AADL Tools

AADL Committee, Toulouse
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Pierre Dissaux

Ellidiss
Technologies
www.ellidiss.com

Ellidiss Software
www.ellidiss.com

UK based company
aka.TNI Europe Ltd
Tools sales office

Ellidiss Technologies
www.ellidiss.com

Fr based company
New tools development
R&D center

20 years + support to major industrial projects:

- HOOD Software design tools for Ada and C
- Eurofighter Typhoon
- Airbus A340, A380, A400M, A350
- Tiger Helicopter (mission calculator)
- Rafale (engine control)

10 years + investement in new technology:

- SAE AS-5506: Architecture Analysis & Design Language
- AADL graphical modeling tools: Stood for AADL
- AADL analysis framework: AADL Inspector
- European Space Agency (TASTE Frame Contract)
- DSM graphical editors: TASTE, COMPASS,…
- Generic model processing technologies: GMP, LMP

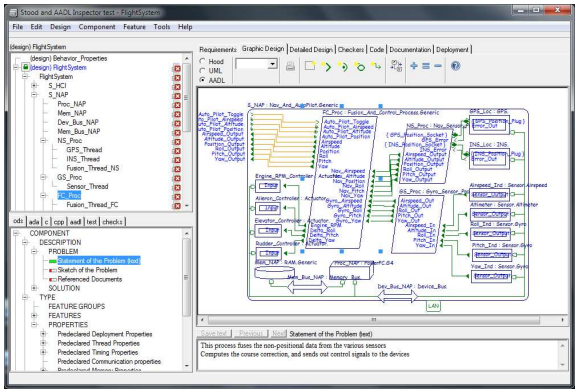
HOOD

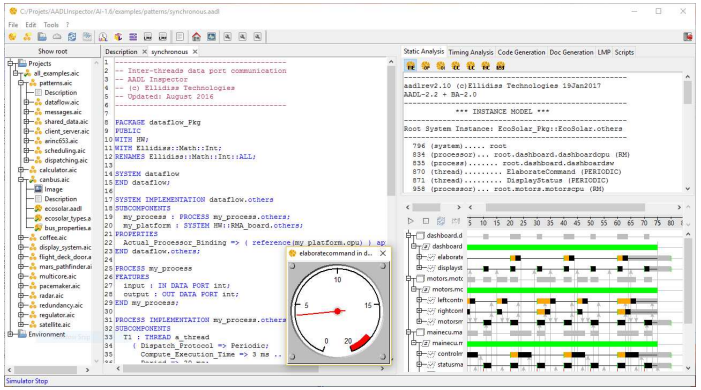
AADL

LMP

COTS Tools for AADL

- **Design: Stood for AADL**
  - AADL project management
  - AADL Instance Model graphical editor
  - Requirement traceability
  - Documentation generator
  - Export textual AADL
- **Verification: AADL Inspector**
  - Import textual AADL
  - Model processing plugins
    - Static rules checkers
    - Scheduling analysis (Cheddar)
  - Simulation (Marzhin)
  - Pre-processors:
    - Import UML profiles (MARTE, SysML, …)
    - Import Domain Specific Models (XML)
- **Model Processing Toolbox: LMP**
  - Supported languages: AADL, Ada, C, XM* (XML, XMI, ECore)
  - Implementation: parsers + prolog engine and libraries





