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HOOD, STOOD and AADL

Ada Europe, Valencia June 2010

Tony Elliston

www.ellidiss.com

The ELLIDISS Group

Model Driven Engineering with Component Based Approaches for Critical Systems and Software

Ellidiss Software
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UK based company
TNI Europe Ltd
Tools commercial office

Ellidiss Technologies
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FR based company
New tools development
R&D center

FAIVELEY
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Eurofighter Typhoon
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BAE SYSTEMS
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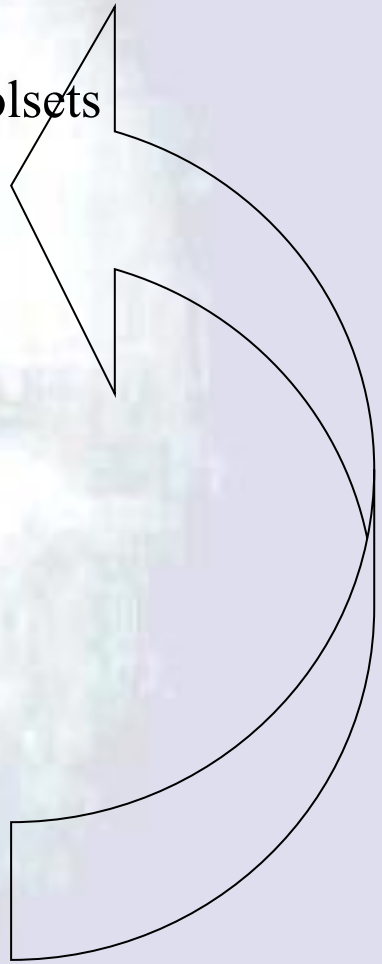
GIAT industries
direction générale de l'Aviation civile
SAGEM
SIEMENS
DASSAULT AVIATION
TELDIX GmbH
Alenia AERONAUTICA
THALES
Hispano-Suiza groupe snecma
ALCATEL
AERMACCHI
DATEL
GENERAL DYNAMICS

What do we do?

- **Develop and Market Software Tools**
  - Development, Distribution and Support of COTS toolsets
  - Consultancy:
    - Training Course
    - Tool Customization (code generators, ...)
    - Project Assistance



- **Research and Development**
  - Model Driven Engineering & Component Based Architectures
  - Bridging System & Software modeling activities
  - Contribution to R&D programs:
    - ASSERT (ESA, Astrium, Alcatel, ...)
    - TOPCASED (Airbus, ...)
    - SMP2 (CNES, ...)
    - SPICES (Thales, Airbus, ...)
    - AADL committee

SOFTWARE TOOLS

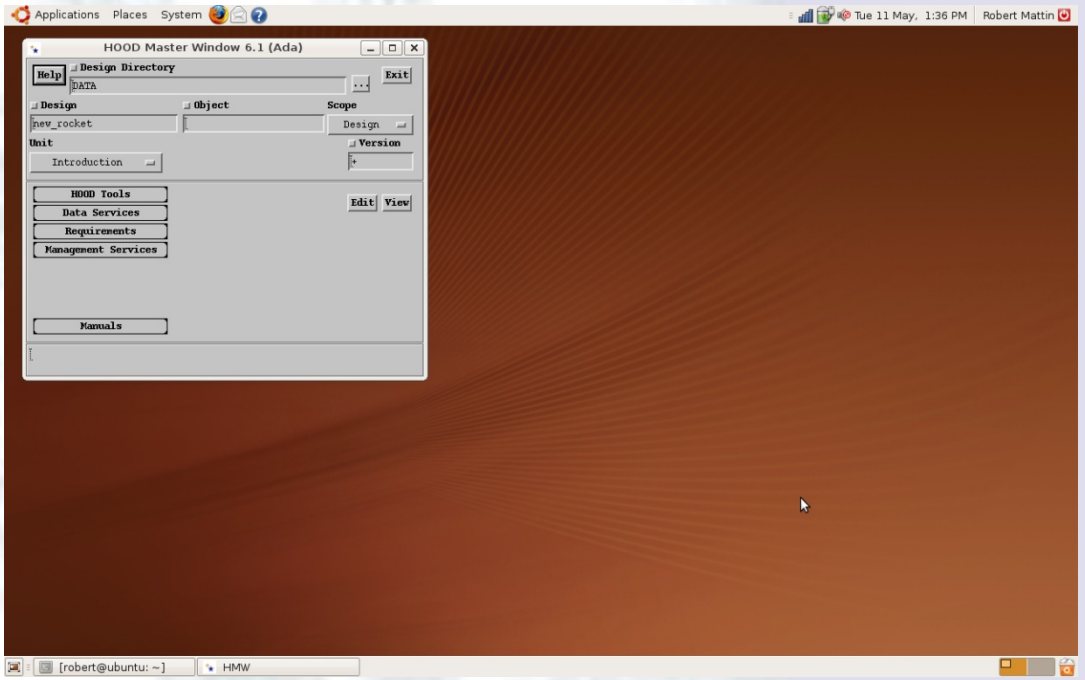
- **CP HOOD**
  - Current release 6.0
  - Beta release 6.1
- **STOOD**
  - Current release 5.2.2
  - Special release 5.3
- **HRT UML**
  - INTECS Toolset
    - Pure UML2 tool
    - Relevant to Space Industry
    - Generates Applications for Microsek
- **AADL INSPECTOR**

