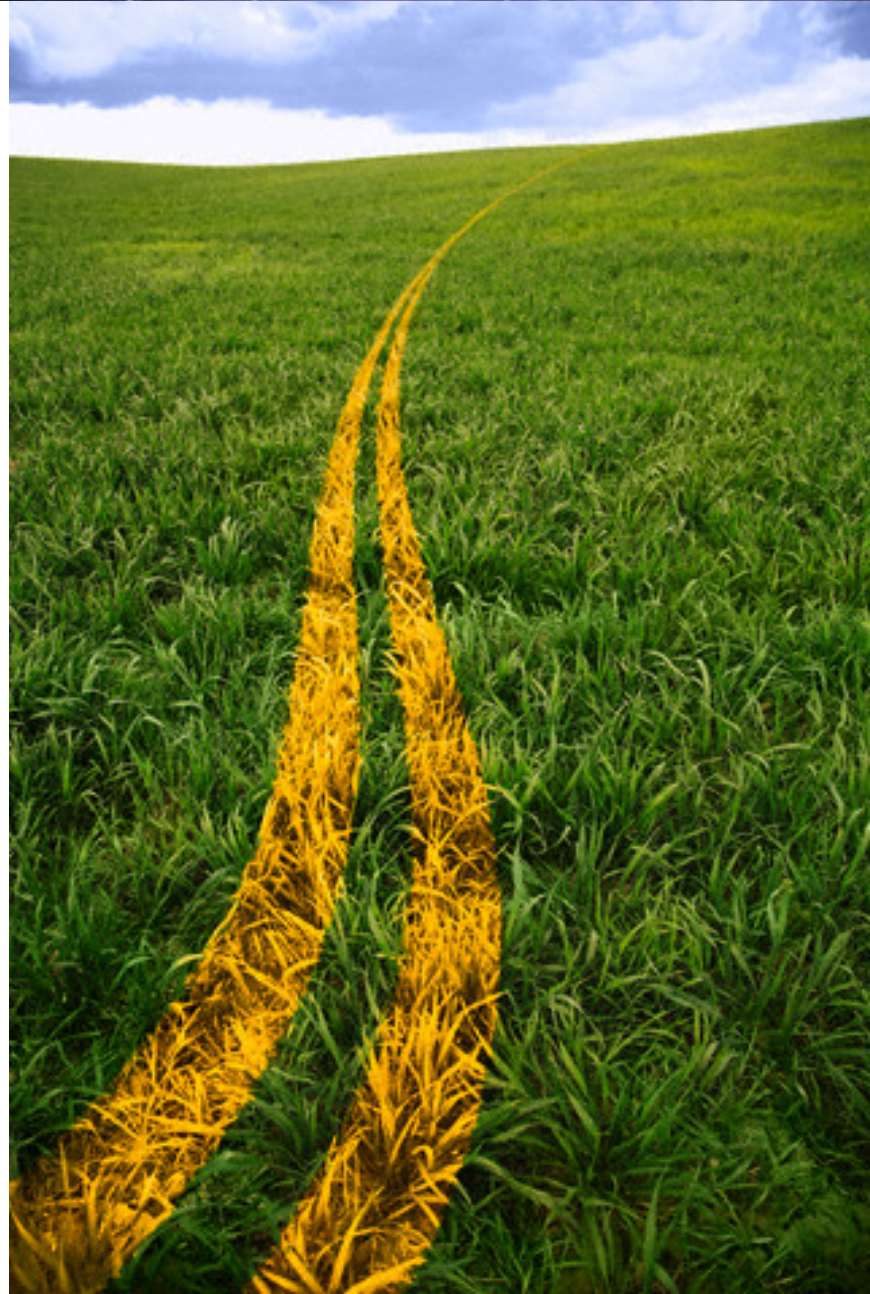




SMP2 Support at ESA

Outline of this Presentation

- **The way we got here**
 - Simulation Model Portability Standard (SMI/SMP2/ECSS)
- **SMP2 in Simsat**
- **UMF 1.0**
- **Ahead...**
- **Summary**



Simulation Model Portability 2 Standard Outline

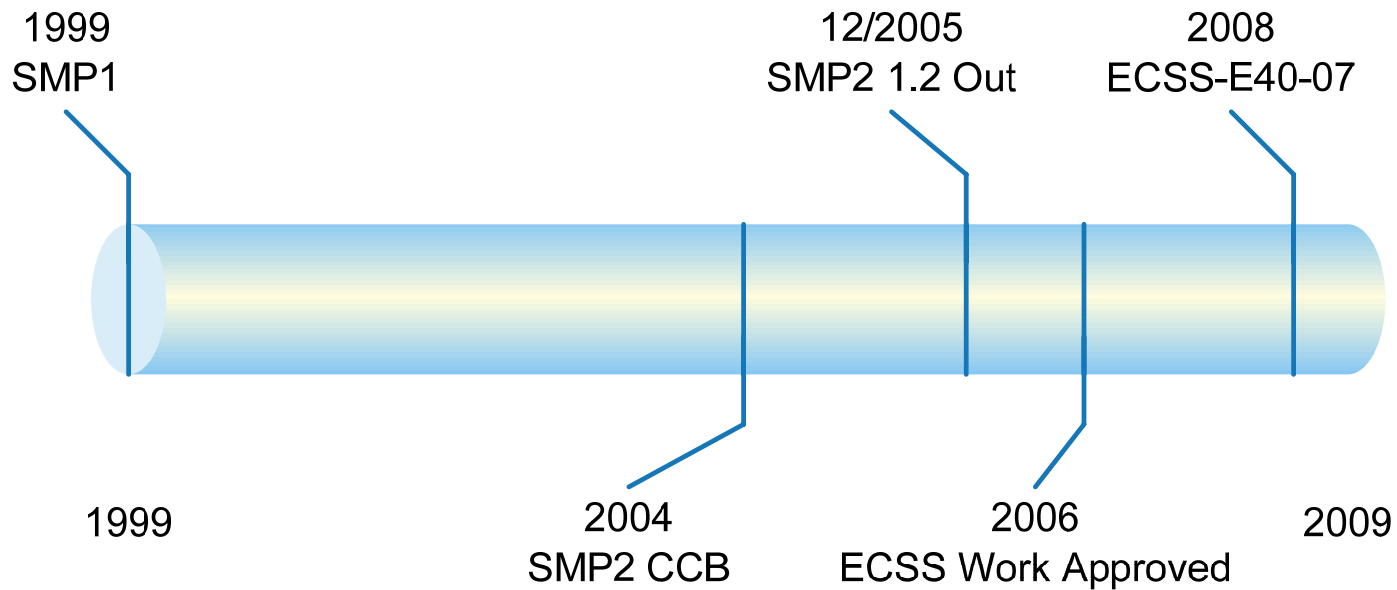
- SMP2 Objectives
- CCB Members
- Status



Simulation Model Portability Standard - Objectives

- Enable the reuse of simulation models between:
 - different project phases
 - different projects
 - different simulation platforms
- Reduce cost of simulator development
 - Use modern software technologies
 - Improve support for model reuse
 - Improve model integration support – code generation
- Make use of open standards (XML, UML)
- Decrease sensitivity to platform change (C++, Java, Windows, Linux)

