



Introduction to OSCI AMS Working Group

SystemC-AMS Workshop
Martin Barnasconi, OSCI AMS WG Chair
June 25, 2007

Outline

- **Introduction to Open SystemC Initiative (OSCI)**

- Organization and Working Groups
- Objectives and activities
- SystemC User Group Survey Trends

- **OSCI AMS Working Group**

- Organization and members
- Charter, objectives and deliverables
- Planning, timing and activities

- **Conclusions**

What is OSCI?

- **The Open SystemC Initiative (OSCI) is**

- an independent not-for-profit organization
- composed of a broad range of companies, universities and individuals
- dedicated to deploy and support SystemC as an open source standard for system-level design.

- **SystemC provides**

- hardware-oriented constructs as a class library implemented in C++
- an interoperable modeling platform for development and exchange of C++ models
- a stable platform for development of system-level tools
- models for design and verification, from concept to implementation in hardware and software

Who is OSCI?

Corporate Members



Associate Members



Key contributors



35 member companies in total



OSCI Board of Directors and Officers

■ OSCI Board Members

- ARM – Nizar Romdhane
- Cadence - Stuart Swan
- CoWare - Pat Sheridan
- Forte - Mike Meredith
- Intel – Ken Tallo
- Mentor - Mark Glasser
- NXP - Ralph von Vignau
- STMicroelectronics - Alain Clouard
- Synopsys – Markus Willems

■ OSCI Officers

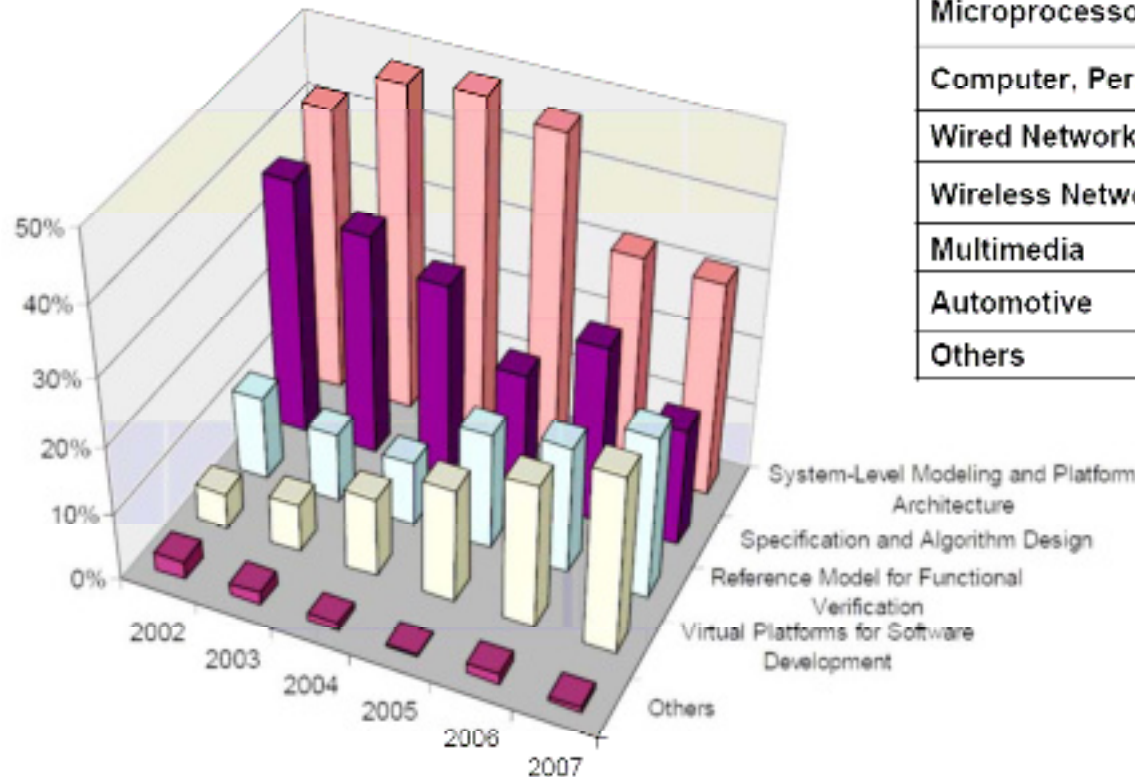
- Chairman, Alain Clouard
 - ♦ alain.clouard@ST.com
- President, Mike Meredith
 - ♦ mmeredith@ForteDS.com
- Executive Director, Pat Sheridan
 - ♦ psheridan@CoWare.com
- Secretary, Paul Tauber
(Legal counsel)
 - ♦ PJT@cpdb.com
- Treasurer, Stan Krolikoski
 - ♦ stanleyk@cadence.com