CP-HOOD 6.1

New Features

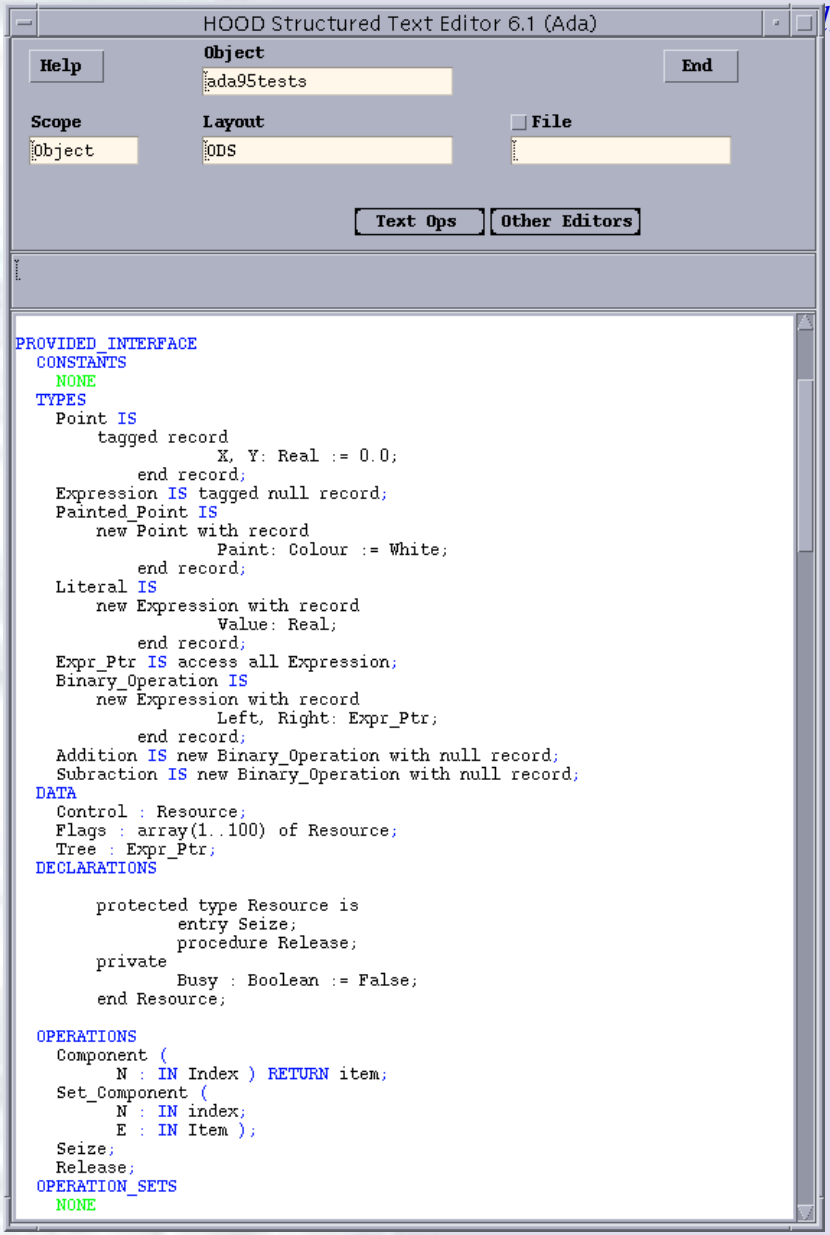
Linux Version

CP HOOD is now available on Linux as well as Solaris



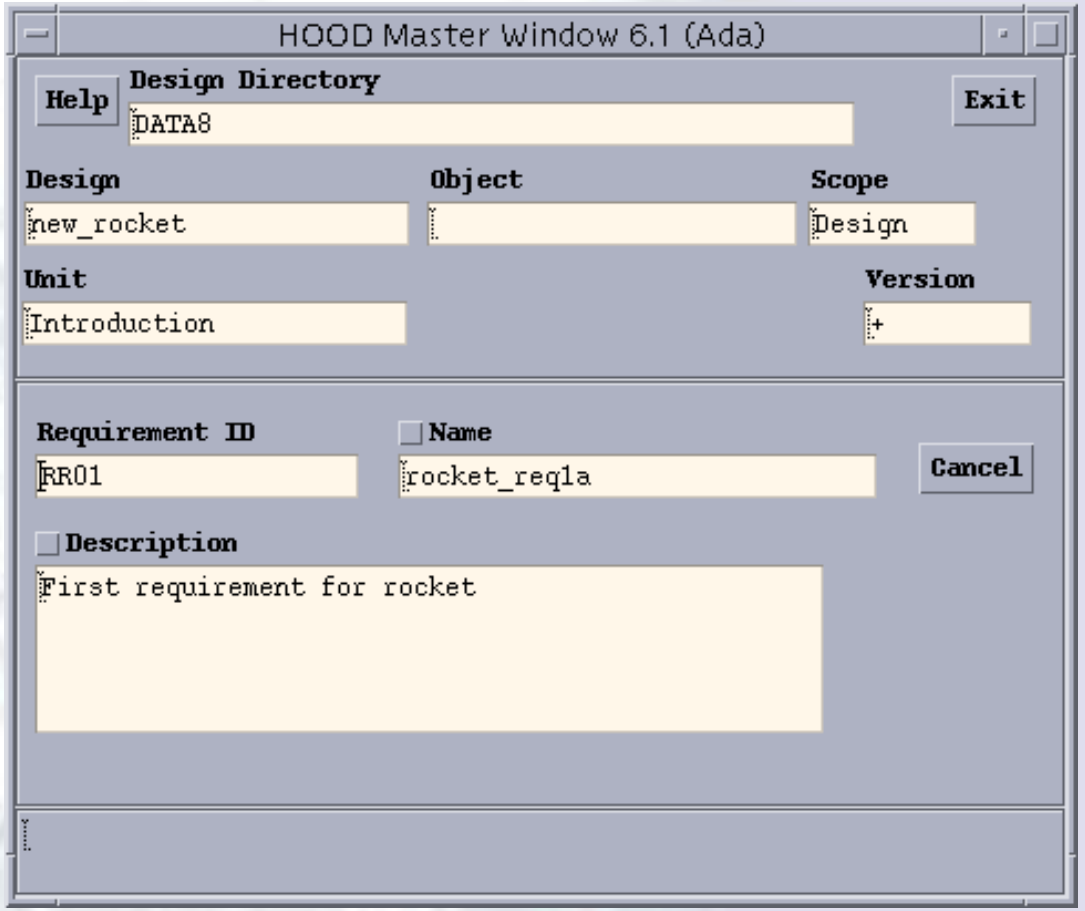
ADA 95

- Can use ADA 95 features such as tagged records, with clauses and protected types
- Can reverse engineer ADA 95 programs



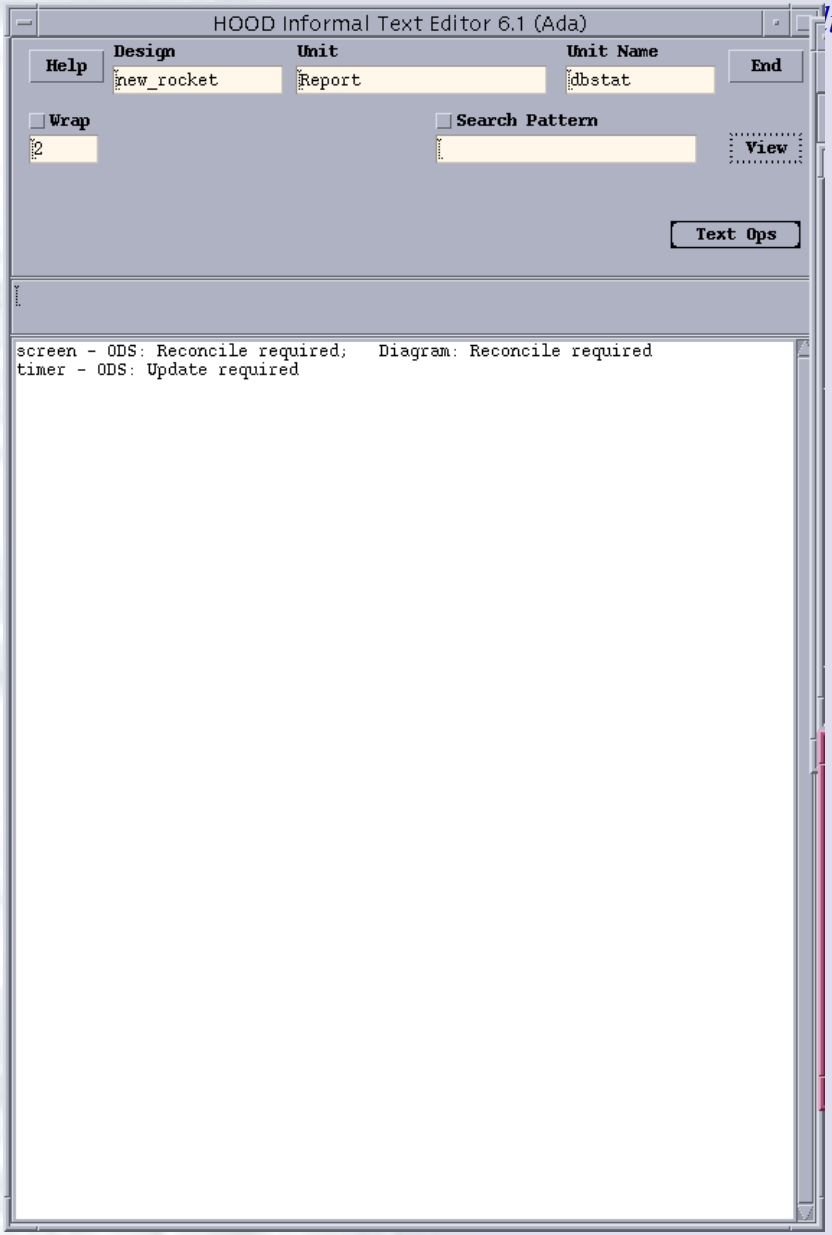
Requirements Maintenance

- Program can be used without external requirements system
- Record text details of requirement
- Add new requirements
- Delete unfulfilled requirements



