MBSS
Model Based System Synthesis

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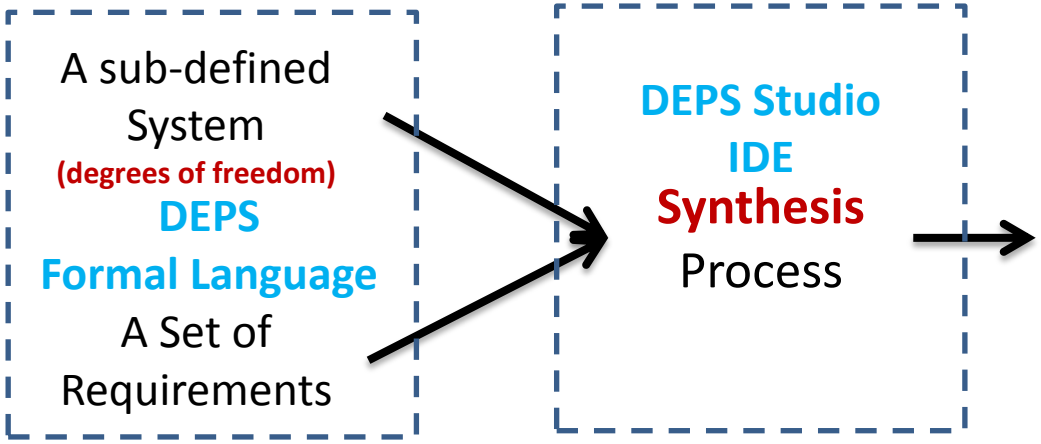
System Synthesis problem

- **Design steps** : preliminary design, architecture synthesis, system integration
- **Design problems**: sizing, allocation/deployment, configuration, architecture generation/synthesis
- **Systems** : physical, software intensive, embedded systems, CPS
- **Problem modeling** : sub-defined system, formal requirements
- **Problem Solving** : correct architectures by construction

« Inductive research »



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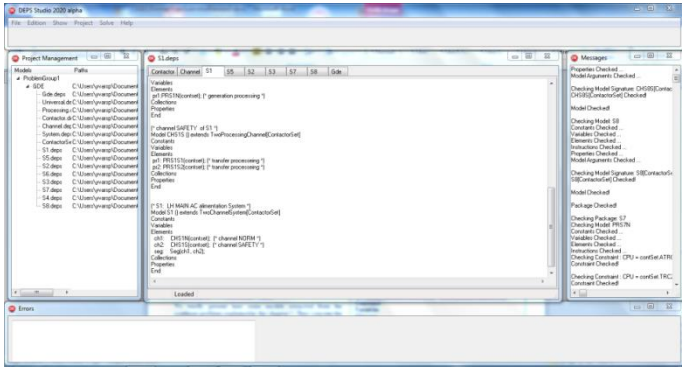
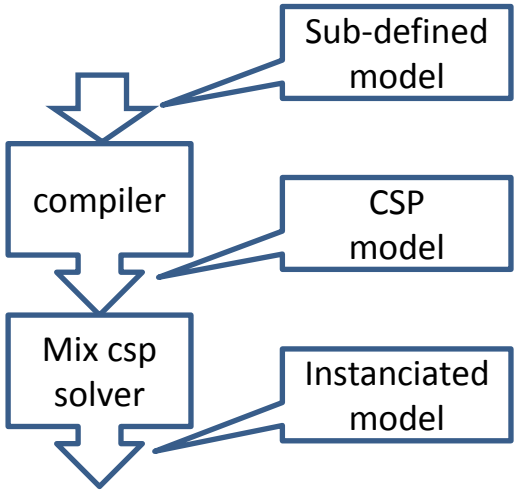




The DEPS language
A DSML for system synthesis

- **Declarative** DSM Language for problem specification and MBSS studies
- **Object-oriented** Knowledge Representation (*Models* are classes, *elements* are instances)
  - class-instance model
  - inheritance, composition, association, polymorphism
  - some attributes can be sub-defined (*variables*)
- **Formal properties** encapsulated inside or between Models
  - equations, inequalities between algebraic expressions (IEEE 754)
  - data catalogs, …
- **Ontology for engineers**
  - quantities, dimensions, units
  - Six data types and domains: real, integer, enumeration (real and integer), intervals (real and integers)
- **Applications :** IMA architecture, battery system sizing, Fuel Cell…
- DEPS is supported by the ***DEPS Link*** non profit organization