SMP Evolution



CCB Members



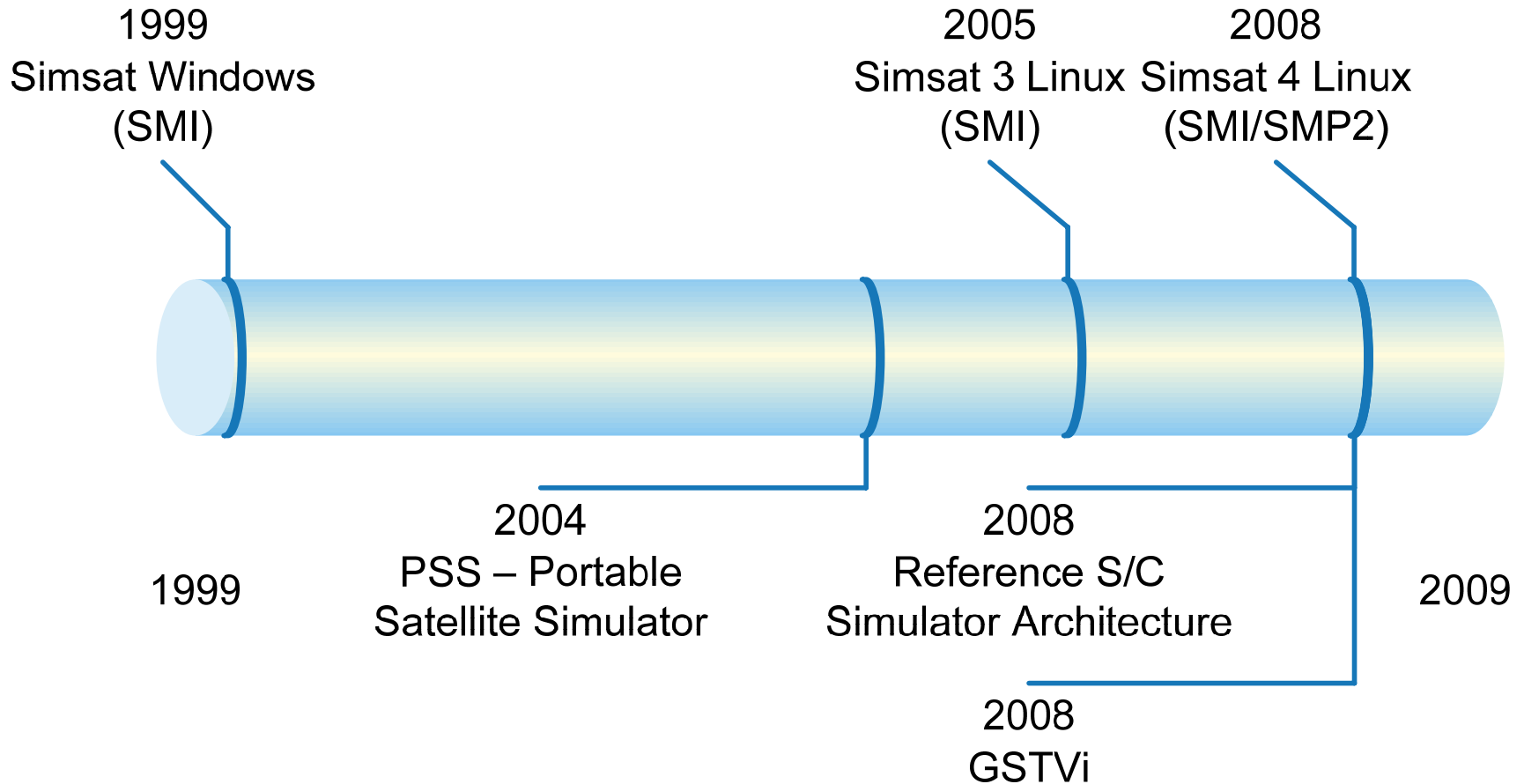
Simulator Infrastructure at ESA

SIMSAT Simulator
infrastructure:

Paving the way
to the future.



Infrastructure Evolution



SIMSAT 4

SMP2 Support

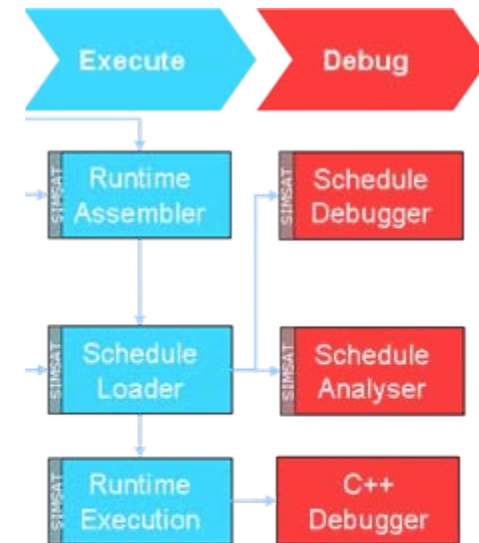
Community
Requests

MMI Migration to Eclipse

SIMSAT 4

SIMSAT – Supporting the Full Simulation Life cycle

The Big picture



SIMSAT – Supporting the Full Simulation Life cycle

The screenshot displays the SIMSAT 4.0 Suite interface. On the left is a 'Simulation Tree' showing a hierarchical structure of components like 'SoftRealTimeSchedule-Contol', 'Time/Geop', and 'SMP2'. The main area is divided into several panes: a 'Commander' pane with a table of properties, a 'Root Locus' plot showing a sawtooth wave, and a 'Temperature' plot showing a step function. At the bottom is an 'Error Log' pane with a table of log messages.

#	Name	Title	Type	Units	Value	Forced status
0	SMP2/DataflowBased/SolarPane	temperature	Int32	°C	58	
1	SMP2/DataflowBased/SolarPane	state	Enum		Bad	
2	SMP2/DataflowBased/SolarPane	current	Single		5.0000	
3	SMP2/DataflowBased/SolarPane	active_cels	UInt16		0	
4	SMP2/DataflowBased/SolarPane	name	String		SolarPanel1	
5	SMP2/DataflowBased/SolarPane	tags_0..4	Boolean		[true,false,true]	
6	SMP2/DataflowBased/SolarPane	RootLocusOn	Boolean		true	
7	SMP2/DataflowBased/SolarPane	Name	String		SolarPanel1	

Log#	Type	Sim Time	Source	Message	Epoch Time	Mission Time	Delta Time
7097	INFO	584 C	Monitor	StateMonitor: SolarPanel1 Current = 5.0	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7098	INFO	584 C	Monitor	StateMonitor: SolarPanel2 Current = 5.8	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7099	INFO	584 C	Monitor	StateMonitor: SolarPanel1 Name = SolarPanel1	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7100	INFO	584 C	Monitor	StateMonitor: SolarPanel2 Name = SolarPanel2	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7101	INFO	584 C	Monitor	StateMonitor: SolarPanel1 Flags = 1,0,1,0,1	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7102	INFO	584 C	Monitor	StateMonitor: SolarPanel2 Flags = 0,1,0,1,0	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7103	INFO	584 C	Monitor	StateMonitor: SolarPanel1 RootLocus = 0H1	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1
7104	INFO	584 C	Monitor	StateMonitor: SolarPanel2 RootLocus = 1L0	2000/01/01-00:09:44.000	0-3 9:44 000	2008/02/22-1