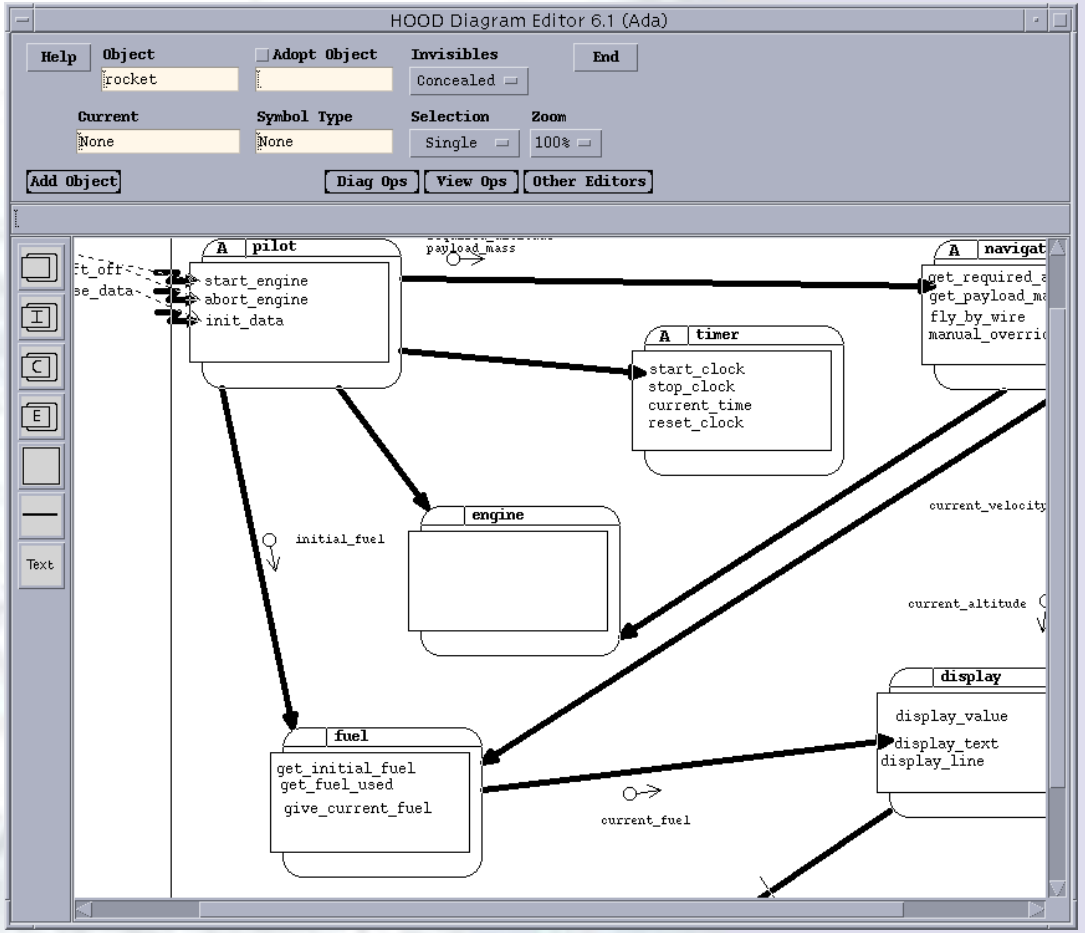
Database Status report

- Lists objects requiring updates or reconciles
- View on screen using text editor
- Alternately, output to printer or file



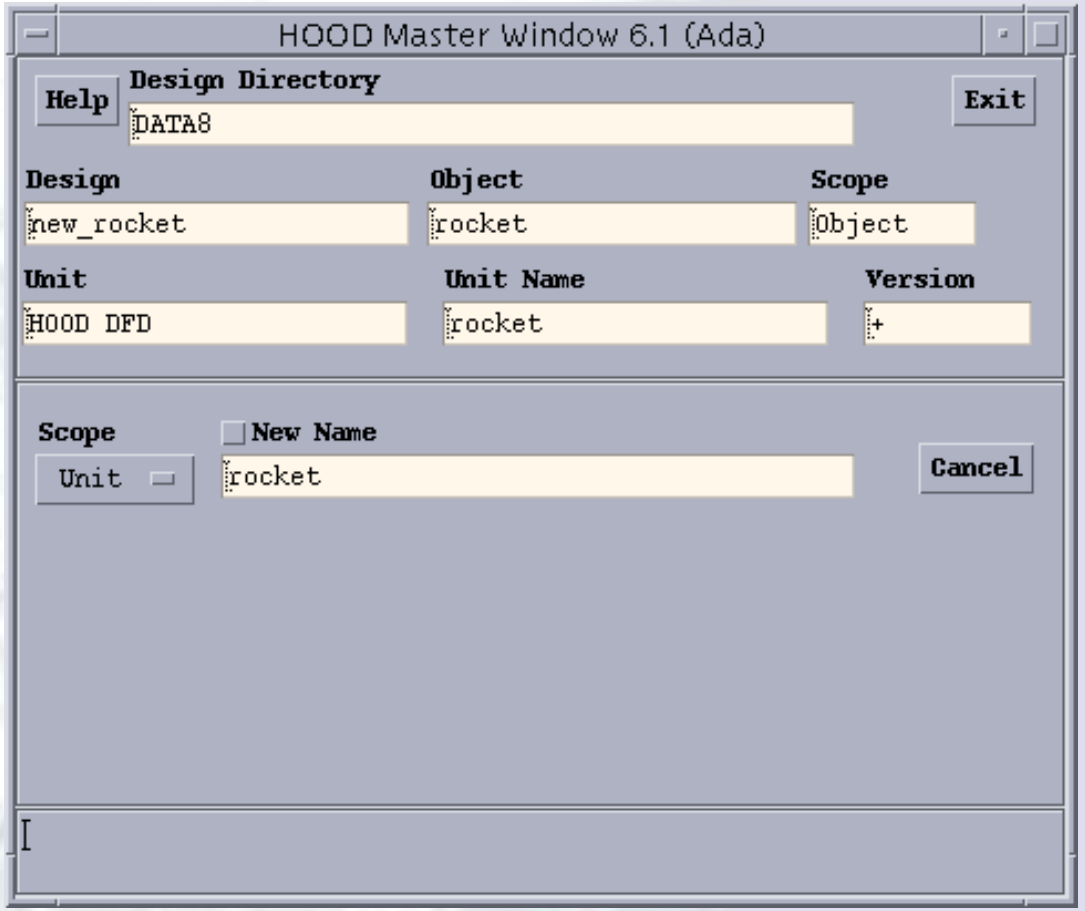
Scrollbars and Zoom Menu

- Scrollbars for viewing part of large image
- Zoom menu for zooming out
- Available on all diagram types



