ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

openETCS

Workpackage 4
Verification & Validation & Safety approach

supported by:

Federal Ministry of Education and Research

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openETCS@ITEA2 Project

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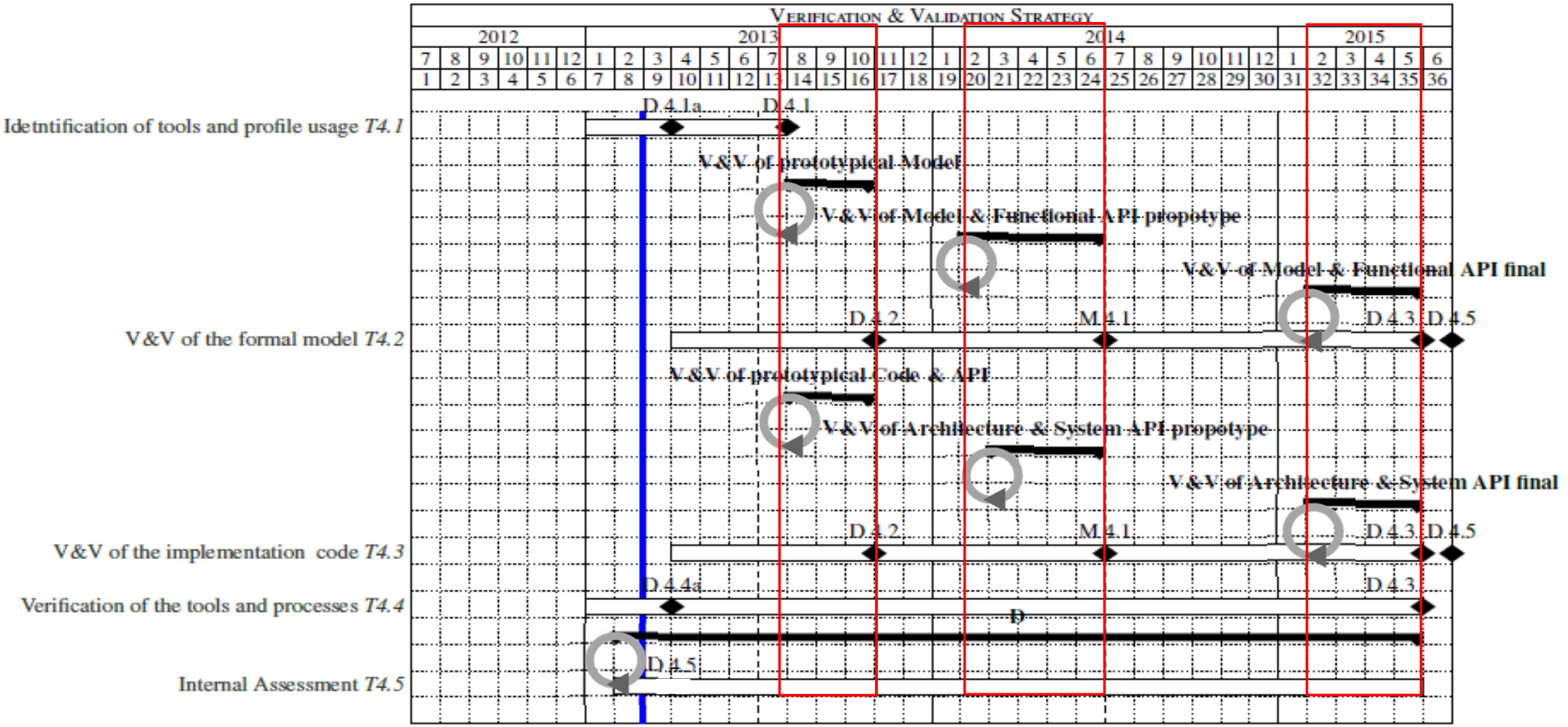
Paris, 04.07.2013