OSCI objectives and activities

- Building a rich system-level design language and open source implementation based on C++ class libraries, called "SystemC"
- Encouraging availability and adoption of intellectual property (IP), tools and methodologies based on SystemC
- Providing the mechanisms that enable the continued growth of the SystemC community
- Defining interoperability criteria for IP and tools based on SystemC
- Delivering updates to the SystemC Language Reference Manual (LRM) and open source implementation
- Standardization of the SystemC language via the IEEE

SystemC User Group Survey Trends

- World-Wide SystemC Use-Model
- End Product Market Segments



End Product Markets	2003	2004	2005	2006	2007
Microprocessor/DSP	18.9%	16.0%	13.1%	10.5%	14.7%
Computer, Peripheral	22.9%	21.6%	18.5%	24.2%	19.0%
Wired Network	11.2%	5.2%	5.8%	4.8%	5.2%
Wireless Network	13.1%	10.4%	13.1%	7.3%	6.9%
Multimedia	25.6%	34.2%	33.8%	37.9%	31.9%
Automotive	1.9%	3.0%	3.8%	4.0%	4.3%
Others	6.4%	9.7%	11.9%	11.3%	18.1%

focus of
OSCI AMS WG

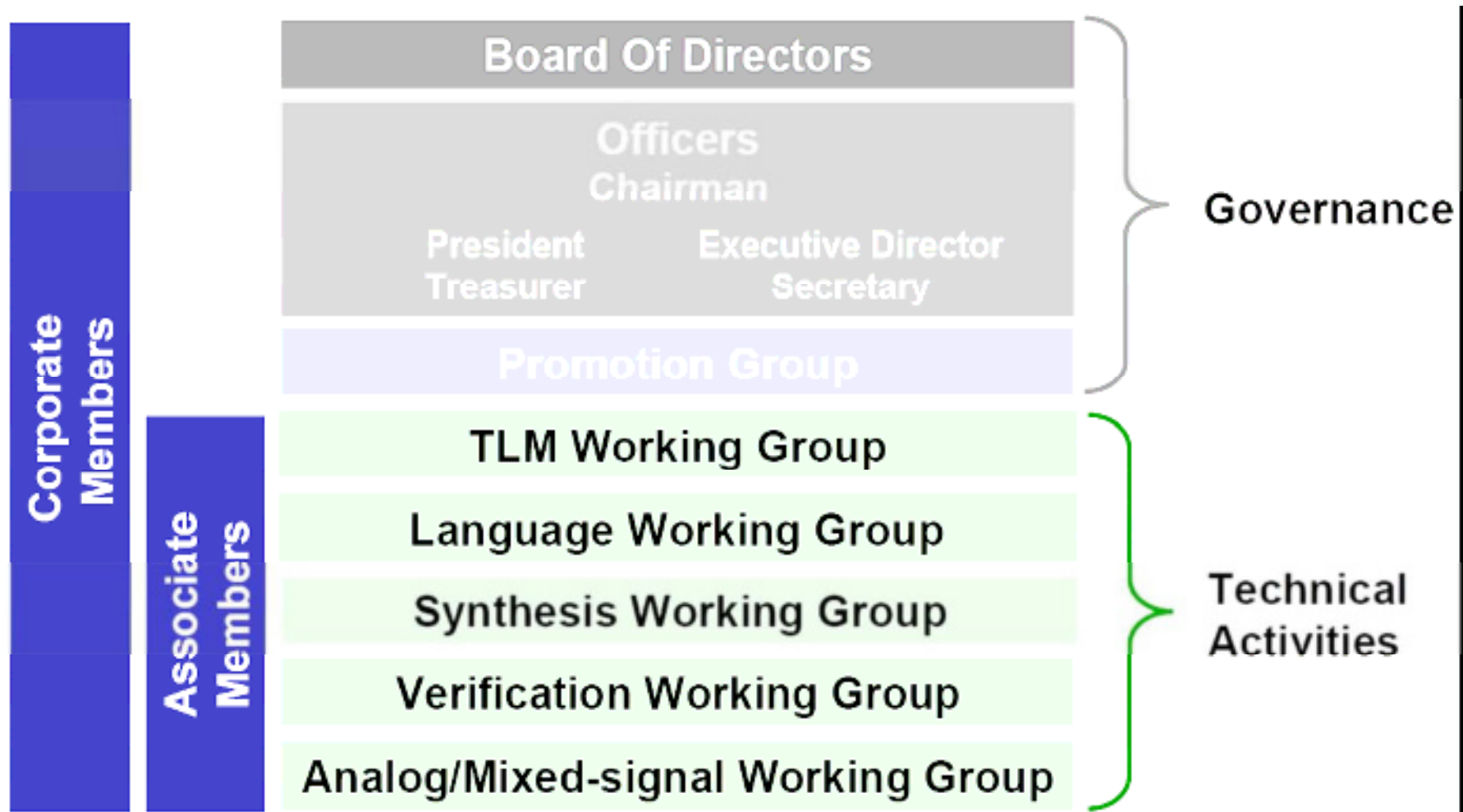
- Full document available on <http://www.systemc.org>



How to join OSCI?