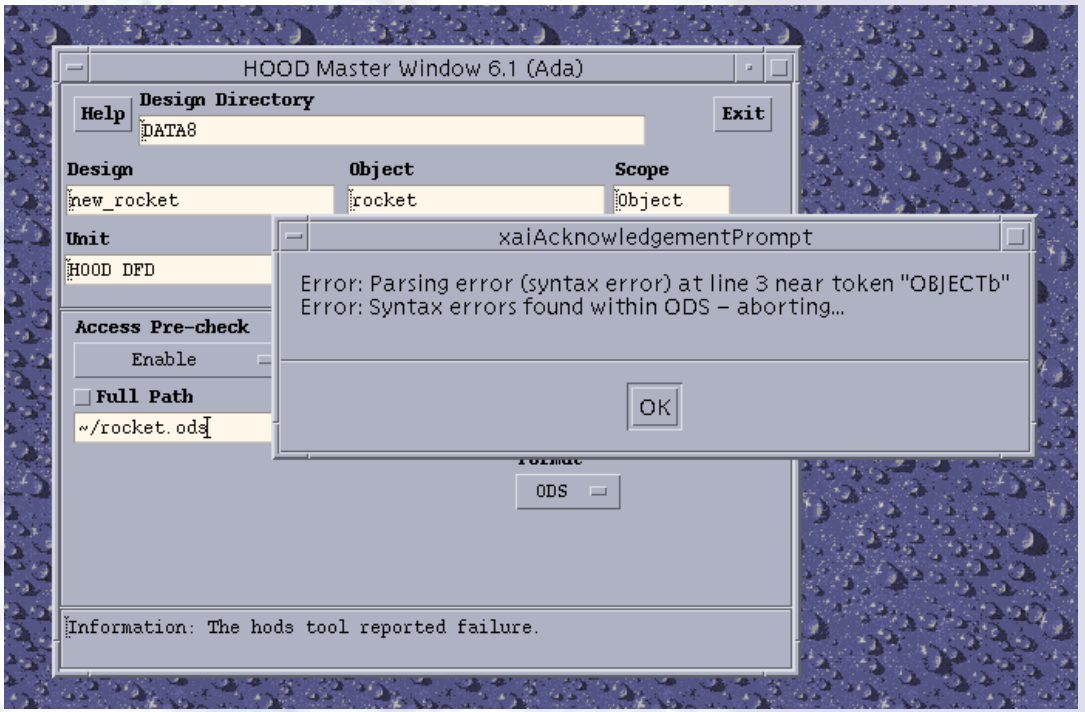
Improved Rename

The rename facility can now be used to rename units and whole designs as well as objects



Import Error Messages

- Import ODS displays error messages immediately
- Messages still recorded in import.report as well
- With command line use, messages sent to stderr.



Other CP HOOD Enhancements

- Choice of page sizes when printing diagrams
- Option to output formatted documents as PDF
- Manual display does not block program

STOOD 5.2.2

- **Multi-standard software modeling tool:**
  - UML2.0, HOOD 4.0, HRT-HOOD and AADL 1.0
- **Well defined step-by-step modeling process**:
  - import of functional and non-functional requirements
  - multi-notation graphical design of the architecture
  - multi-language detailed design and coding (Ada, C, C++, ...)
  - static design verification tools
  - multi-format documentation generators (html, pdf, word, ps, ...)
  - code generators and reverse engineering (i.e. Ada <-> AADL)
- **Matured on important current mission-critical projects**:
  - multi-user, configuration management, requirements traceability
  - Unix-Windows interoperability
  - Complies with process standards:
    DO-178B, EN-50128, ECSS-E40, MIL-STD-498, ...

Mission critical systems

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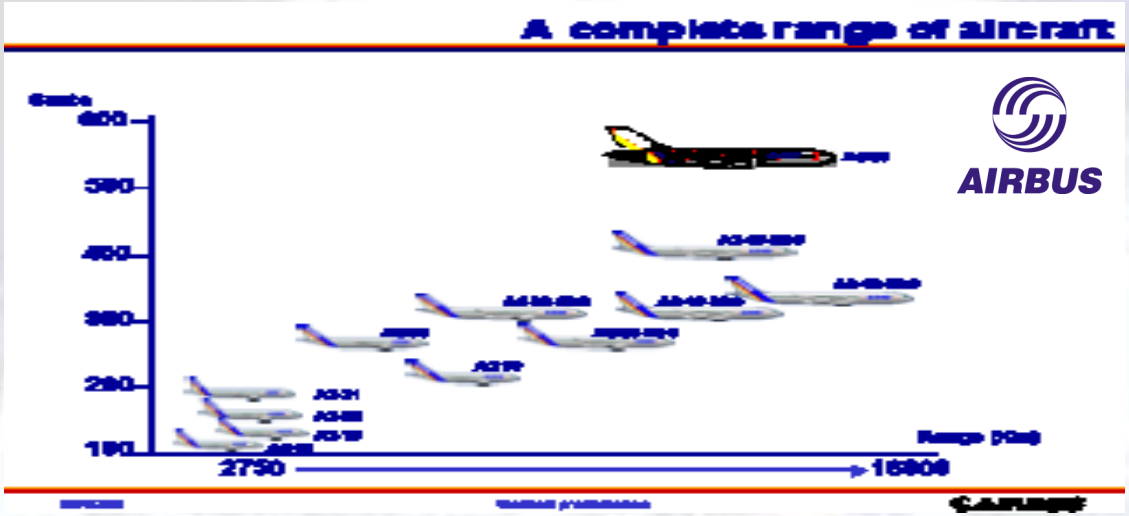