Verification and Validation Activities

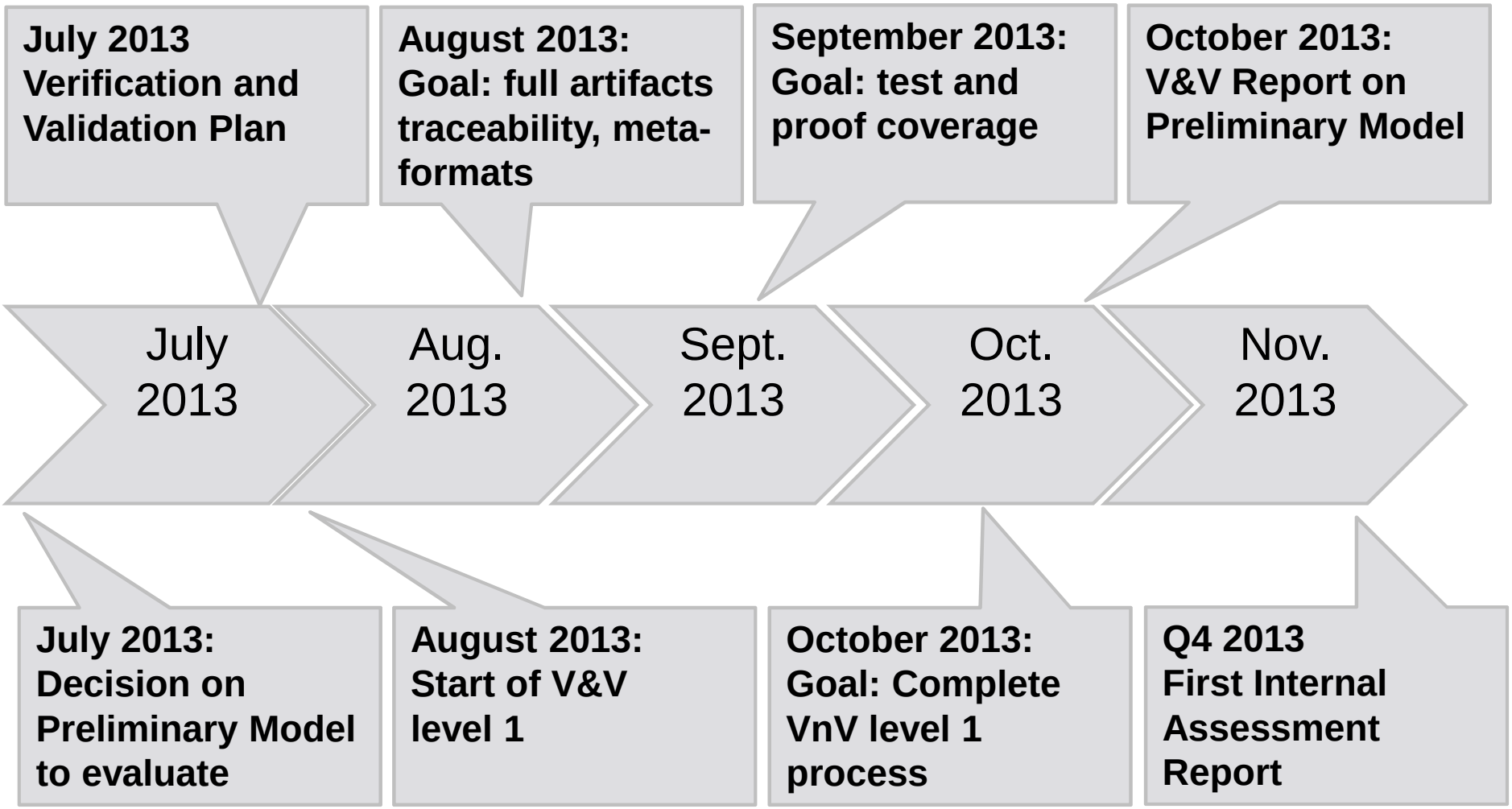
Artifacts Triggered SCRUM-Verificarion and Validation Level