The MMI is delivered as a set of Eclipse RCP plug-ins

- Data Display
- Logger Viewer
- Commander
- Schedule Viewer
- Schedule Analyser
- Property Grid
- Recorder
- Simulation Tree
- Status Viewer

User-Requested Improvements

- Schedule Analyzer
- Parameter Recording
- Logger improvements (Filtering, Search, User Comments)
- Model Failure
- Parameter Forcing
- Parameter Limits
- Conditional and Scheduled Commanding
- Simulation Tree Search

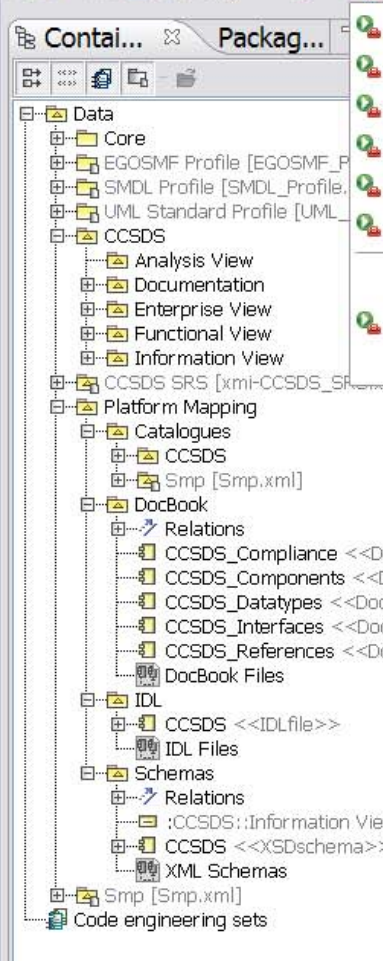
The Universal Modelling Framework (previously EGOS-MF)



Universal Modelling Framework

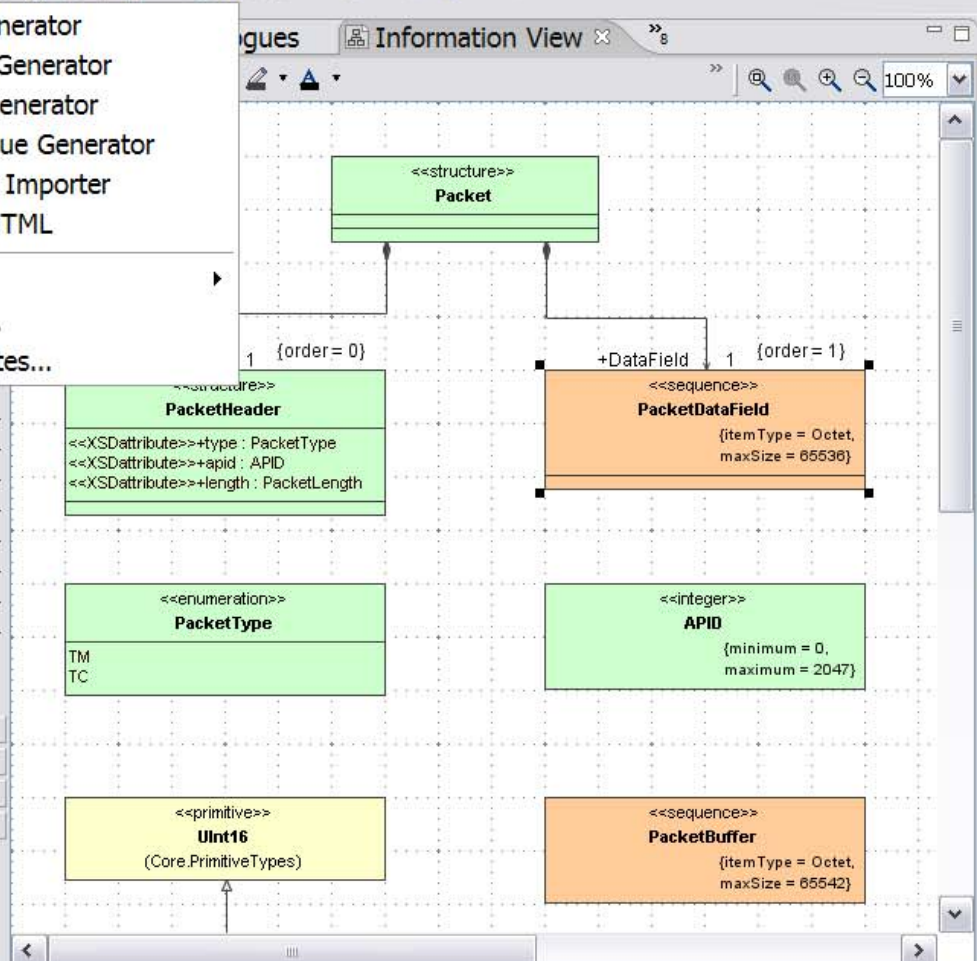
EGOS-MF Demo - Information View - Eclipse SDK

File Edit Diagrams Navigate Search Project MagicDraw Layout Run Window Help



- 1 Document Generator
- 2 XML Schema Generator
- 3 CORBA IDL Generator
- 4 SMP2 Catalogue Generator
- 5 Requirements Importer
- 6 DocBook to HTML

Run As
External Tools...
Organize Favorites...



Properties

Element	Symbol	Language properties
Class		
Name	PacketDataField	
Qualified Name	CCSDS::Informati	
Owner	CCSDS_Infor...	
Applied Stereo...	<> sequence [Cla	
Base Classifier		
Realized Interf...		
Visibility	public	
Is Leaf	<input type="checkbox"/> false	
Is Active	<input type="checkbox"/> false	
Is Abstract	<input type="checkbox"/> false	
Active Hyperlink		