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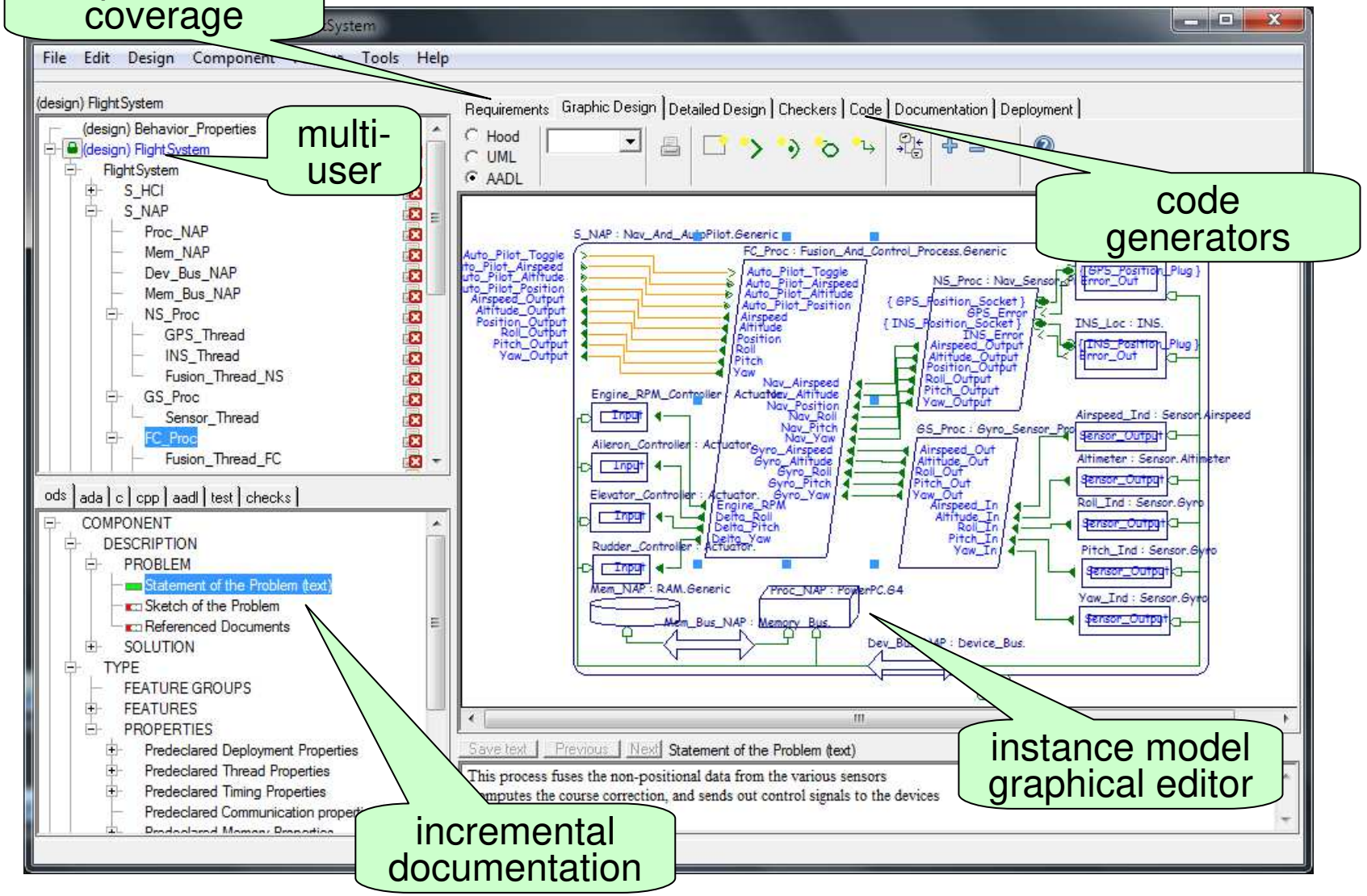
Stood for AADL



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Top-Down modeling process for AADL

- Offers an industry proven practical modeling process to AADL designers
- Hierarchical Object Oriented Design (HOOD)
  - Inherits 20 years usage for the biggest European avionics projects (Airbus, Eurofighter)
  - Architectural Design (diagrams):
    - hierarchy of components with rigorous visibility rules:
    - enable safe subcontracting (sub-trees)
    - ease testing, integration and maintenance
    - prevent from producing "spaghettiware"
  - Detailed Design (structured text):
    - keep track of design decisions
    - requirements coverage
    - supporting framework for design documentation, coding and testing
- Benefits for the AADL user (cf. Stood for AADL)
  - Graphical editor of the AADL Instance Model (what you design is what you get)
  - Data Hiding enforcement (visibility rules, no provides data access)
  - AADL Declarative Model generator (textual AADL) for early verification activities
  - Complement AADL design activities with detailed design (documentation and coding)