3 Verification and Validation Level:

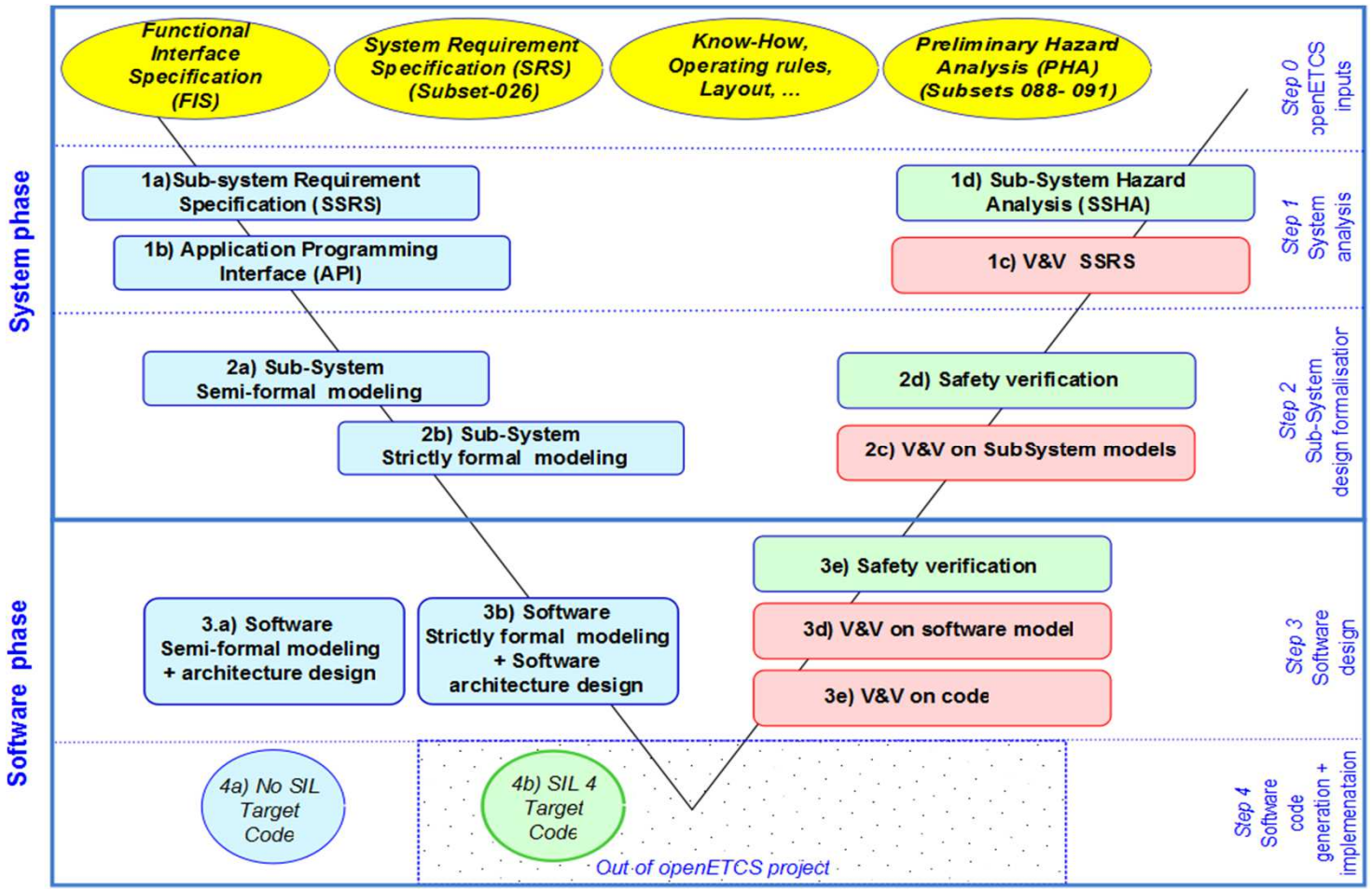
GANTT chart



WP4 Progress



Verification and Validation Inside openETCS