Documentation

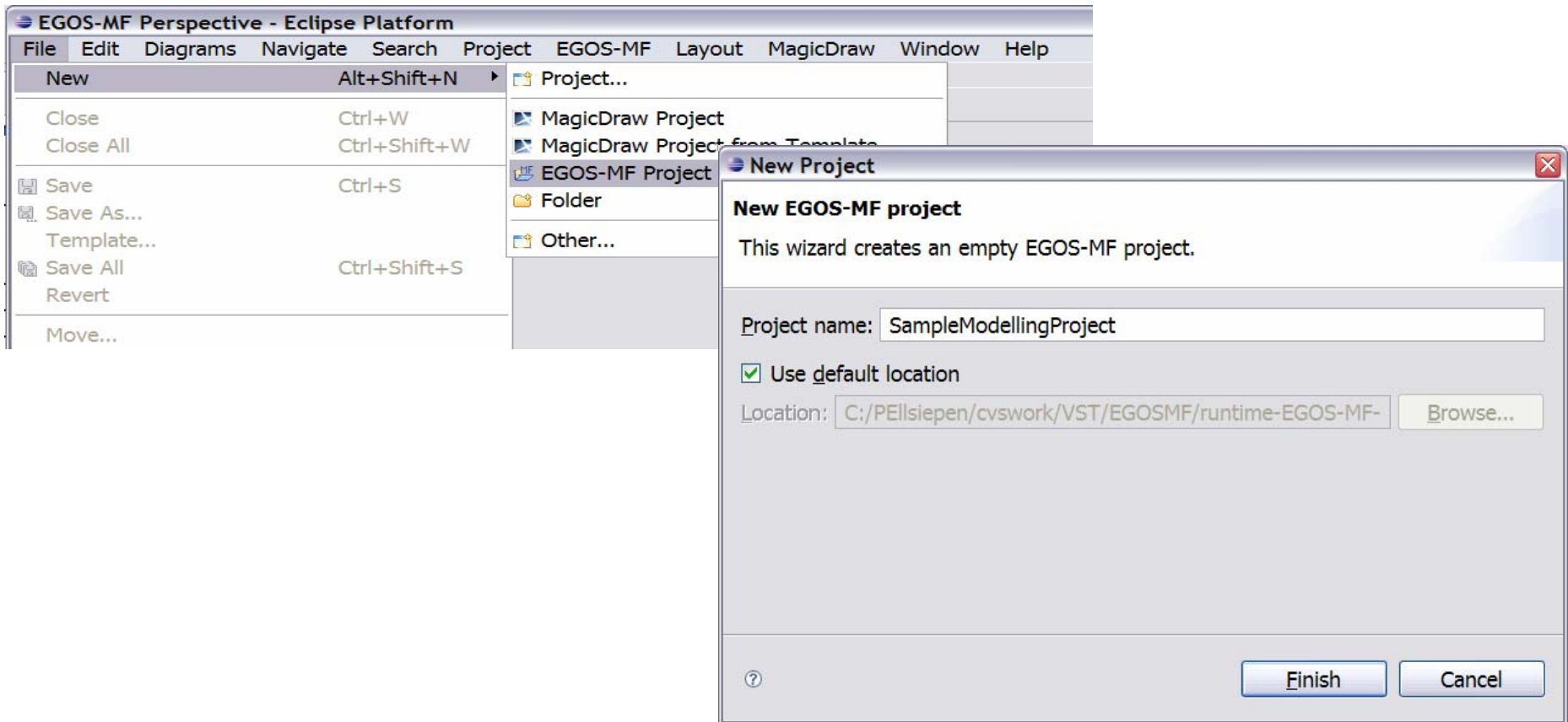
HTML

Packet data field of a CCSSD telemetry telecommand packet. The data field has variable size, as specified in the packet header's length field and has a maximum of 65536 bytes.

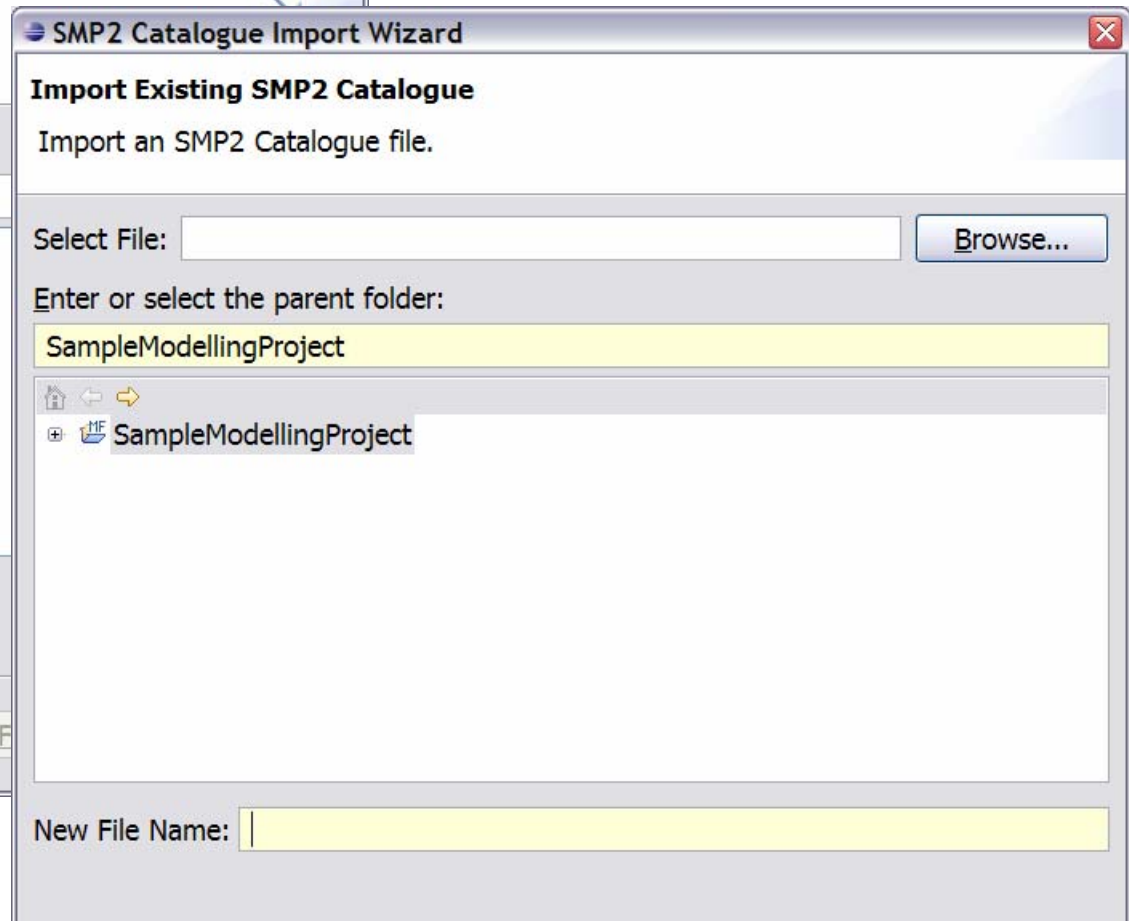
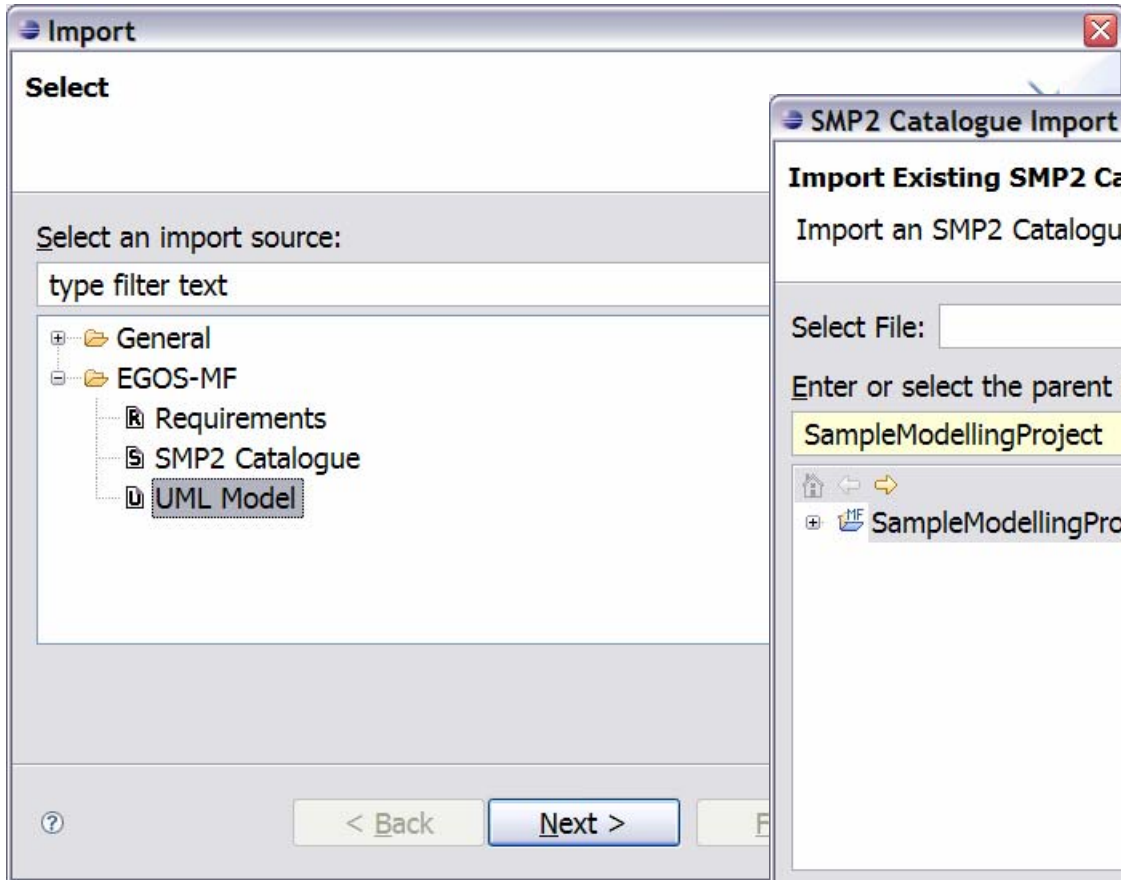
Problems Console
No consoles to display at this time.