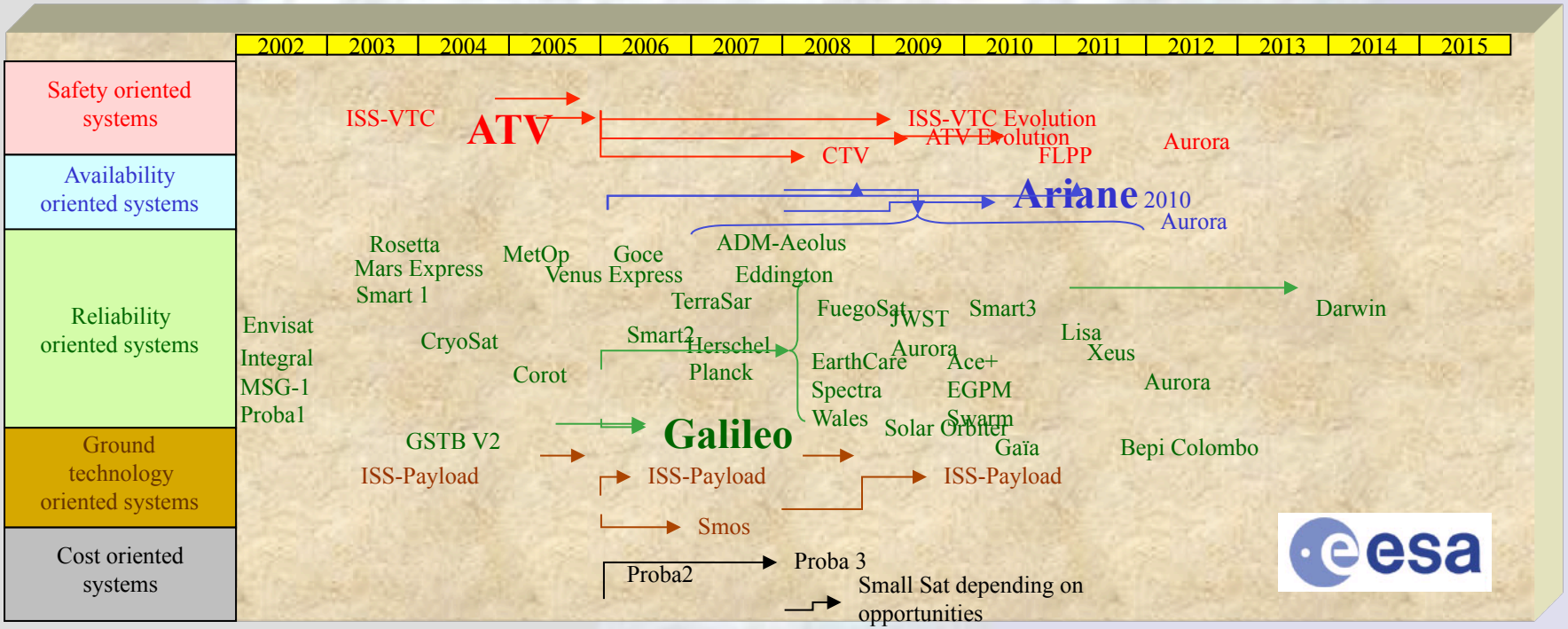

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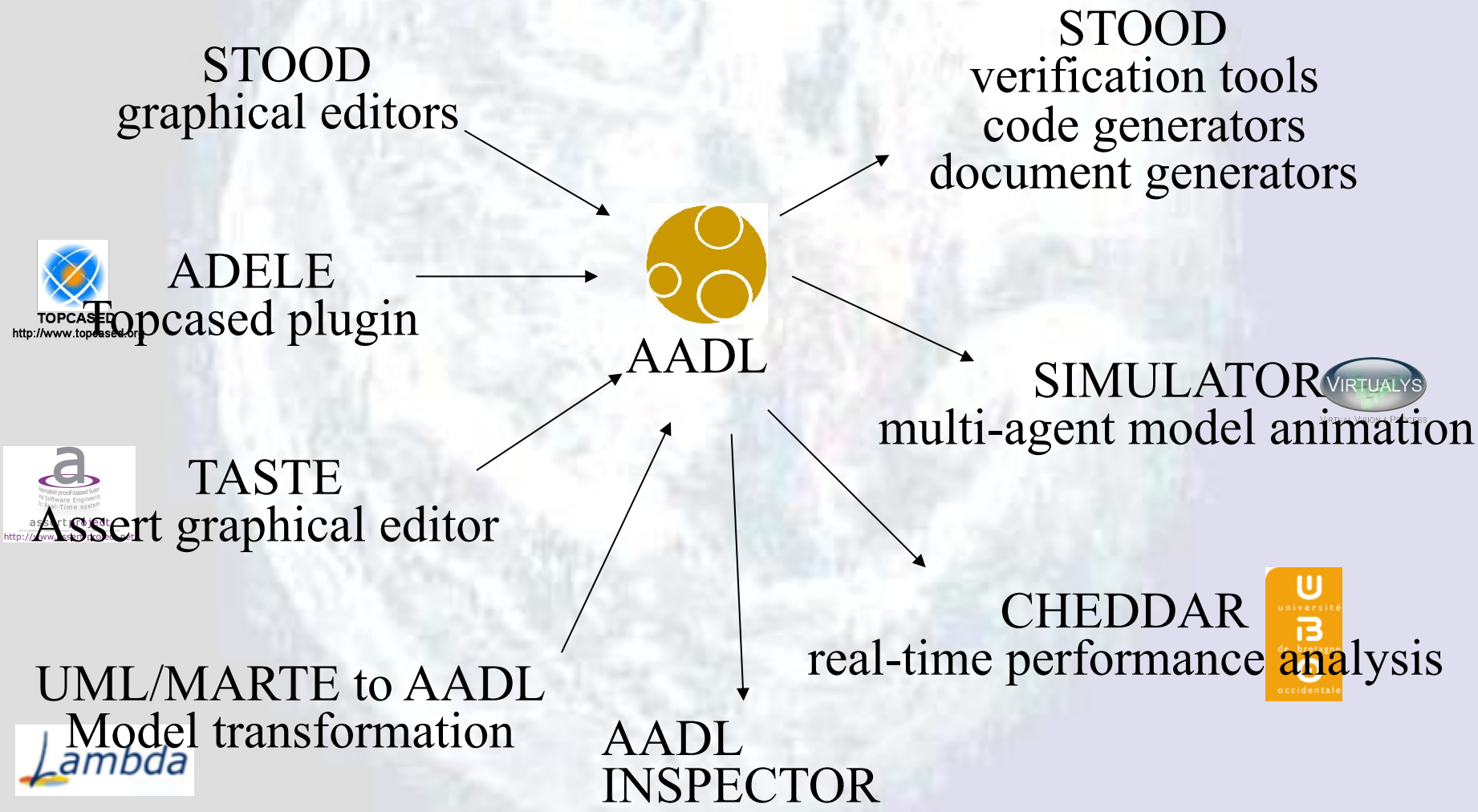
AADL Toolbox overview



AADL Toolbox

- **STOOD**
  - graphical support of AADL
  - import/export of textual AADL
  - connection with production/analysis tool (OSATE, OCARINA, CHEDDAR)
  - download: http://www.ellidiss.com
- **ADELE**
  - included into TOPCASED experimental package
  - download: http://www.topcased.org
- **CHEDDAR**
  - download: http://beru.univ-brest.fr/~singhoff/cheddar
  - support available from Ellidiss Technologies
- **Developments :**
  - TASTE: domain specific graphical editor (ASSERT) and AADL generator
  - UML/MARTE to AADL model transformation
  - Stood 5.3: now (special for the A350 program)
  - Stood 5.4: planned Q4 2010 (support of AADL v2)
  - AADL Inspector – Newly available - further test capability

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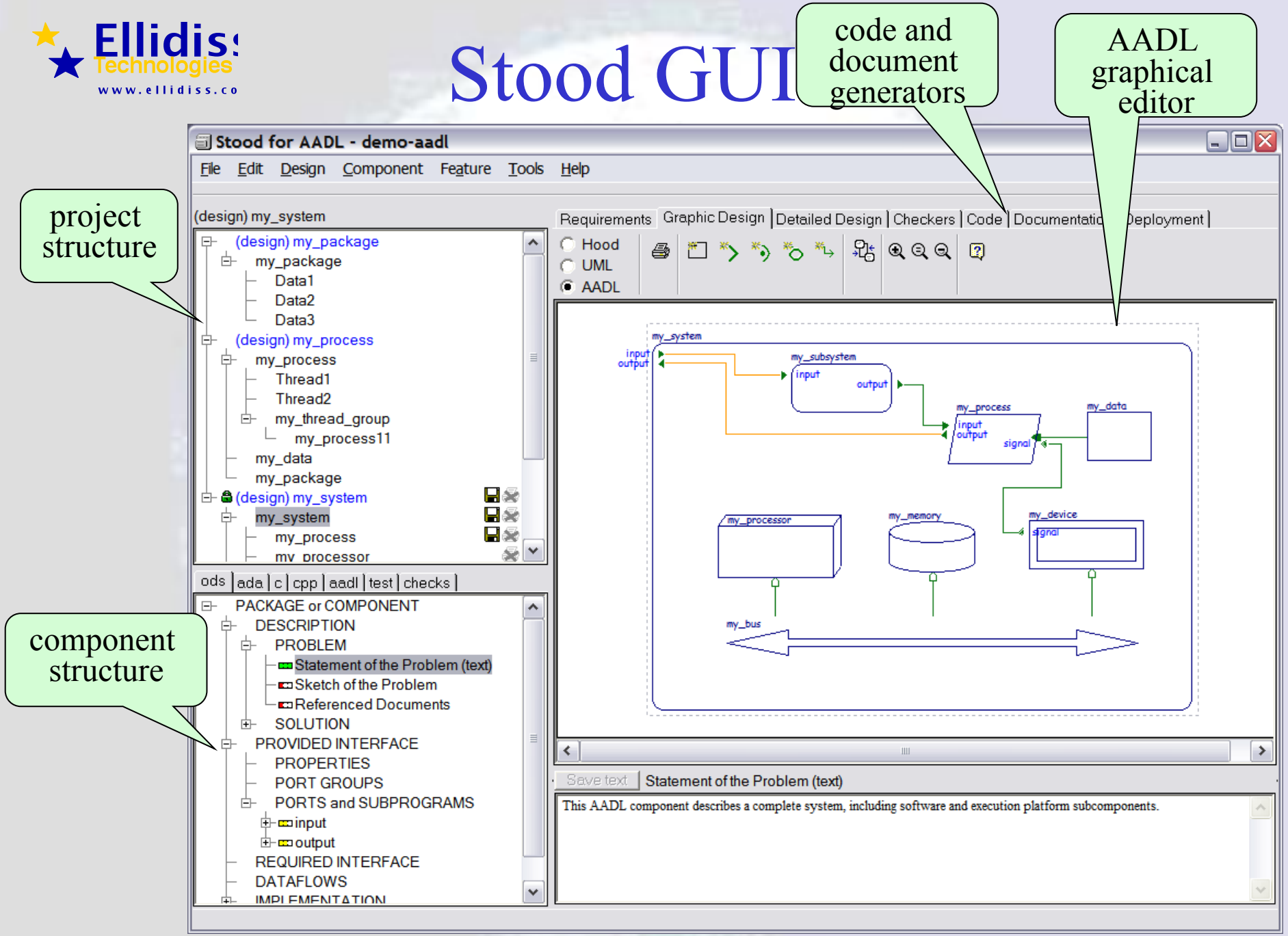
AADL Inspector