Verification and Validation Inside openETCS

Tools for management of requirements

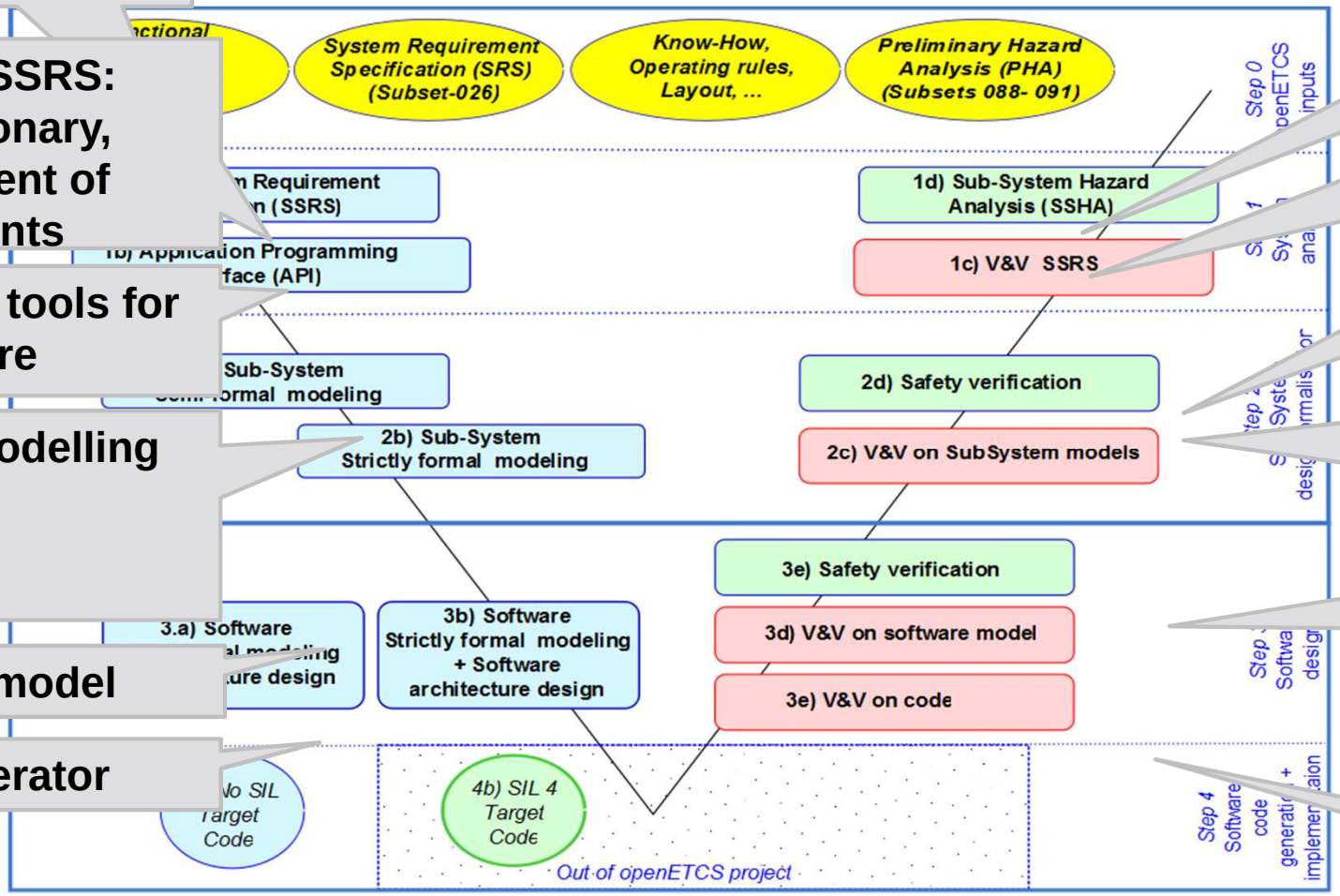
Tools for SSRS: Data dictionary, management of requirements