Proper... Outline ? Messa...

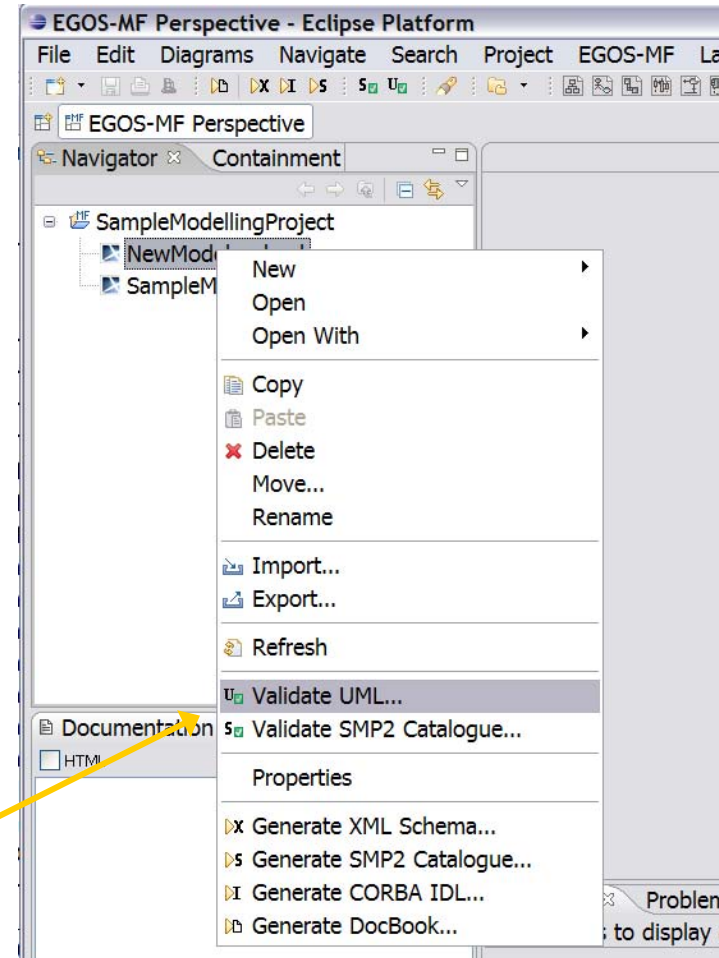
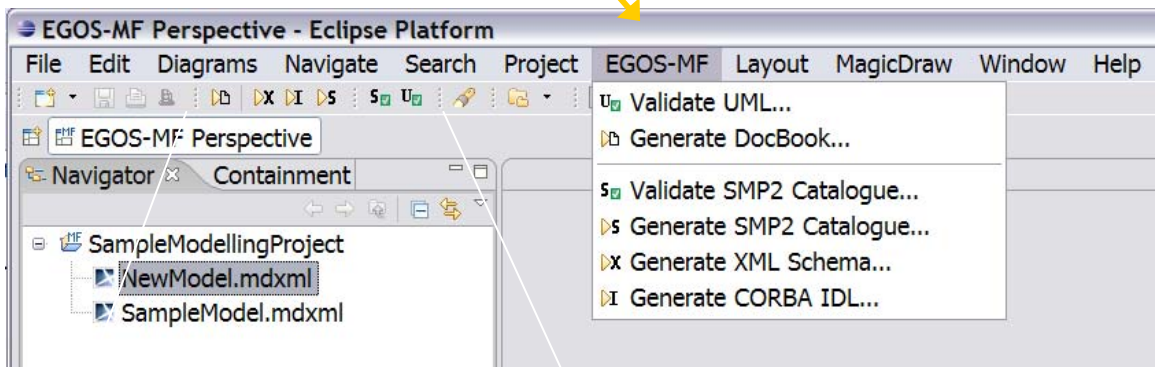
New Wizards