- **IMPORT of AADL textual specifications**
  - AADL V2
  - Behavioural Annex
  - AADL V1 compatibility
- **STATIC RULES ANALYSIS**
  - AADL legality, consistency and naming rules
  - Architectural metrics
  - Project specific rules
- **SCHEDULABILITY ANALYSIS**
  - Integration of CHEDDAR
- **DYNAMIC SIMULATION**
  - Multi-Agents simulation engine
  - Complies with the AADL run-time

STOOD

The AADL Coordinating 'Engine'

Stood GUI


code and document generators
AADL graphical editor
project structure
component structure
Stood for AADL - demo-aadl
File Edit Design Component Feature Tools Help
(design) my_system
(design) my_package
my_package
Data1
Data2
Data3
(design) my_process
my_process
Thread1
Thread2
my_thread_group
my_process11
my_data
my_package
(design) my_system
my_system
my_process
ods ada c cpp aadl test checks
PACKAGE or COMPONENT
DESCRIPTION
PROBLEM
Statement of the Problem (text)
Sketch of the Problem
Referenced Documents
SOLUTION
PROVIDED INTERFACE
PROPERTIES
PORT GROUPS
PORTS and SUBPROGRAMS
input
output
REQUIRED INTERFACE
DATAFLOWS
Requirements Graphic Design Detailed Design Checkers Code Documentatio Deployment
Hood
UML
AADL
my_system
input
output
my_subsystem
input
output
my_process
input
output
signal
my_data
my_processor
my_memory
my_device
signal
my_bus
Save text
Statement of the Problem (text)
This AADL component describes a complete system, including software and execution platform subcomponents.

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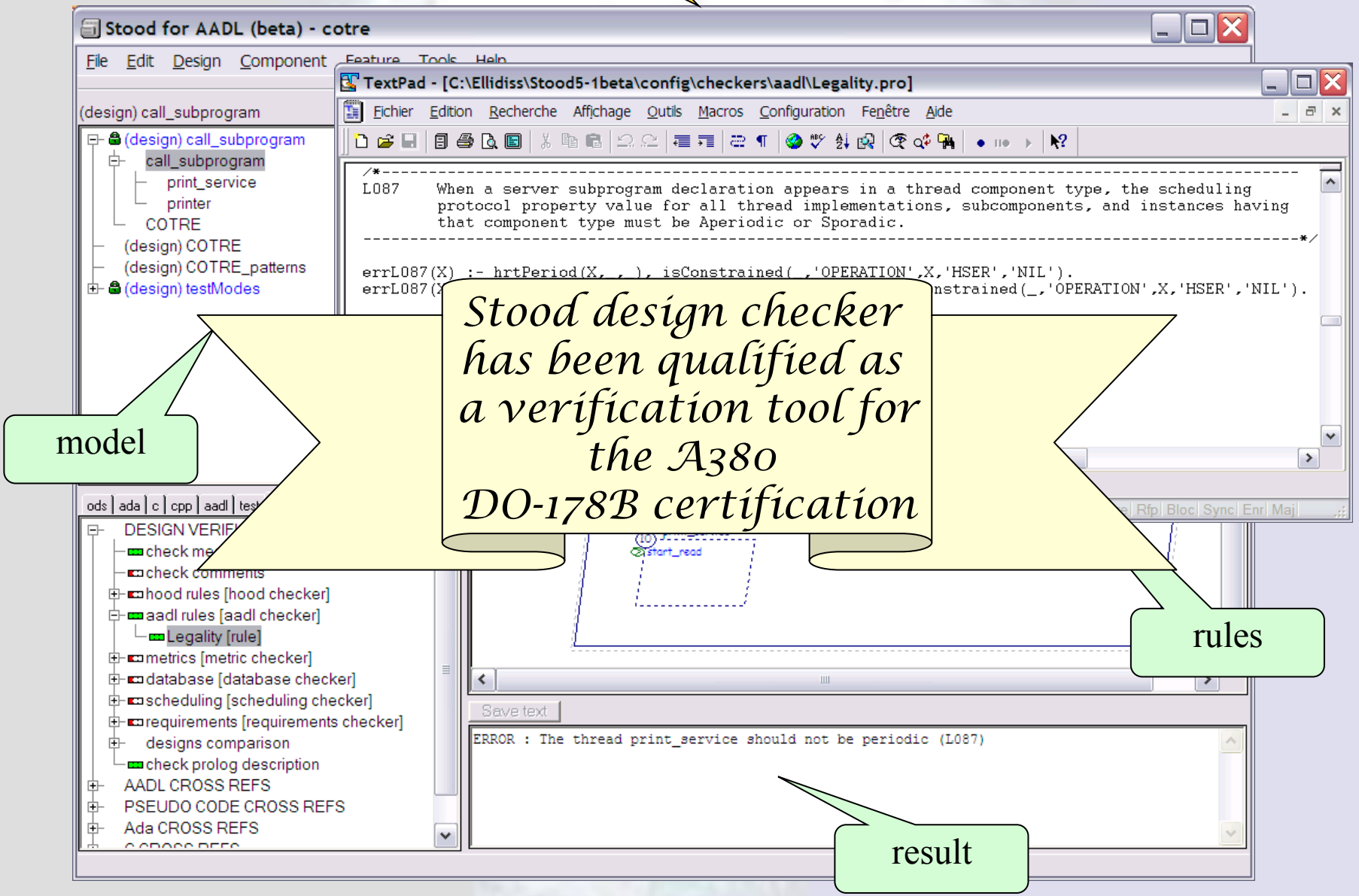
Stood LMP plugins