- **Membership levels**
 - Corporate Members
 - Associate Members
 - Very occasionally: Key contributors
- **Fill out and sign the Corporate Membership or Associate Membership Agreement to the OSCI Secretary**
 - For Associate Corporate memberships please indicate the appropriate fee category.
- **Contact the chairman of each individual Working Group in which you are interested in participating**
- **Start to join in the Working Group technical discussions that determine the future direction of SystemC!**

OSCI Organization and Working Groups



OSCI Organization and Working Groups



Why starting with an OSCI AMS WG?

- **Missing is**
 - a true architecture design tool for AMS system design and verification
 - an agreed system modeling language for AMS system architectures
 - a platform that facilitates AMS model exchange and reuse of intellectual property (IP) for AMS system architectures
 - an open model interface between AMS and digital system descriptions, independent of ‘integrated solutions’ of CAD/EDA tool vendors
- **It’s time to standardize a modeling language for analogue mixed-signal systems !**
 - AMS models for architecture design and verification, from concept to implementation
 - AMS constructs in a SystemC compatible class library implemented in C++
 - Providing an interoperable modeling platform for development and exchange of AMS models
 - Creating a stable platform for development of system-level tools

OSCI AMS Working Group charter

- The Analogue Mixed-Signal (AMS) Working Group develops and recommends techniques and provides an extension to the foundation class library for SystemC, called SystemC-AMS, promoting the modeling of heterogeneous systems including both continuous time and discrete event behaviours at architectural level.
- Main purpose is to enable specification, simulation, verification, implementation and evaluation of embedded heterogeneous systems containing digital, analogue, mixed-signal and radio frequency functions, which are characterized in electrical or non-electrical domains.



Fraunhofer
Institut
Integrierte Schaltungen



OSCI AMS Working Group members

■ Members

- NXP - Martin Barnasconi (chair), Giorgia Zucchelli
- TU Vienna - Christoph Grimm (vice-chair)
- Fraunhofer - Karsten Einwich
- Infineon - Wolfgang Granig, Gerhard Nössing, Martin Schell, Wolfgang Scherr
- Intel - Eric Grimme
- Doulos - David Long
- Freescale - David Miller, Brian Mulvaney
- STMicroelectronics - Serge Scotti, Jean-Paul Morin
- EPFL Lausanne - Alain Vachoux
- UPMC/LIP6 - Dimitri Galayko, Patrick Garda, Marie-Minerve Louerat, François Pêcheux

OSCI AMS Working Group scope

■ Embedded mixed-signal systems

- Heterogeneous systems including analogue, mixed-signal RF and digital IP

■ Application domains

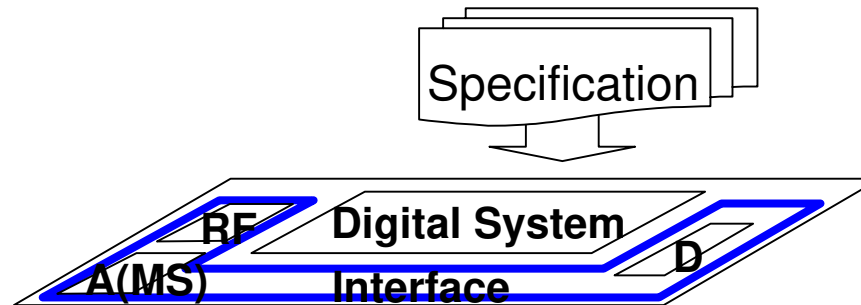
- Wireless
- Wired
- Automotive
- Imaging sensors

■ Use cases

- Virtual prototyping for SW development
- Creating reference models for functional verification
- Architecture exploration, definition and algorithm validation

