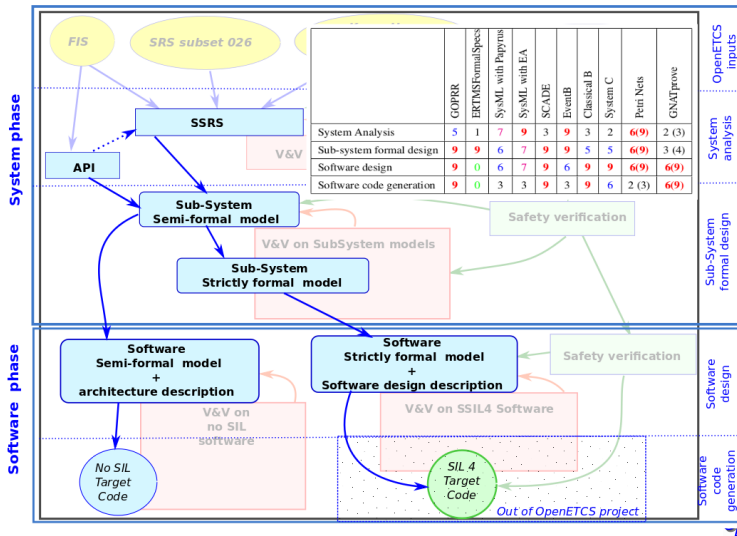
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Overview

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CORE

- Proposed by All4Tec
- Approach and tool suitable for system analysis
- Evaluation stopped:
  - close source tools
  - difficulties to integrate the approach in the project
  - mising of inputs for this approach (operational rules)

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Why3

- Proposed by MERCE
- Platform for deductive program verification
- Evaluation stopped:
    - GnatProve is more efficient to cover the same topics

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GOPPRR

- Proposed by Uni. Bremen
- Domain specific language allowing definition of meta-models
- University of Bremen is currently more in favour of SysML based approach (Munich meeting)

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Color Petri Nets

- Proposed by Uni. Braunschweig
- Formal notation, supported by various formal analysis mechanisms
- No model provided, Uni. Baunschweig proposes to discharged it

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UPPAAL

- Proposed by TwT gmbh
- Tools for verification and validation of real-time properties
- Moved to the benchmark of tools for VnV

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Gnat-Prove

- Proposed by MERCE
- Tools for formal verification on Ada code
- Moved to the benchmark of tools for VnV

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Outline

1. T7.1 Presentation
   - T7.1 Overview
   - T7.1 Results

2. **T7.1- First round**
   - Overview of the candidates
   - Discarded approaches
   - Approaches moved in secondary tool benchmark
   - **SysML case**

3. T7.1 - Second round
   - Overview of the candidates
   - Decision on second round

4. Conclusion

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One approach - two tools

- A standardized approach SysML
- Two tools proposed:
    - Papyrus (CEA/All4Tec/Fraunhofer)
    - Entreprise Architect (Uni. of Bremen)
- Exchanged of models between the tools seems difficult

Can we select only one tool now ?

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Pros - Cons

Papyrus
+ EPL license
+ Eclipse platform
+ Interoperability
+ Active community
+ Modular architecture
- Poor with analysis tools
- SysML 1.2
- Diagrams
- GUI