modelling tools for architecture

System modelling tool

Software model

Code generator



tool for automizes requirements coverage

Tool for Hazard Log/ Safety Evaluation

proofing framework

testmodel testgenerator testsuite

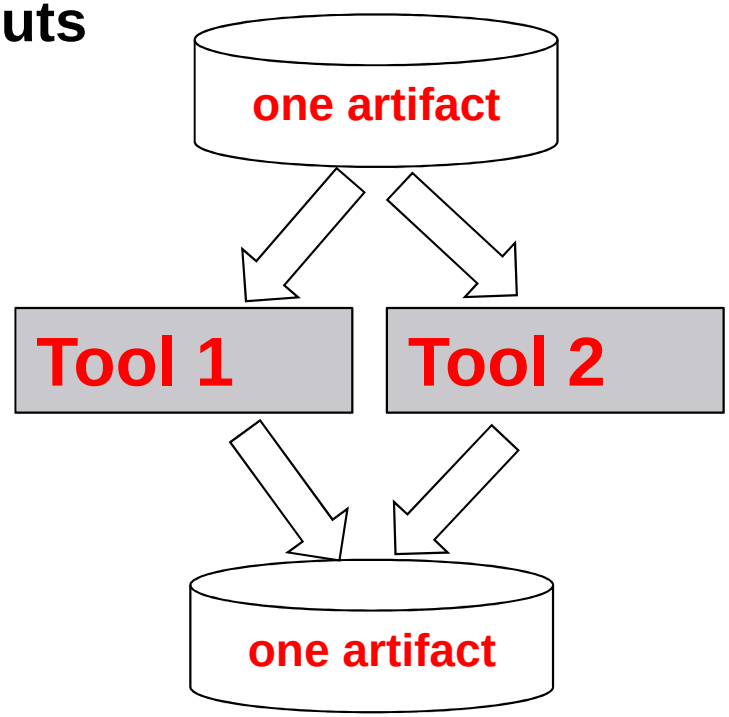
tools for code analysis

message based tests

Principles for artifacts integration (1st VnV level)

Qualification for generated artifacts

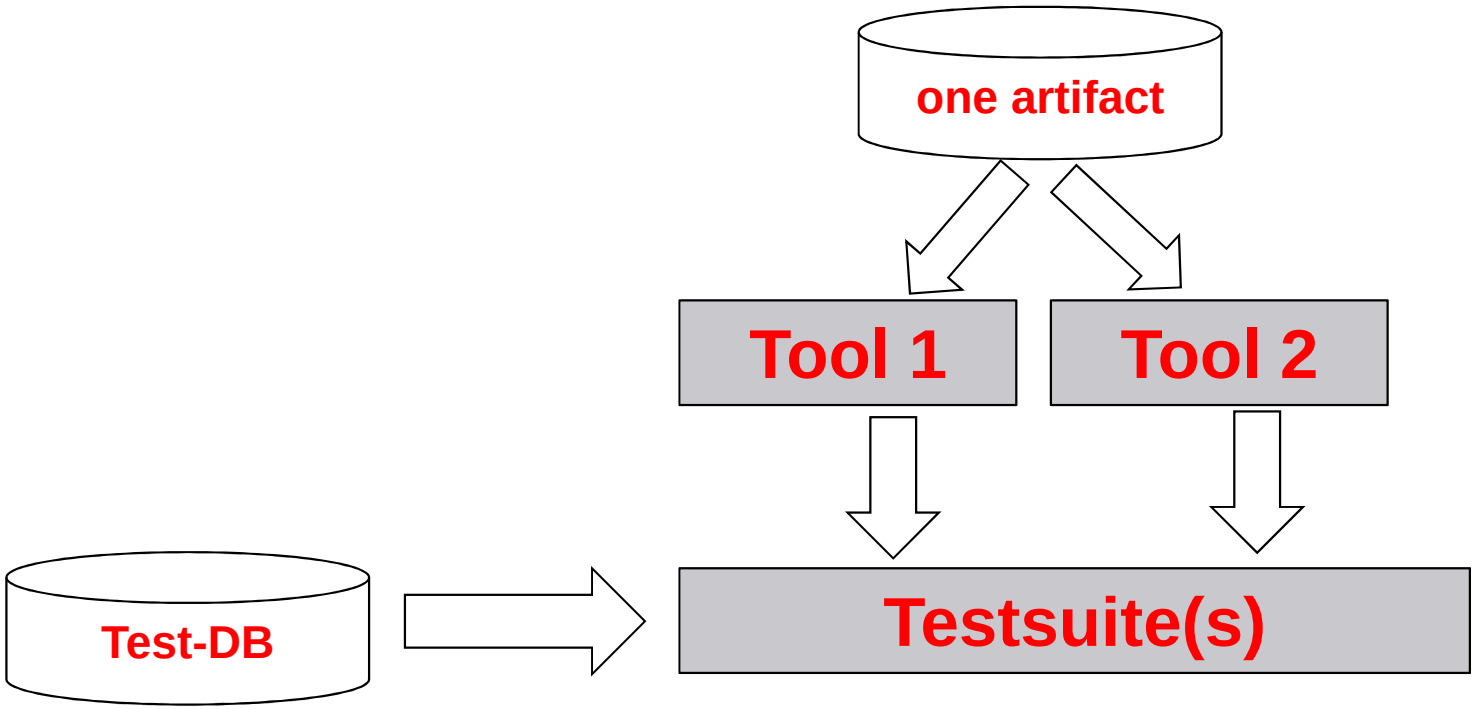
- Using the same artifact as input – clearly defined interface
- Having integrable outputs