Heterogeneous System Design

Functional

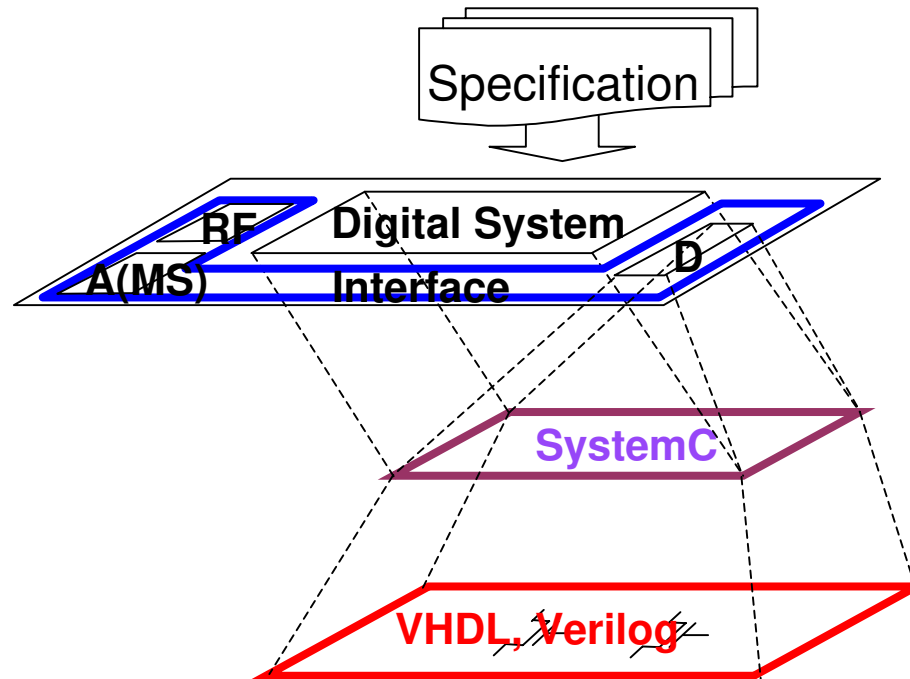


Heterogeneous System Design

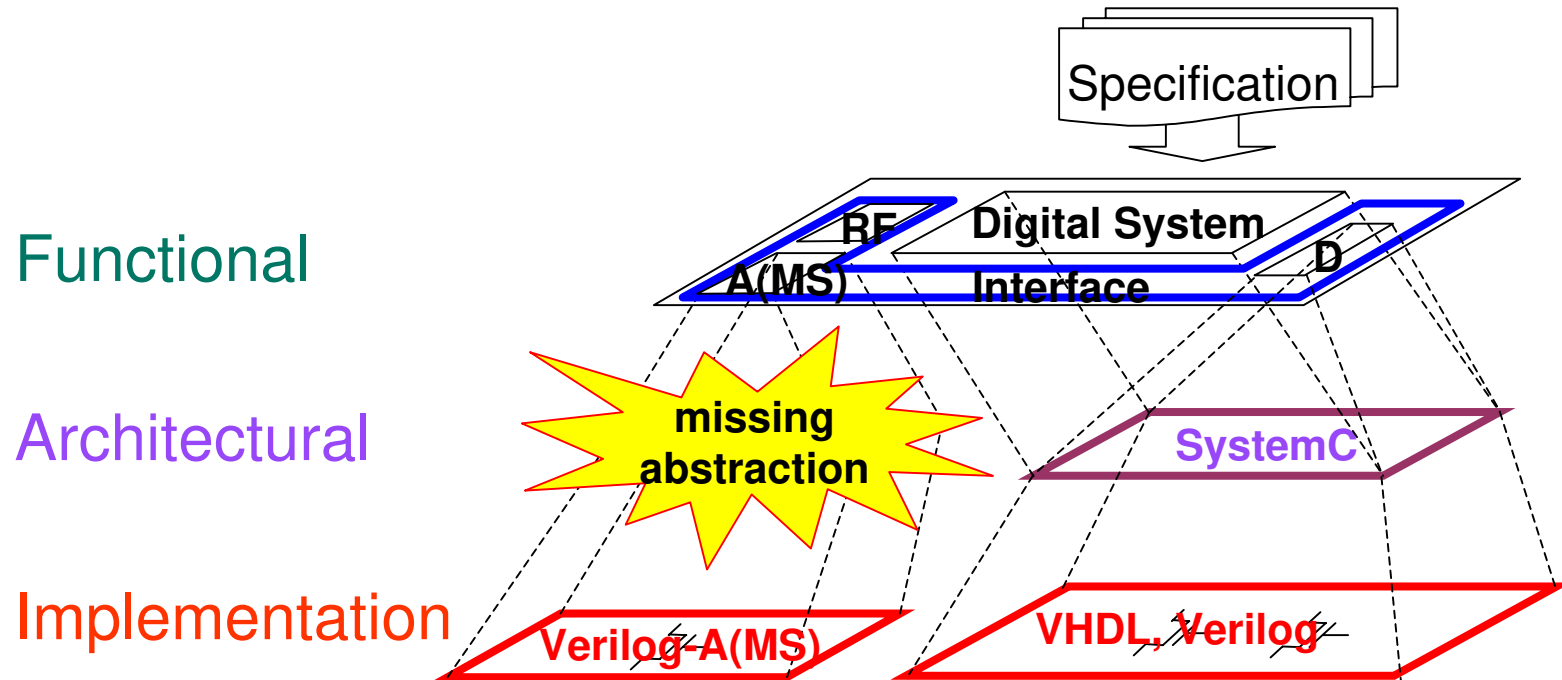