Import Wizards

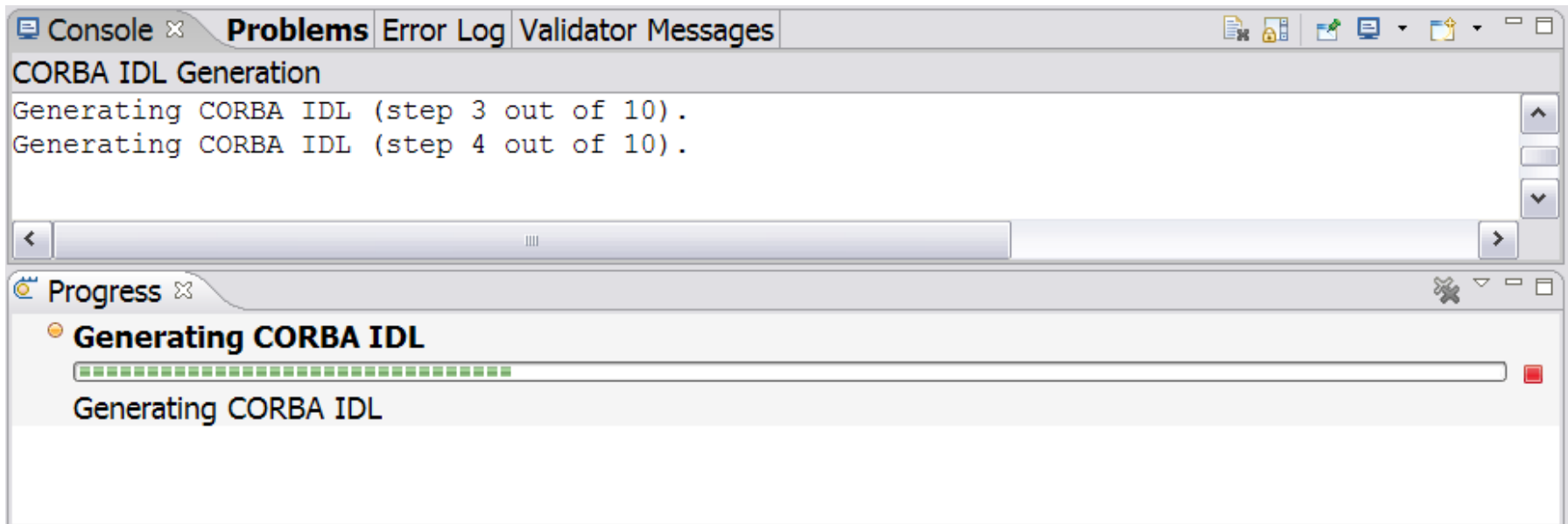


Validation and Generation



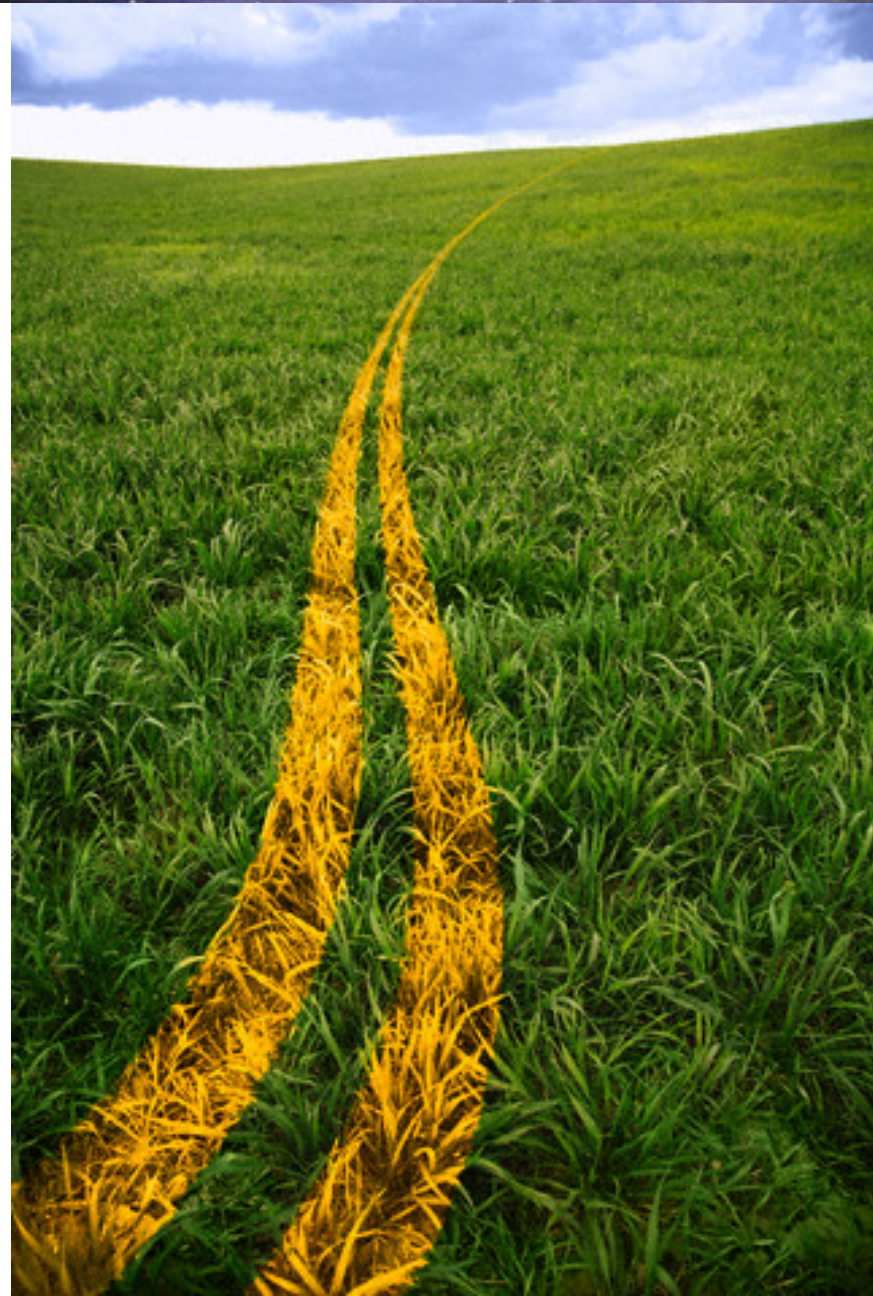
Observe Tool Operations

- Re-use standard Eclipse views:
Console, Progress, Problems





The road ahead



Simsat and UMF Improvements 2009

- EGOS-MF and SIMSAT MIE merge into a single product supporting the SMP-2 models development (UMF). Finally a proper SMP2 IDE - Q2
- SIMSAT 4 Upgrades (Scheduler Improvements, Win support, 3D Adapter)

Universal Modelling Framework

- Will supersede EGOS-MF
 - Integration of MIE and EGOS into one product: Universal Modelling Framework (UMF)
- Integration with Eclipse CDT (C++ Editor)
- Usability Improvements relative to EGOS-MF
- SMP2 Scheduler Editor Improvements
- SMP2 Code Generator Improvements
- MIE Property Grid Improvements

