

# From UML to SystemC: Intensive signal processing application



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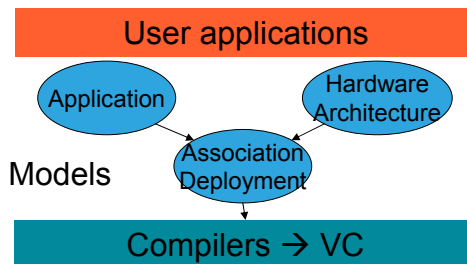
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## « Y » model for SoC design



- 3 models
  - ISP applications
  - Target architectures
  - Mapping of applications on architectures
- Model separation allows reuse
- Typical programming techniques in SoC design



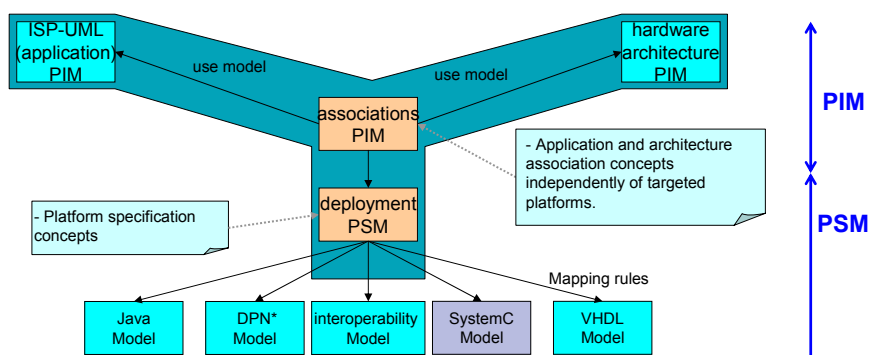
# Model Driven Engineering



- Model Driven Architecture (MDA) approach for SoC design
- PIM to PIM transformation mapping/scheduling
- Automatic generation of high-level SystemC specifications from ISP description
  - PIM to PSM transformation
  - Platform description model of SystemC ISP domain
- Profiling and performance evaluation
- Toward SW/HW co-design
  - Modeling at different abstraction levels
  - Ensures bit accuracy and cycle accuracy
  - Industrial IP libraries (VIPLibrary:ST, ARM, ...) and academic (SoCLib)