Functional

Architectural

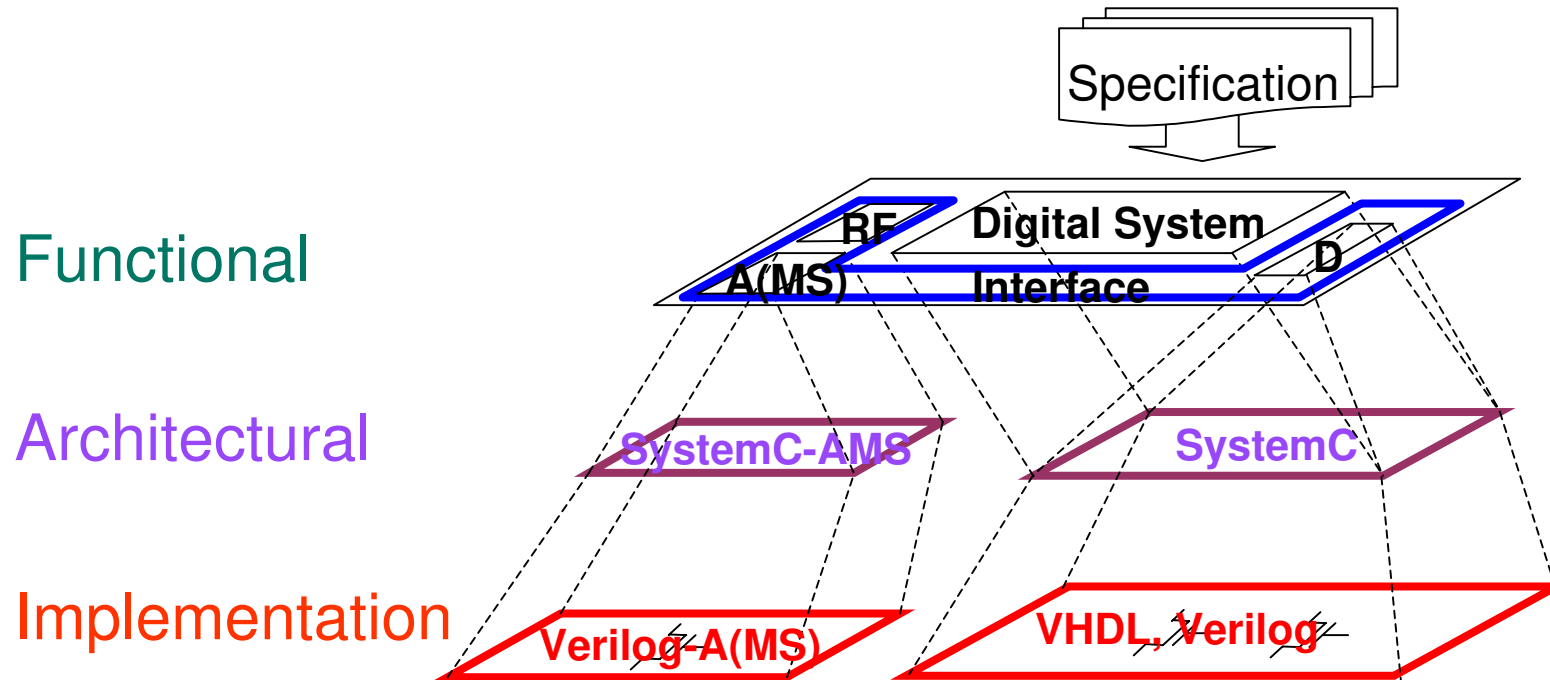
Implementation



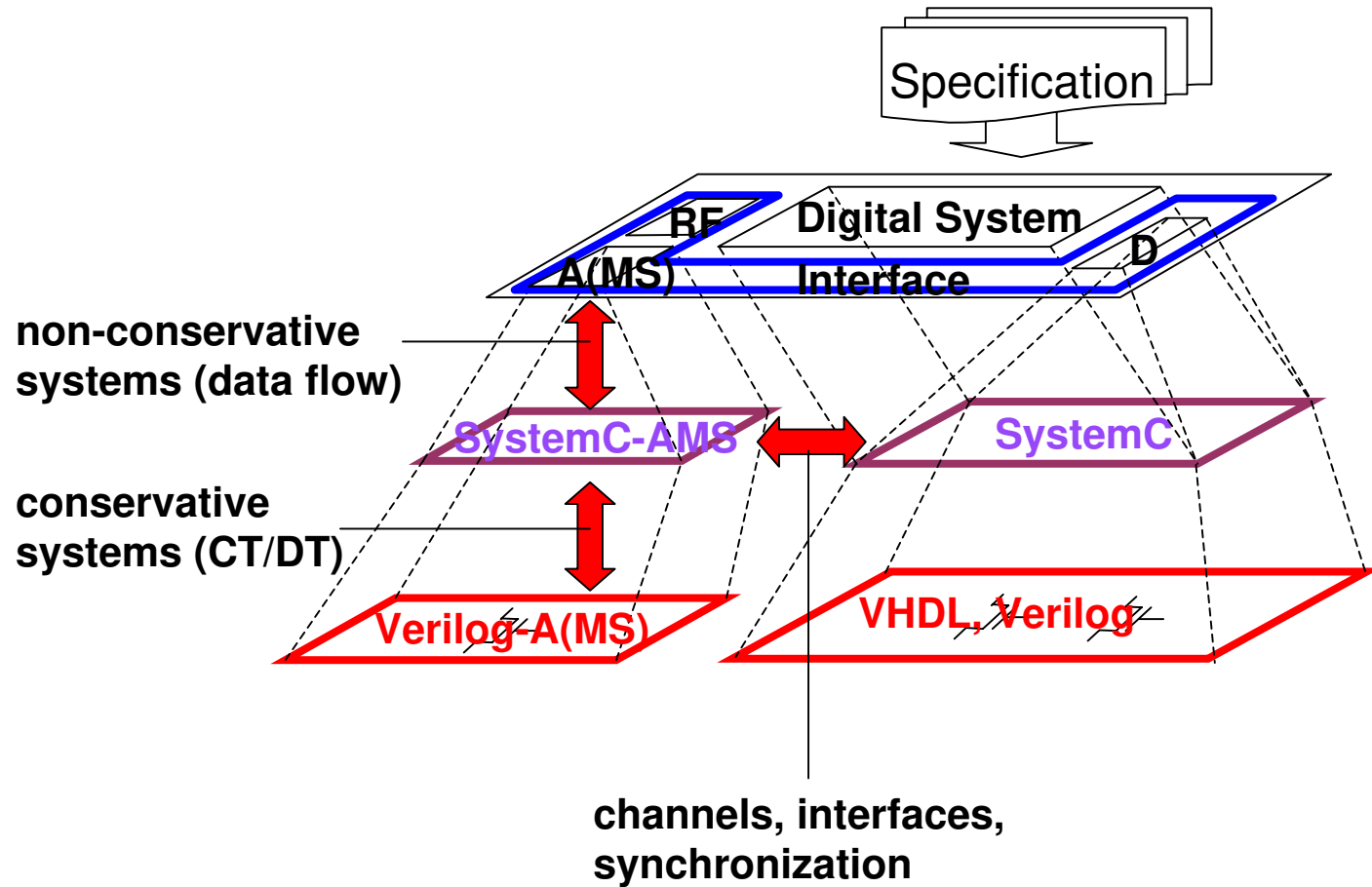
Heterogeneous System Design