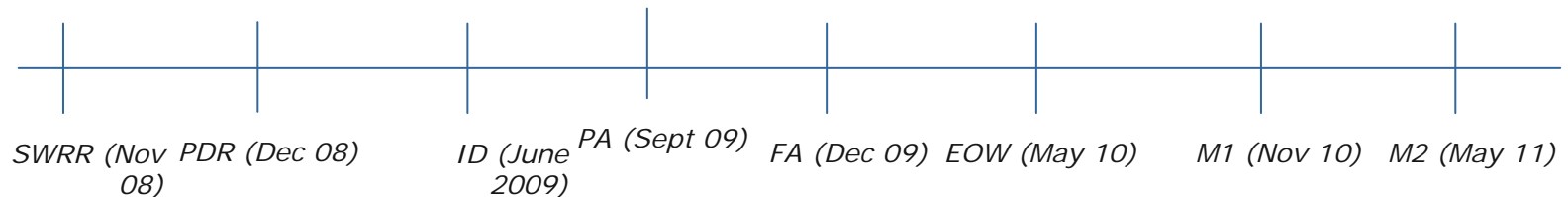
Next Year Deliveries

Simulus 5 Upgrades

- ❖ Available Q3 2009

UMF1 Upgrades

- ❖ Available Q3 2009,

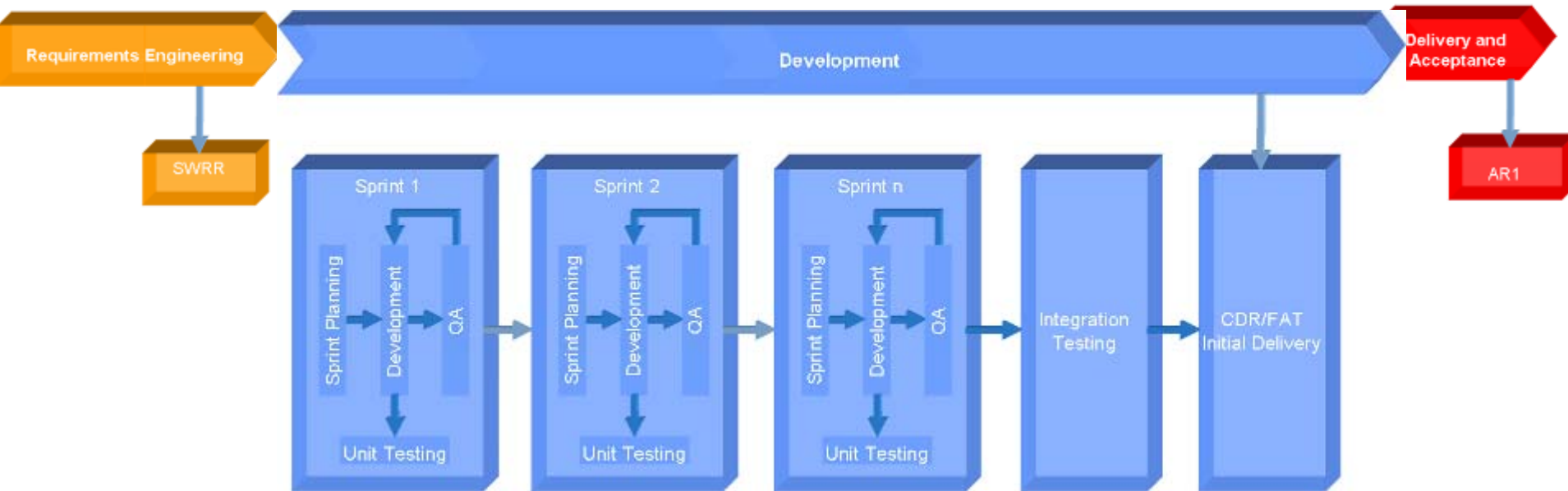


- ❖ One main delivery a year

- ❖ Up to 5 five intermediate deliveries per year (every 2 month)

New Development Approach

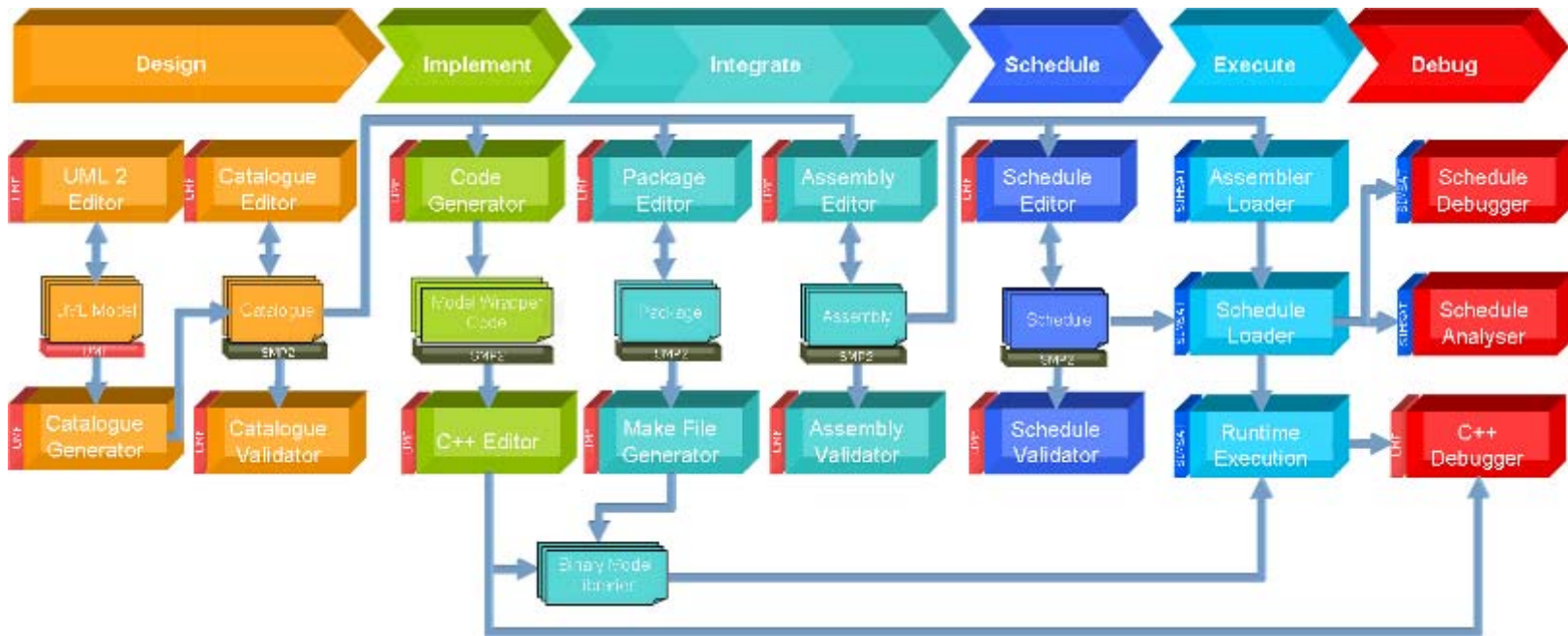
❖ Agile Development Methodology – Engolve the Community



Universal Modelling Framework

- SMP2 levels the playing field.
 - Enables reuse of models across simulation kernels
- UMF Modelling Framework
 - A common Modelling environment to be used allowing proprietary/specific runtime environments
 - The de facto tool for the modeling and assembling of SMP2 elements.
 - Released under **a open source license** so that all interested parties can contribute to its development (coordinated by ESA).
 - Foster the community development around SMP2

Universal Modelling Framework

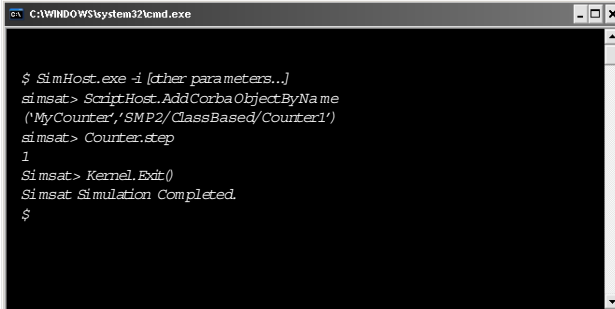


Simulus 5

❖ *Kernel Scheduling Improvements*

❖ *Support for batch mode operation*

- ◆ *To allow running Simsat in a fully automated way from start to end, it shall be possible to start and operate Simsat via the so called "batch mode".*
 - *Comment: The objective is to allow the control of the simulation (including starting and stopping) from the command line.*



```
C:\WINDOWS\system32\cmd.exe

$ SimHost.exe -i [other parameters...]
simsat> ScriptHost.AddCorbaObjectByName
('MyCounter','SMP2/ClassBased/Counter1')
simsat> Counter.step
1
simsat> Kernel.Exit()
Simsat Simulation Completed.
$
```