- Advantage: Not more effort on artifacts

Principles for artifacts integration (1st VnV level)

Qualification for generated artifacts



- Message Based Tests (Subset-026 chapter 7 & 8 transferability)
- ➔ Tests can contribute to Validation

Gaps in primary model

Top Level: Completing SSRS according to a first set of functions that can feed validation

- Is needed for Verification!

Selection of toolchain

- Selection of stable builds (all tool chain)

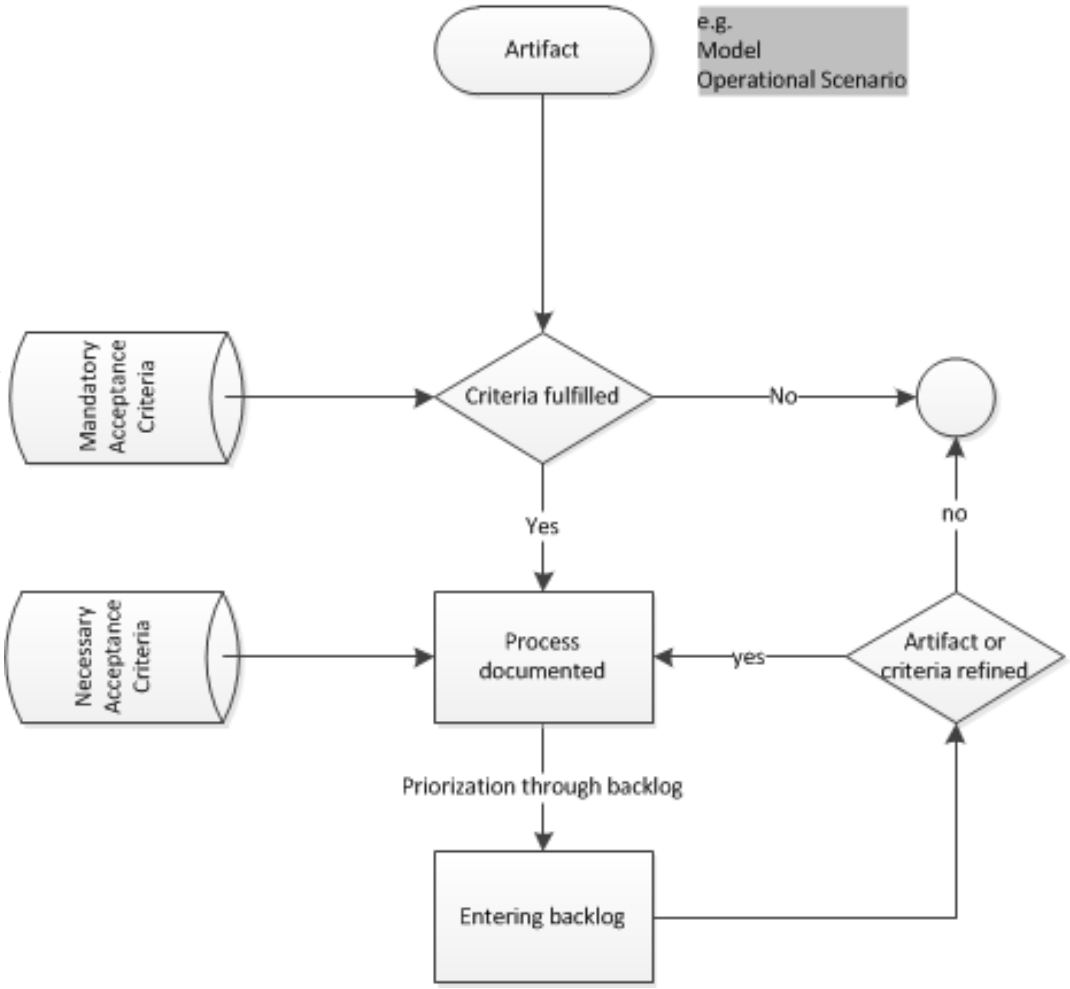
Code generator in the toolchain is needed