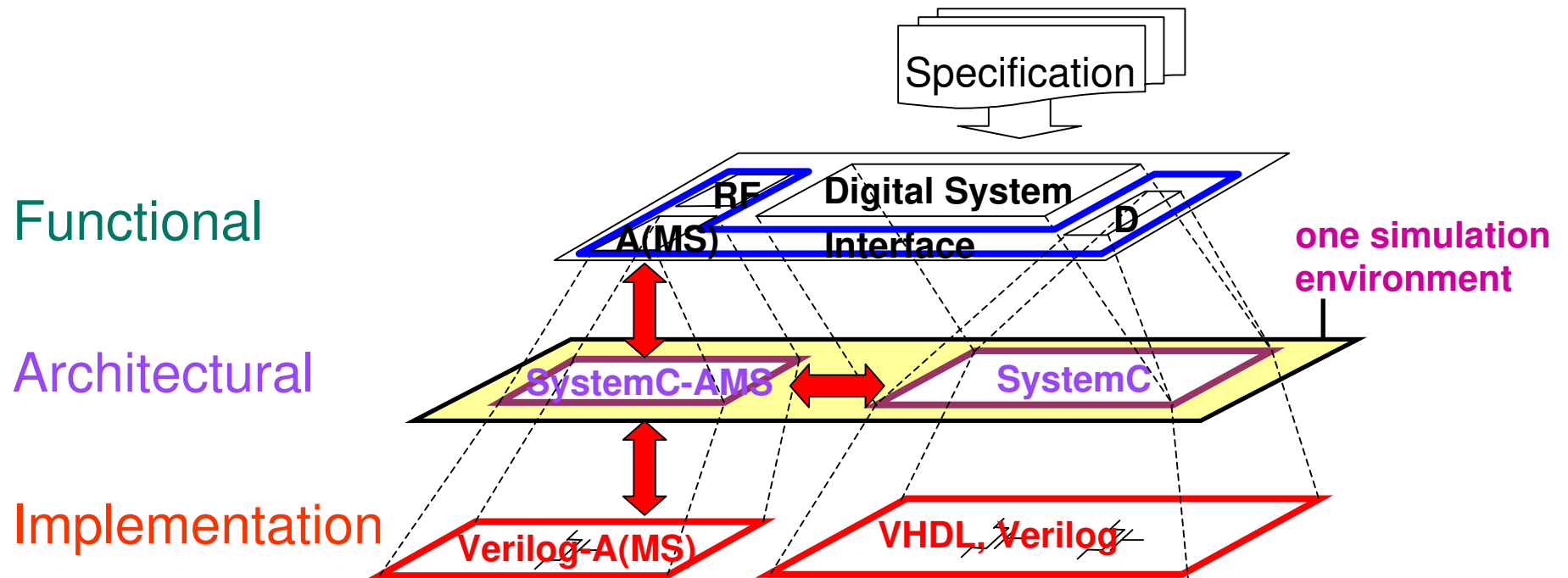
Heterogeneous System Design



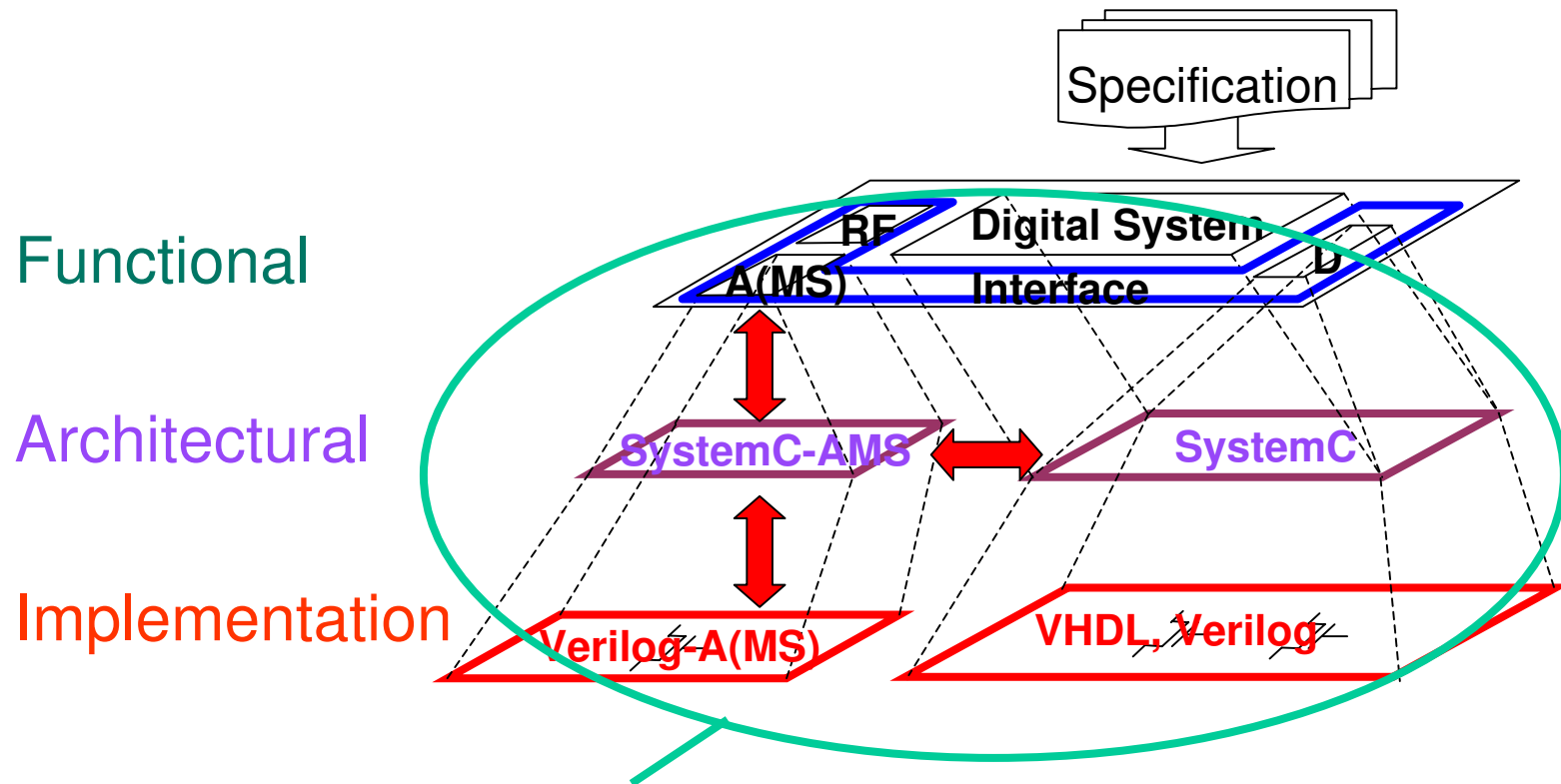
Heterogeneous System Design



Heterogeneous System Design



Heterogeneous System Design



Required: A common integrated design environment for system and circuit design engineers