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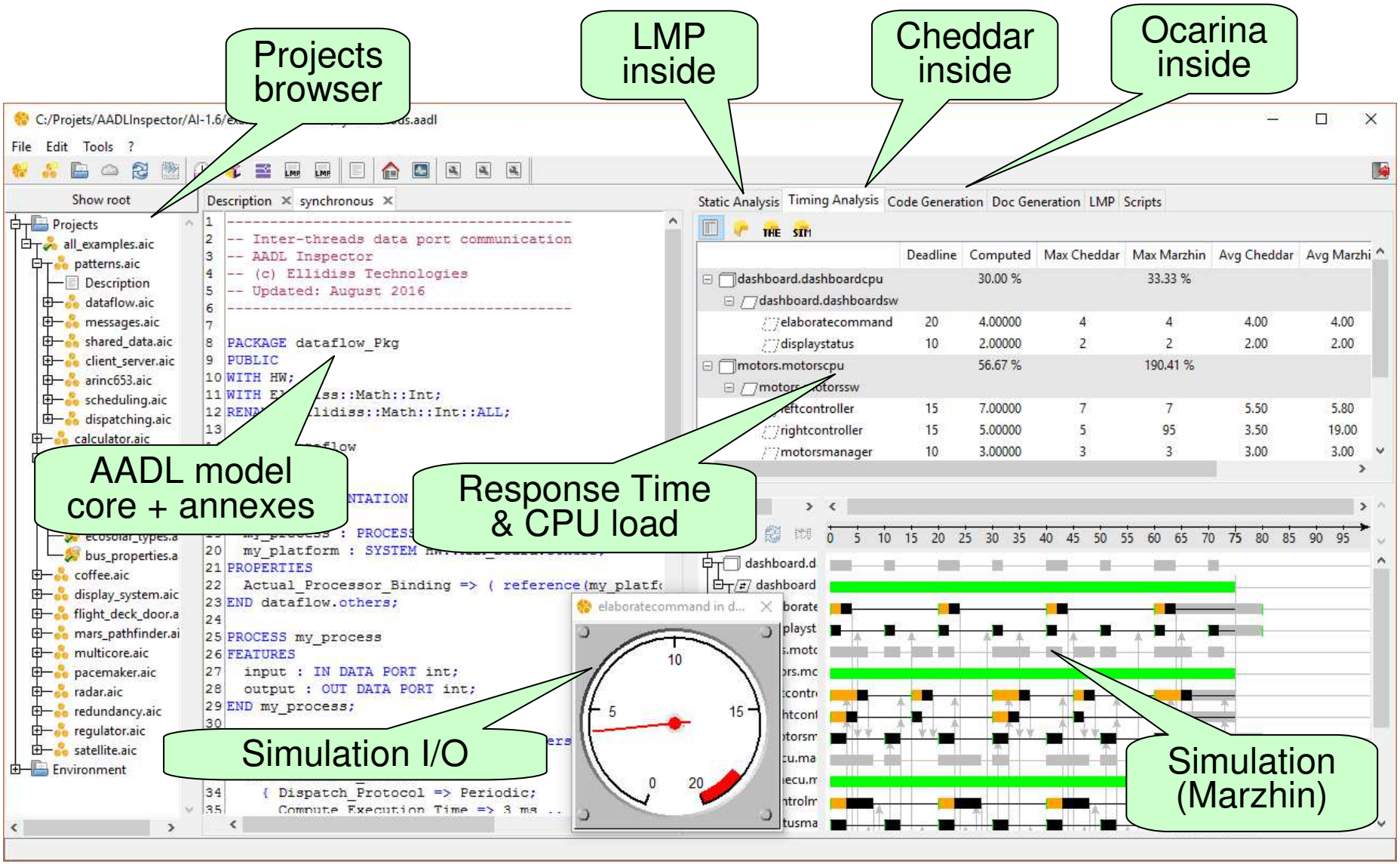
AADL Inspector