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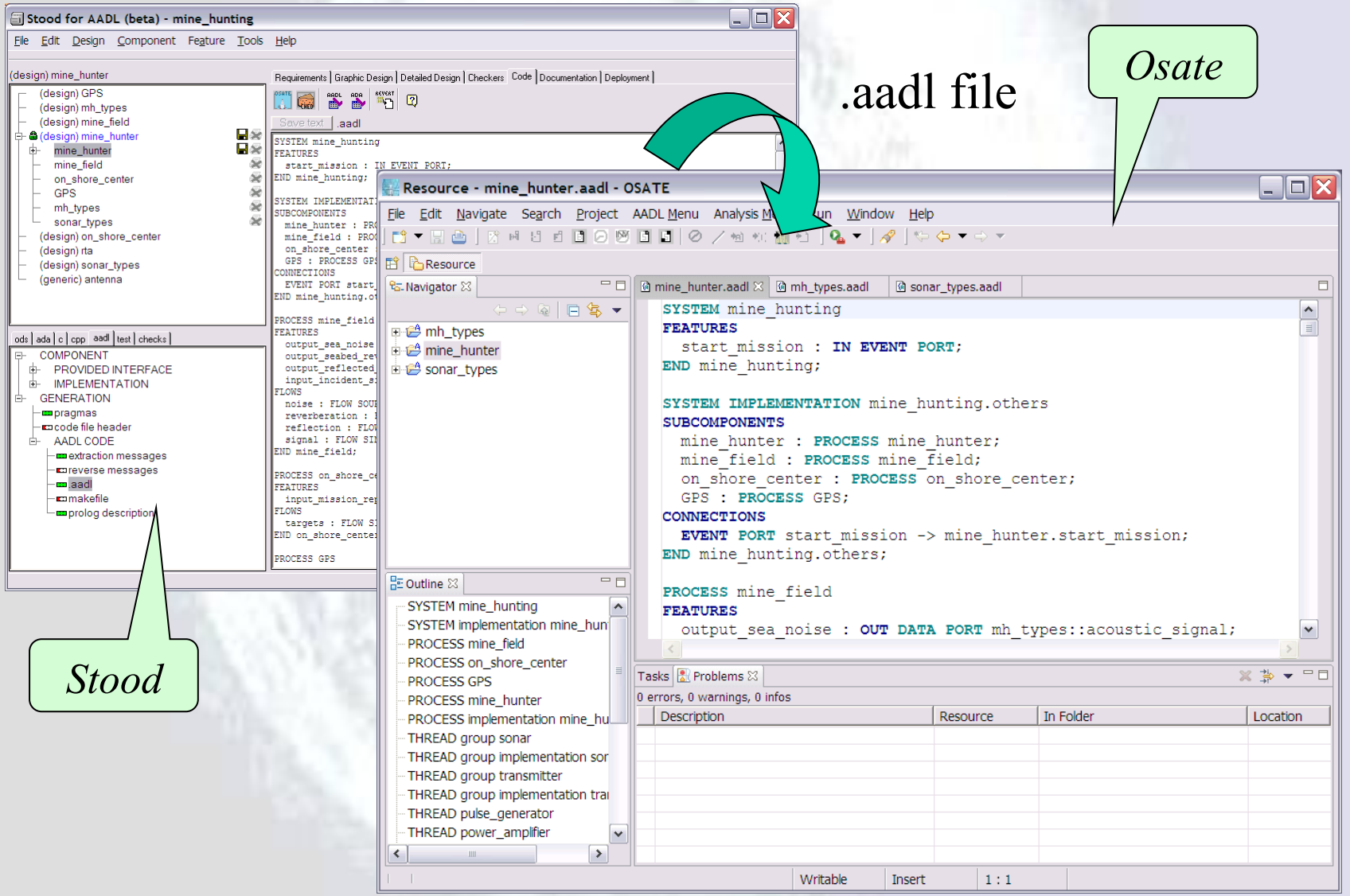
Static analysis



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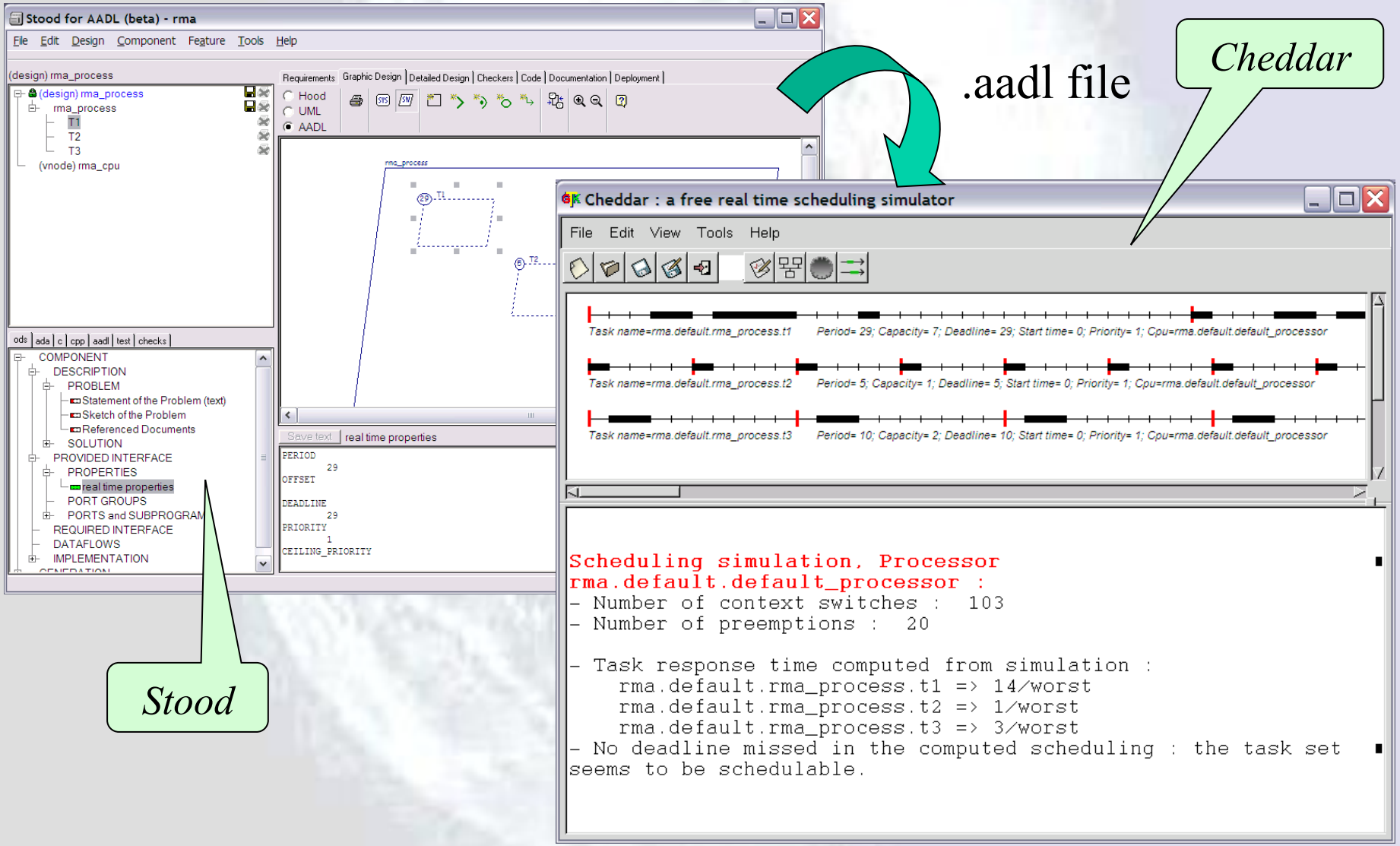
Schedulability analysis