- If there is no open source code generator, code generated by closed source will be taken for VnV level 1

Artifacts decision process

Mandatory criteria
- Model in baseline 3 exists
- Existing interfaces to other VnV tools
- Modularity (D2.6-02-078.1)

Necessary criteria
- Model completeness
- Evaluation from state of the art
- Integration



Results WP7 Tool-Benchmark

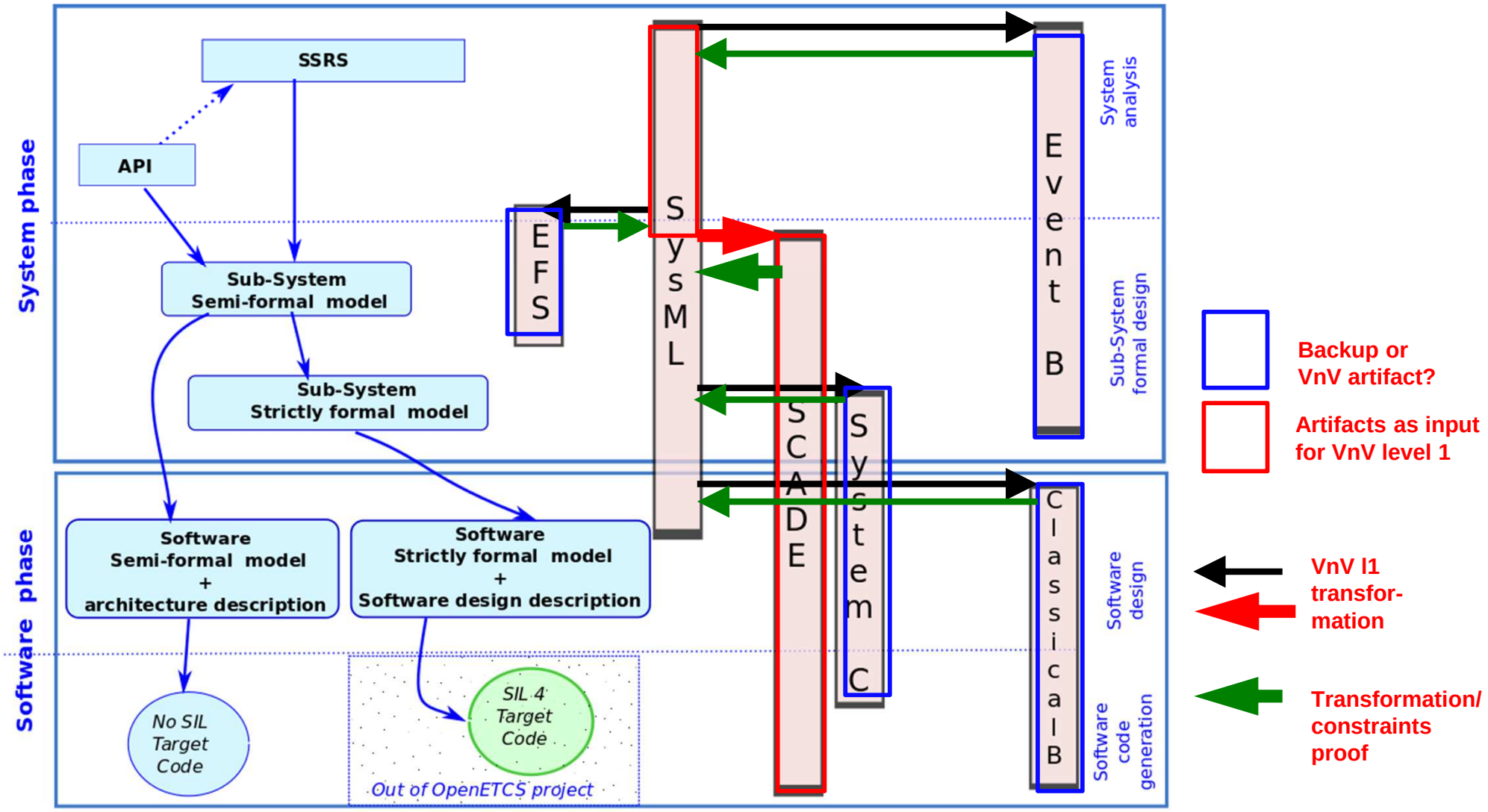
		Weight	GOPRR	ERTMSFormalSpecs	SysML with papyrus	SysML with EA	SCADE	EventB	Classical	System	Petri	GNATprove	Semi-Formal	Formal
3.1 Main usage of the approach	for which phases do you recommend the approach	1	18	0	9	10	18	9	18	15	12	18	1	1
	0for which type of activities do you recommend the approach	0,1	27	42	39	40	52	50	42	36	47	39	1	1
3.2 Language	Which are the main characteristics of the language	1	35	54	52	49	56	42	41	46	0	45	1	1
	0capabilities of the language	1	57	65	62	74	81	63	73	74	87	81	1	1
3.3 System Analysis	how the approach can be involved for the sub-system requirement specification	1	62	53	58	72	59	69	57	0	63	33	1	1
3.4.1 Semi-formal model	Concerning semi-formal model, how the WP2 requirements are covered ?	1	0	94	69	87	0	91	74	68	81	79	1	0
	Concerning safety properties management, how the WP2 requirements are 0covered ?	1	0	39	24	35	0	55	54	48	63	50	1	0
	0Does the language allow to formalize (D2.6-02-069):	1	0	56	33	51	0	51	56	62	54	57	1	0
3.4.2 Strictly formal model	Concerning strictly formal model, how the WP2 requirements are covered ?	1	54	0	0	68	86	87	90	0	86	80	0	1
	0Does the language allow to formalize (D2.6-02-070):	1	45	0	0	47	61	50	56	0	54	57	0	1
3.5.1 Functional design	How the approach allows to produce a functional software model of the on-board unit ?	0,5	35	0	31	45	39	0	45	37	42	37	0	1
3.5.2 SSIL4 design	How the approach allows to produce in safety a software model ?	0	35	0	34	67	72	0	72	41	69	58	0	1