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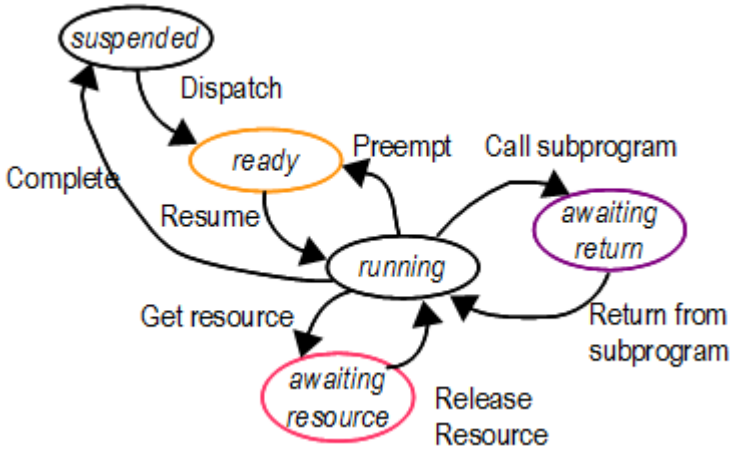
Marzhin
Executable AADL

VIRTUALYS
VIRTUAL VISION & PROCESS

- Multi-agent real-time simulator:
  - Based on a pre-existing multi-agent kernel
  - Specialized agents to represent real-time software constructs:
    - Processor and scheduler
    - Process and partition
    - Thread and shared data
    - Ports and connections
    - Bus and bus messages
  - The agents interact together and exhibit a global behavior
- Implementation of the AADL run-time
  - Standard run-time semantic
  - Details with the Behavior Annex (subset of)
  - Supports TSP & multicore (AMP,SMP,BMP)
  - Generates system state changes events
- Accepts user interaction
  - Can be controlled by scenarios or dialogs
  - Used to display simulation traces
  - Used to animate 2D/3D graphics



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AI 1.6 Features

- AADL projects manager
  - core 2.2 + annex sub-languages EMV1, EMV2, BA 2.0
  - interface with other AADL editors (Osate, Stood, …) and github access
  - hierarchical project structure:
    - AADL environment (libraries, property sets)
    - sharable sub-projects
    - simulation scenarios
    - documentation sections (text, pictures)
- Imports XML/XMI models
  - generic transformation process for ECore based models using LMP
  - existing prototypes for UML/MARTE, SysML, Capella, …
  - require precise mapping rules to be formalized (project dependent)
- AADL model processing
  - turnkey embedded tools:
    - Cheddar (scheduling analysis)
    - Marzhin (event based simulation)
    - Ocarina (AADL compliancy analysis, code generation)
  - customizable plugins using the LMP toolbox:
    - AADL and XML parsers
    - prolog engine
    - AADL processing libraries (instance model, legality rules, …)