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Model Animation

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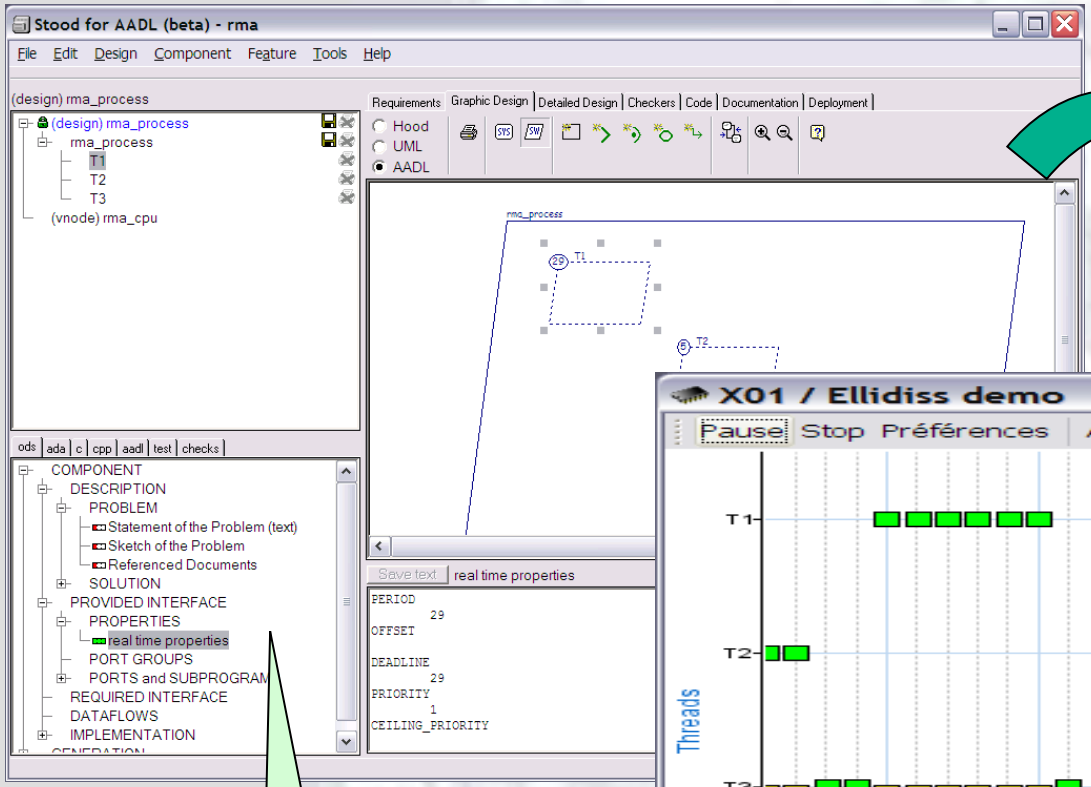
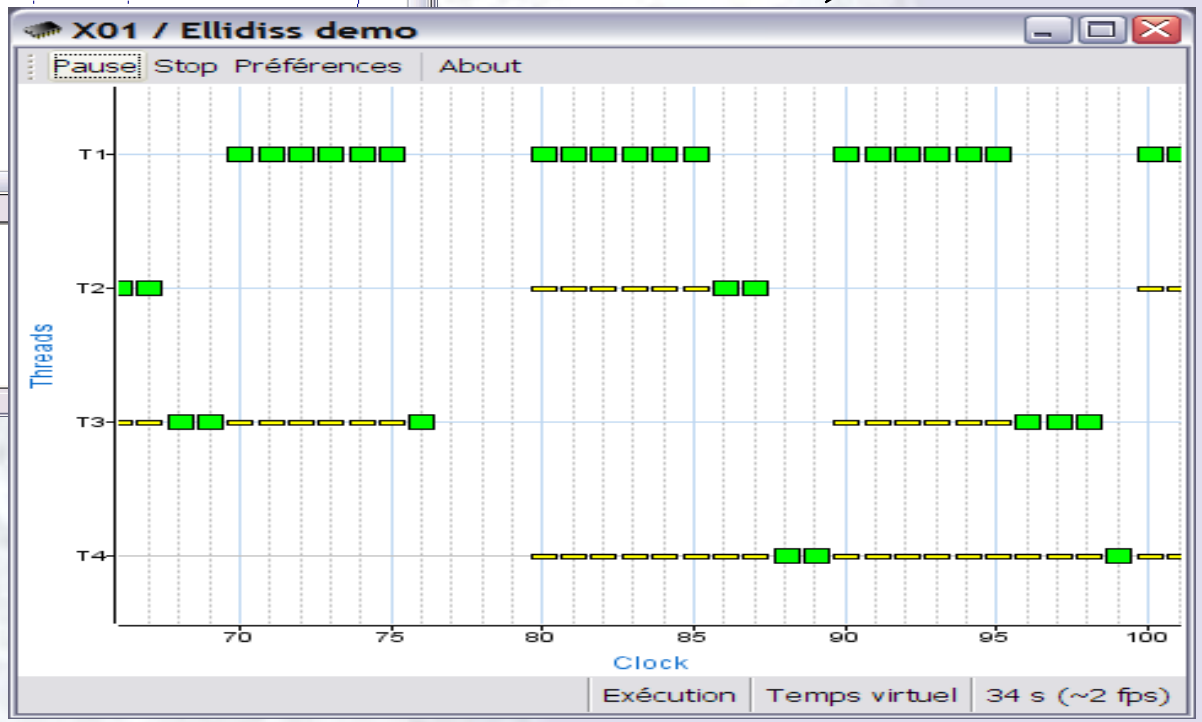
VIRTUALYS
VIRTUAL VISION & PROCESS



.aadl file

Stood

Multi-Agents Simulator



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STOOD summary 1/2

Support of the Software Design activities

Architectural Design

- components based approach
with black-box and white-box views
- UML 2.0 graphical notation
- AADL import/export
- support of HOOD and HRT-HOOD methodology
- built-in real-time model

Verifications

- cross references table
- automatic calculation of the required interfaces
- automatic generation of call trees and dataflow graphs
- real-time schedulability analysis
- requirements traceability matrix
- design rules checker
- design metrics

Detailed Design & Coding

- customizable structured detailed design framework
- incremental documentation
- incremental coding and round-trip engineering
- incremental requirements coverage
- legacy Ada and C code reverse engineering

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STOOD summary 2/2

Workflow Integration

Project management
- full Windows-Unix interoperability
- network distributed project bases
- integrated interface to remote Configuration Management Systems
- multi user management at system and subsystem level
- SIF and XML design model interchange

Compliancy to Standards
- DO-178B for embedded avionics
- ECSS-E40 for space systems
- EN-50128 for railways
- MIL-STD-498 for military

Requirements traceability
- import of high level requirements
- incremental requirements coverage
- management of the derived requirements
- bidirectional interface with Reqtify[tm]

Code & Doc generators
- Ada95
- C/C++
- HTML
- PostScript/PDF
- RTF (Word[tm])
- MIF (FrameMaker[tm])

Stood at Airbus

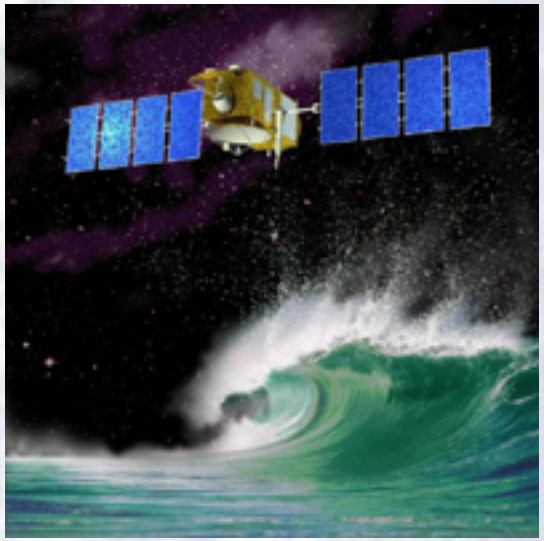
- **Major industrial return of experience:**
  - **A340, A380, A400M** and now **A350**
  - More than 40 licences
  - Fully integrated inside the Airbus Software development environment
  - Customized features:
    - code generators: C + Assembly
    - design checkers: DO-178B qualified for the A380
    - documentation generator

Stood at Eurocopter

- **Tiger Helicopter:** mission calculators
  - French/German program
  - Australian program
  - Spanish program

Stood at CNES
(French Space Agency)

- **Jason satellite**
  - 3 Stood Projects:
    - Proteus: platform
    - Poseidon: altimetry
    - Doris: positioning



- **Helios 2 satellite**
  - 40 Stood Designs
  - 900 000 Lines of Ada code

- **Spot 5 satellite**
  - **Ariane 5 launcher** telemetry
  - **Demeter micro-satellite**

Stood at ESA

(European Space Agency)

- **Envisat satellite**
- **Metop satellite**
- **Galileo positioning system**

- **European Robotic Arm** for the **International Space Station**