Entreprise Architect
+ GUI
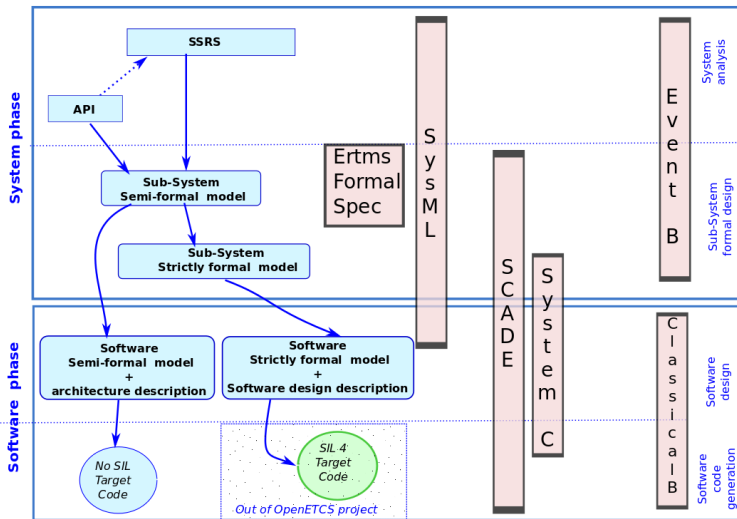+ Diagrams
+ SysML 1.3
+ Stable tool
+ Analysis tools
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- Only on windows
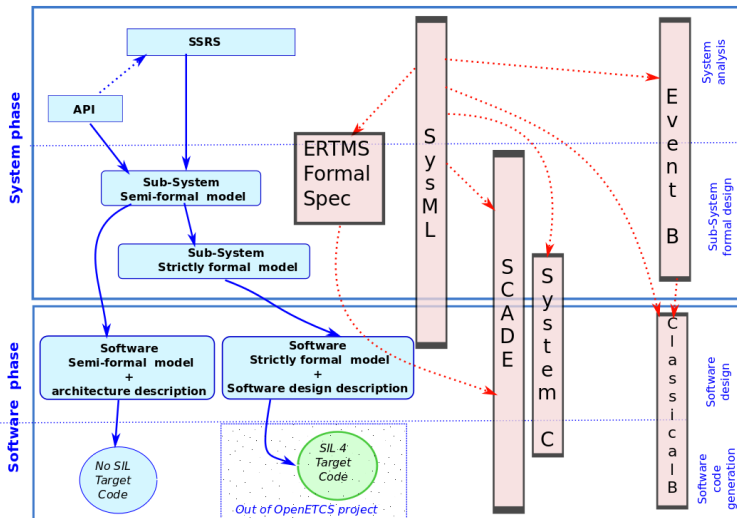
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Overview

Interactions

Items for open Discussions

- Open source approach ?
- Approach easy to integrate in the toolchain ?
- End-user point of view (railway operators and industrials, modellers, VnV responsible, safety responsible,..) ?
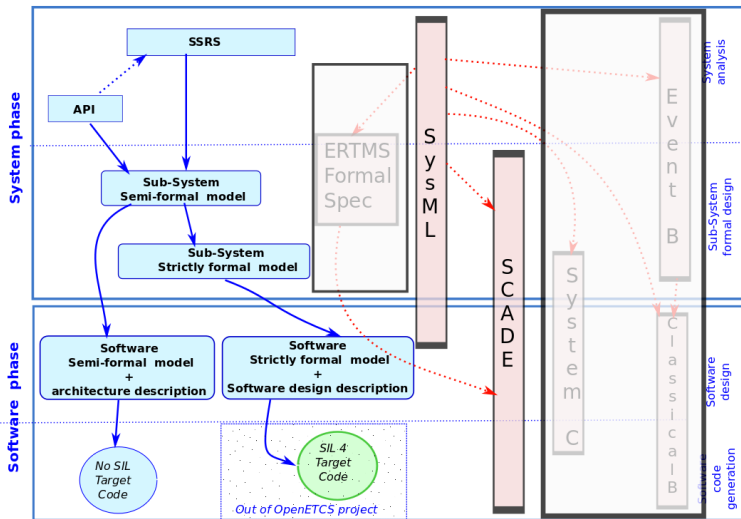- Cooperation between approaches ?
- . . .

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Discussion

- open discussion
- decision ?

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First proposal

Open questions

- How to use SysML and SCADE during the process (vertical integration) (WP2-WP7) ?
- How to integrate the approaches on the whole process (VnV, Safety,...) (horizontal integration) (WP2-WP4) ?
- Close property (WP7) ?
- Integration of Scade on eclipse tool platform (WP7) ?
- Who has knowledge to made effort on modelling with these approaches (WP3) ?
- Who has knowledge to made effort on VnV, safety,... around these approaches (WP4) ?
- Who has knowledge to participate to the development of the tool chain on these approaches (WP7) ?

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Back-up approaches

- ERTMS Formal Spec (Bracking curves + VnV)
- System C (Vn)
- Classical B (VnV)
- Event B (VnV and Safety analysis)

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