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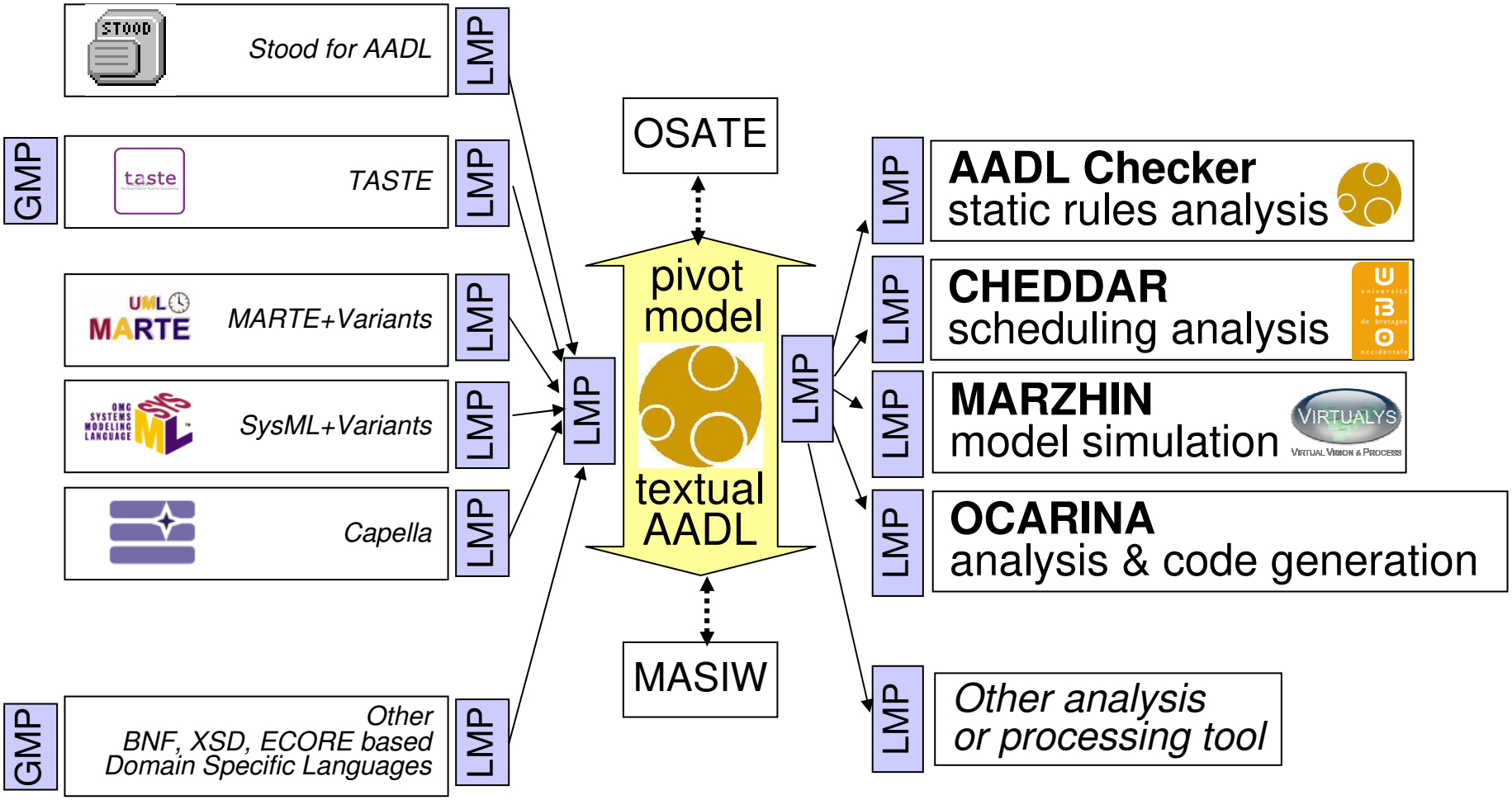
AADL based tool-chains



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AADL related projects

- Cheddar
  - collaboration with the University of Brest (F. Singhoff & all)
  - multicore scheduling analysis (SMP, BMP)
  - cache aware scheduling (priority assignment, scheduling simulation)
  - network on ship scheduling analysis (NoC)
  - partitioning methods, multi objective optimization
- European Robotic Goal-Oriented Autonomous Controller (ERGO)
  - EC funded collaborative project: www.h2020-ergo.eu
  - reuse/improvement of the TASTE tool chain (AADL based)
  - part of a bigger project about Space Robotics: PERASPERA
- Other topics of interest (but not funded yet…)
  - Safety Analysis support in AADL Inspector
    - interfacing with existing tools (i.e. COMPASS)
    - possible use case: ship Dynamic Positioning system
  - Security Modeling & Analysis
    - possible collaboration with Telecom Bretagne/French Navy (PhD student)
    - contribution to the AADL security annex ?
  - FMI/FMU support in AADL Inspector (Marzhin)
  - AADL subsets (needed for tool set specification)

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Conclusion

- **COTS tools**
  - Stood for HOOD: software design and coding (Ada, C)
  - Stood for AADL: instance model graphical editor for AADL
  - AADL Inspector: analysis and simulation
  - AADL Builder (future product)
  - LMP Designer (future product)
- **Technology**
  - LMP: model processing toolbox (prolog)
  - GMP: DSL graphical editor framework
- **Services**
  - Tools support
  - AADL consulting
  - Graphical front ends development
  - Model processing tools (rules checkers, generators)
  - Model transformations
  - Heterogeneous tools integration
  - R&D partnerships