	Which criteria for software architecture are covered by the methodology (see 0EN50128 table A.3) :	0	60	0	33	36	37	0	48	52	44	75	0	1
3.6 Software code generation	Which criteria for software design and implementation are covered by the methodology (see EN50128 table A.4) :	1	45	0	23	44	52	0	54	39	42	48	0	1
3.7 Main usage of the tool	Which task are covered by the tool ?	1	33	32	16	34	54	48	50	40	45	45	1	1
3.8 Use of the tool	0	1	54	96	104	93	103	107	92	104	74	110	1	1
3.9 Certifiability	This section discusses how the tool can be classified according EN50128 requirements (D2.6-02-085).	1	21	27	23	28	57	35	53	24	51	43	1	1
	Sum		581	558	610	880	827	757	975	686	914	955		
	Weight Sum		444	520	492	719	652	712	795	542	738	768		
	Semi Formal		283	520	454	537	433	575	572	485	535	565		
	Formal		444	331	366	546	652	515	611	364	540	582		

Expectations to WP7

To develop the VnV Process:

- **Support for consistency of process**
  - **Does the process work?**
- **Support for tool functionality**
  - **Which tasks are supported by the tools?**
- **Support for tool integration is needed**
  - **Do the tools integrate?**
- **Support for artifacts**
  - **Do the artifacts trace?**

Model Transformation Possible



Primary Model for VnV level 1

SysML/papyrus (High level model)

SCADE (Low level model & Code)

Justification:

SysML:

- **agreed on as primary tools for modelling (WP7- Workshop 4.7.2013)**

SCADE:

- **Best available formal tool and code generation according to WP7 benchmark**

- **Thank you for your attention!**

- **For further regular information, please subscribe to the Verification & Validation group: wp4+subscribe@openetcs.org**

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Question round

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