# The “Y” Model and MDA: Metamodel View



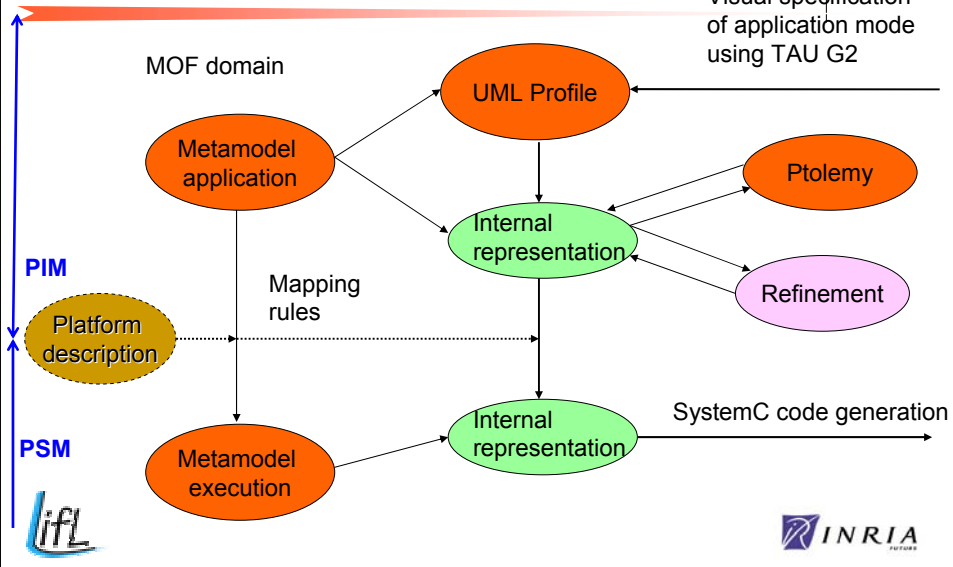
\*Distributed Process Network



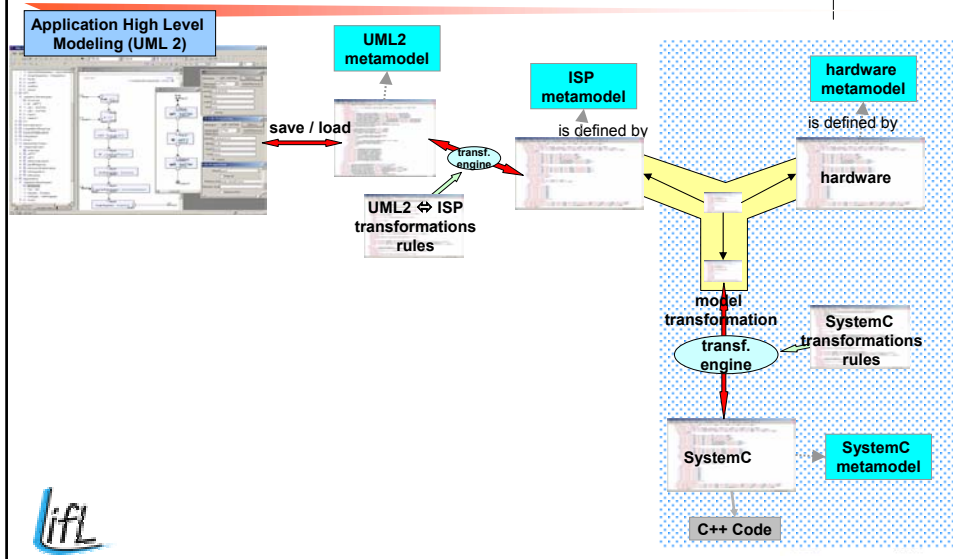
# Model Driven Engineering for ISP



Visual specification of application mode using TAU G2



# Model to Model Transformations ISP ⇔ SystemC



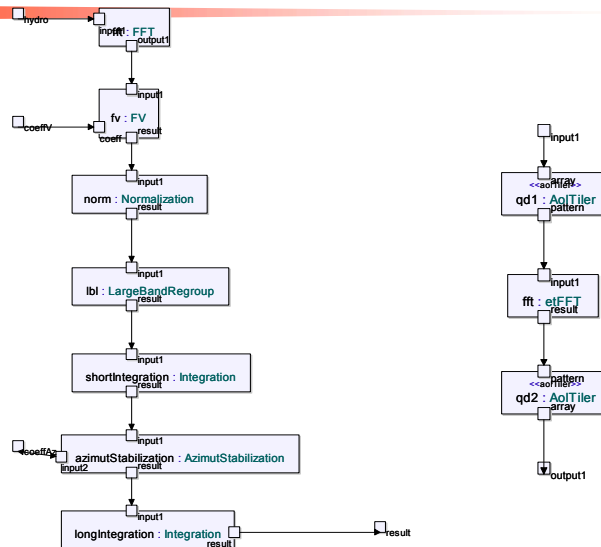
# Status



- Visual modeling of Intensive Signal Processing Application
- Eclisp Plugin
- Metamodel and UML profile of ISP
- Model to model transformation and code generation
  - UML TAU G2 <-> ISP
  - ISP -> SystemC
- ISP domain in SystemC ( KPN execution model)
- Distributed SystemC runtime
  - Socket
  - Corba
- Multi abstraction level SystemC simulation



# Application PIM: ISP Example

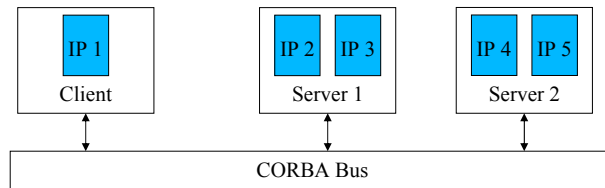




# Distributed SystemC in CORBA



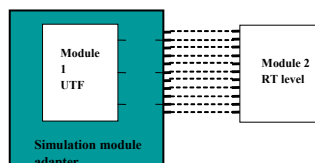
- IPs are available on server hosts
- Each IP or IP group must be encapsulated in a SystemC module (corba\_server\_if)
- Transport object : remote method invocation on CORBA bus (set/get on ports)
- Clocked modules to support synchronization of distributed IPs



# SystemC multi-abstraction level



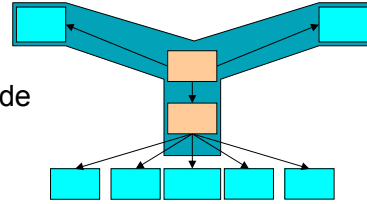
- What : Connecting together IPs described at different abstraction levels
- Why : Easy and fast simulation platform with existing IPs
- How : Data conversion and protocol conversion
  - Construction of level adapters by rule compositions (No library)
    - Transformation rules (transformation of the ports)
    - Association rules (transformation and definition of ports protocols)



## Future works



- A Full « Y-model »
  - Extend ISP model with control-flow model (esterel)
  - Hardware hierarchical specification (Syndex oriented)
  - Mapping specification and optimization techniques
- A MDA style
  - MOF definition of metamodels
  - MDATransf tool
  - Mapping rules towards Esterel/scade
  - PDM of SystemC ISP domain
  - Multi-language PSM, Multi-PSM



## Collaborations



- UML2.0 Profil
  - P2I Itea Project
  - PROTES (Carroll Inria, CEA, Thales)
  - Standardisation action at OMG
- Around SystemC
  - Collaboration with Irvine (D Gajski) SpecC
  - TIMA Grenoble (Dynamic scheduling)
  - Soclib
  - EuroSoc
  - ECSI



# FDL '04 in Lille

<http://www.ecsi-association.org/ecsi/fdl/fdl04/home.htm>



Forum on specification & Design Languages

FDL'04

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September 13 - 17, 2004  
M A C C  
Lille - France

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