  www.depslink.com

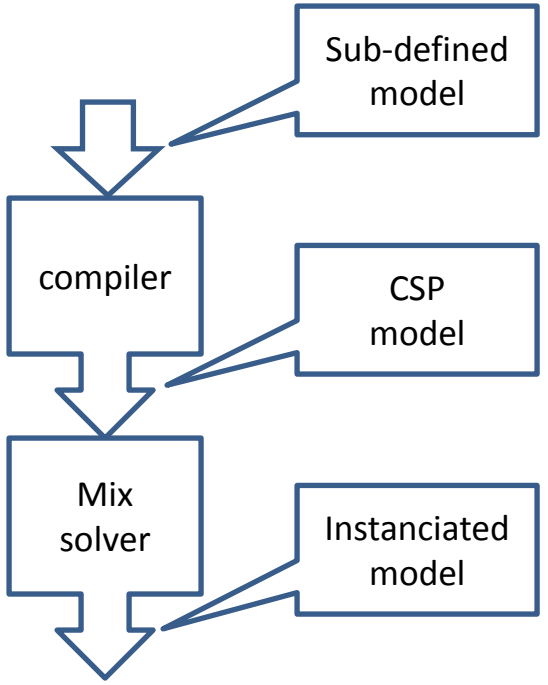
The DEPS Studio IDE

An Integrated Modelling and Solving Environment

A SYNTHESIS TOOL CHAIN:

an integrated problem solving tool chain to address design problems:

- sizing, deployment, configuration, architecture synthesis



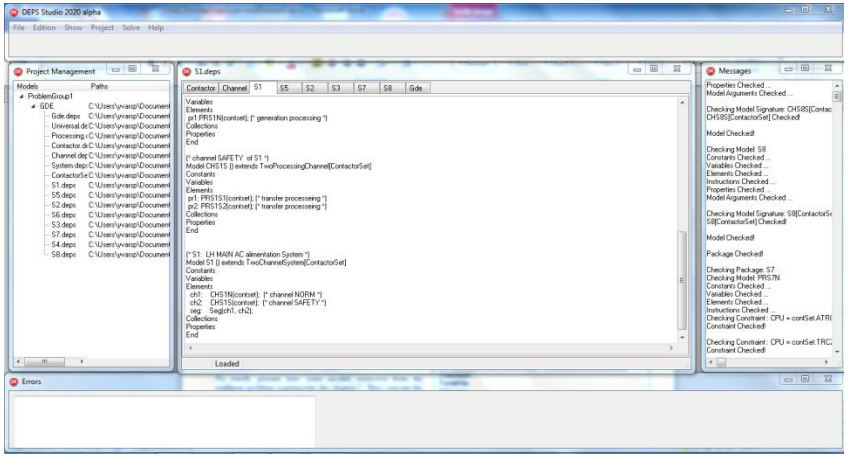
Model edition, project and package management

DEPS COMPILER

- Ahead-of-time with static type checking
- generation of sub-defined model instances with constraints

DEPS SOLVER

- constraint programming paradigm
- Purpose-built
- Mixed (integer/real) solving capabilities



➔ DEPS Studio V “2020 alpha” disseminated internally

➔ DEPS Studio V 2021 soon available in freeware

People

	DEPS Language	DEPS Studio IDE	Problem & requirements modeling & solving
Dassault Aviation L. Zimmer (IR)	X	X	X
Dassault Aviation M. Lafaye (IR)			X
Thalès RT J. Lenoir (IR), S. Madelenat(IR)			X
IRT System X S. Creff (IR)	X		X
UTC - Roberval A. Hubert (PR), S. Diampovesa (Phd student)			X
IREENA S. Bourguet (MCF HDR)			X
ISAE-Supméca QUARTZ P.A. Yvars (PR)	X	X	X

Projects and studies

Current projects:

- Clean Sky 2: AIRFRAME ITD - Virtual Modelling for Certification package
  - Verification of the fail-safe character of an embedded electrical power generation and distribution system

  (Dassault Aviation / ISAE-Supméca)

- IRT System X: I(SC)^2 project – Design Space Exploration package
  - Embedded resource allocation problem under functional requirements
  - Satellite optical device presizing problem under fonctional requirements

  (Thales RT / Dassault Aviation, ISAE-Supméca)

- GDR SEEDS: MOPEE project
  - Energy storage system design under functional and non functional requirements

  (UTC / ISAE-Supméca)

- Off-shore wind turbine network design (IREENA / ISAE-Supméca)