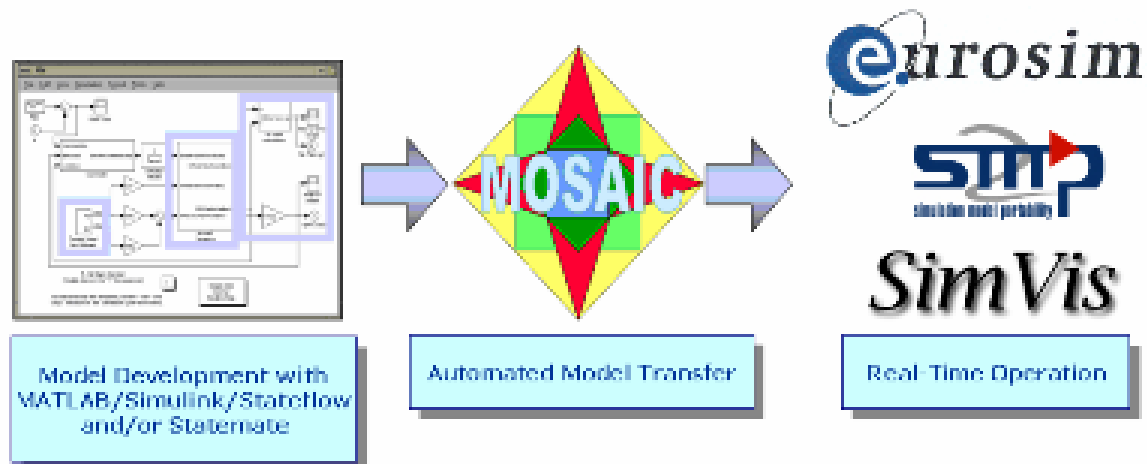
Simulus 5

❖ External Data Access

- ◆ *It shall be possible to access data recorded and saved to file by the Simsat Recorder from any source while it is still being recorded and/or saved.*

❖ Matlab Simulink Support through MOSAIC

- ◆ *The intended use of MOSAIC is for developers of systems who wish to benefit from the potential modelling capabilities of MATLAB/Simulink/Stateflow, the potential of the simulation shells of EuroSim or SIMSAT and/or the potential of ESA's Simulation Model Portability (SMP) standard.*
- ◆ *Subsequently, MOSAIC will either generate model source code that can run in SMP2 compliant simulation environments.*

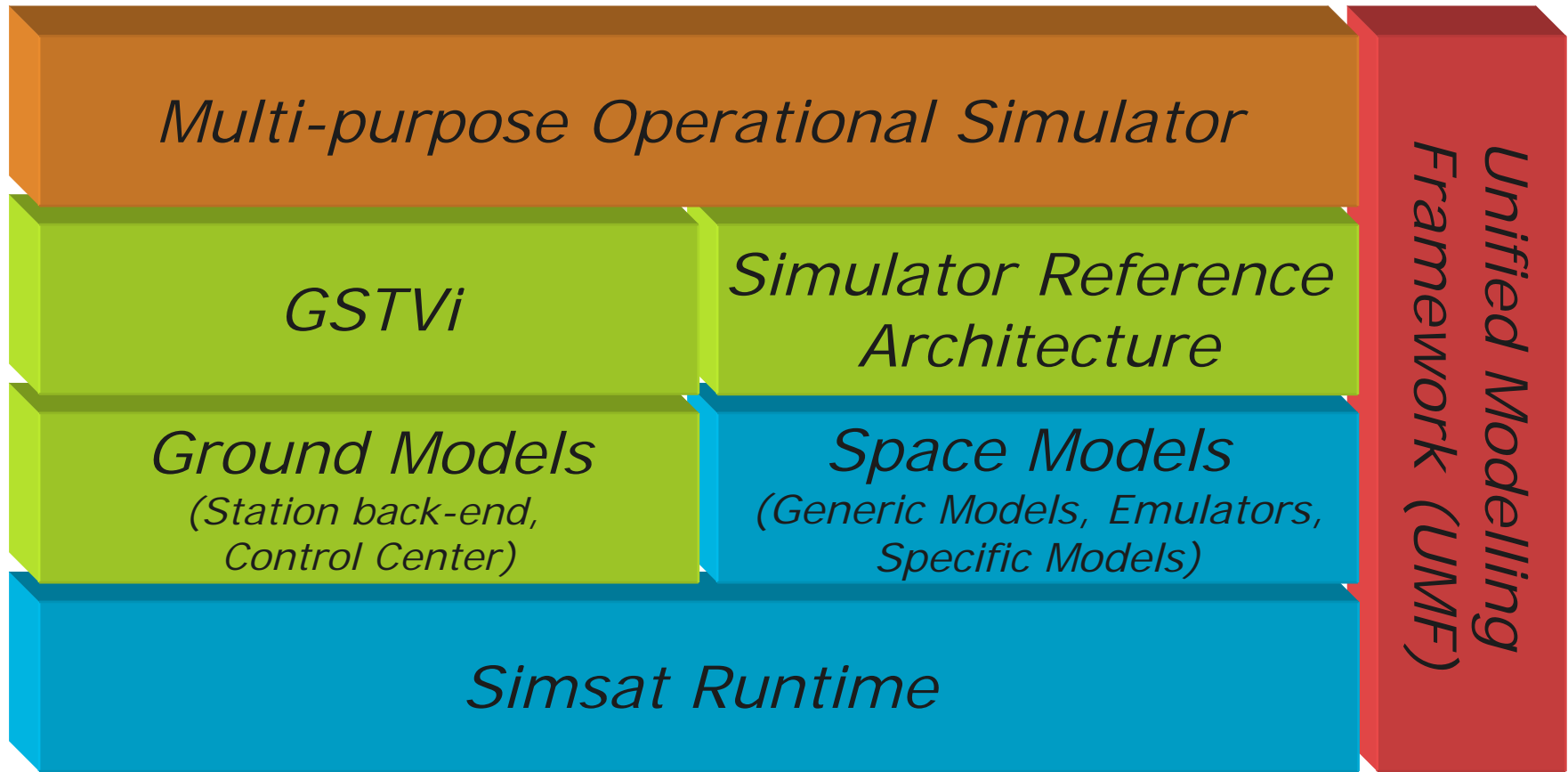


Future of ESOC Simulators

Summary



Simulation Stack at ESOC



Tevalis



Simulus



UMF

Summary

- SMP2 tooling: It has been a long difficult road with lots of uncertainties and learning mistakes.
- The customization of tools (e.g. generators, COTS, etc) still requires very specialized knowledge/experts.

Summary

- By providing a Universal Modeling Framework a common Modeling environment to be used allowing proprietary/specific runtime environments
- By leveraging on Eclipse, we need to develop less to get more.
- By going open source with UMF we aim at making a truly Universal Modelling Framework for SMP2 and avoid the proliferation of different tools.

Thank you for your attention !

Let's continue to build
the future