OSCI AMS WG objectives and activities

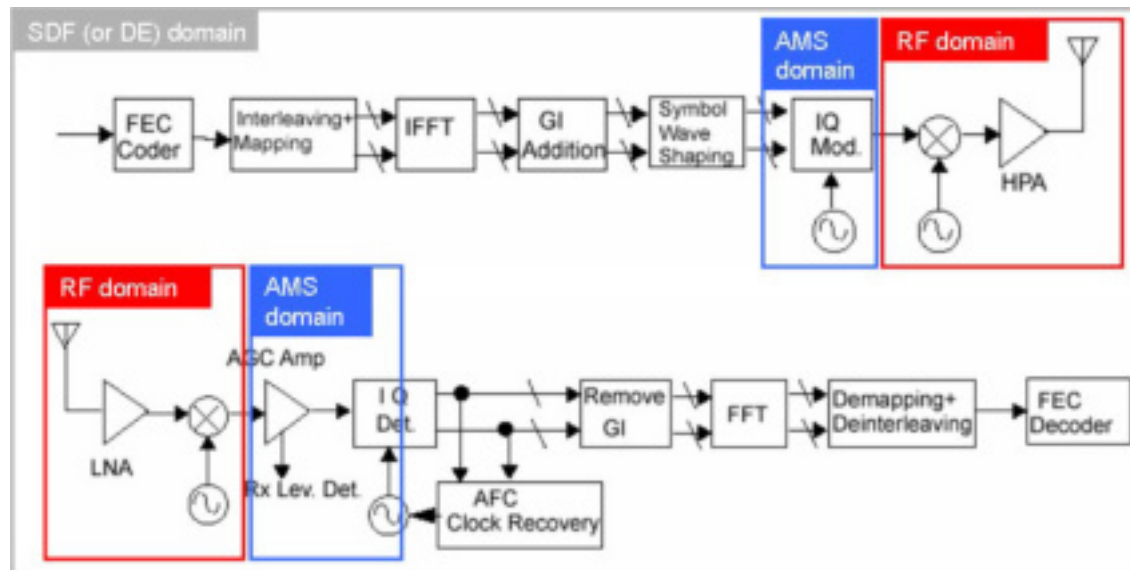
■ Objectives

- Analyse and standardize extensions of SystemC with a semantic for describing:
 - ◆ non-conservative and conservative systems
 - ◆ continuous value/signal and time descriptions
 - ◆ electrical or non-electrical domains and units
- Extend SystemC with C/C++ class libraries for analogue, mixed-signal and radio frequency functions, which require additional Model of Computations (MoC) and dedicated solvers. For these extensions, techniques for continuous value/signal/time representations and time synchronization mechanisms are explored.
- Disseminate SystemC-AMS by providing examples and application specific libraries, such as wired and wireless communication systems, automotive domain and sensor applications.

OSCI AMS WG deliverables

■ Deliverables

- AMS extension of Language Reference Manual
- Proof of Concept Library
- Regression Test Suites
- Application Examples, Model libraries and constants



Planning and timing

■ Phase 1: STUDY / DEFINITION

- Objectives:
 - ◆ Agreement of functional requirement specification
 - ◆ Architecture and code review existing solutions
 - ◆ Propose AMS extension constructs for SystemC Language Reference Manual
- Target release documentation: December 2007

■ Phase 2: IMPLEMENTATION

- Objectives:
 - ◆ Develop proof of concept library with new/agreed LRM language constructs
- Target release: Q2/2008

■ Phase 3: RELEASE

- Objectives:
 - ◆ Disseminate proof-of-concept library
 - ◆ Develop Methodology and Technology specific Libraries, examples, etc
- Target release: Q4/2008

Requirement specification

- **Comprehensive list of requirements defined**
 - Introduction
 - ◆ Why include AMS and/or RF in System level design,
 - ◆ Heterogeneous System Design
 - ◆ Digital, analogue and RF views
 - Applicable application domains
 - Identified target use cases
 - Positioning of a SystemC-AMS environment
 - Design and simulation environment requirements
 - Implementation requirements
 - Defined terminology
- **Available for OSCI members on <http://www.systemc.org>**

Architecture and code review

- **Architecture and code review has started**
 - Study different SystemC modeling extensions
 - ◆ SystemC-A
 - ◆ SystemC-H
 - ◆ SystemC-AMS
 - ◆ SystemC-WMS
 - ◆ ...
 - Consolidate “best-in-class” solutions into OSCI standardized SystemC-AMS architecture

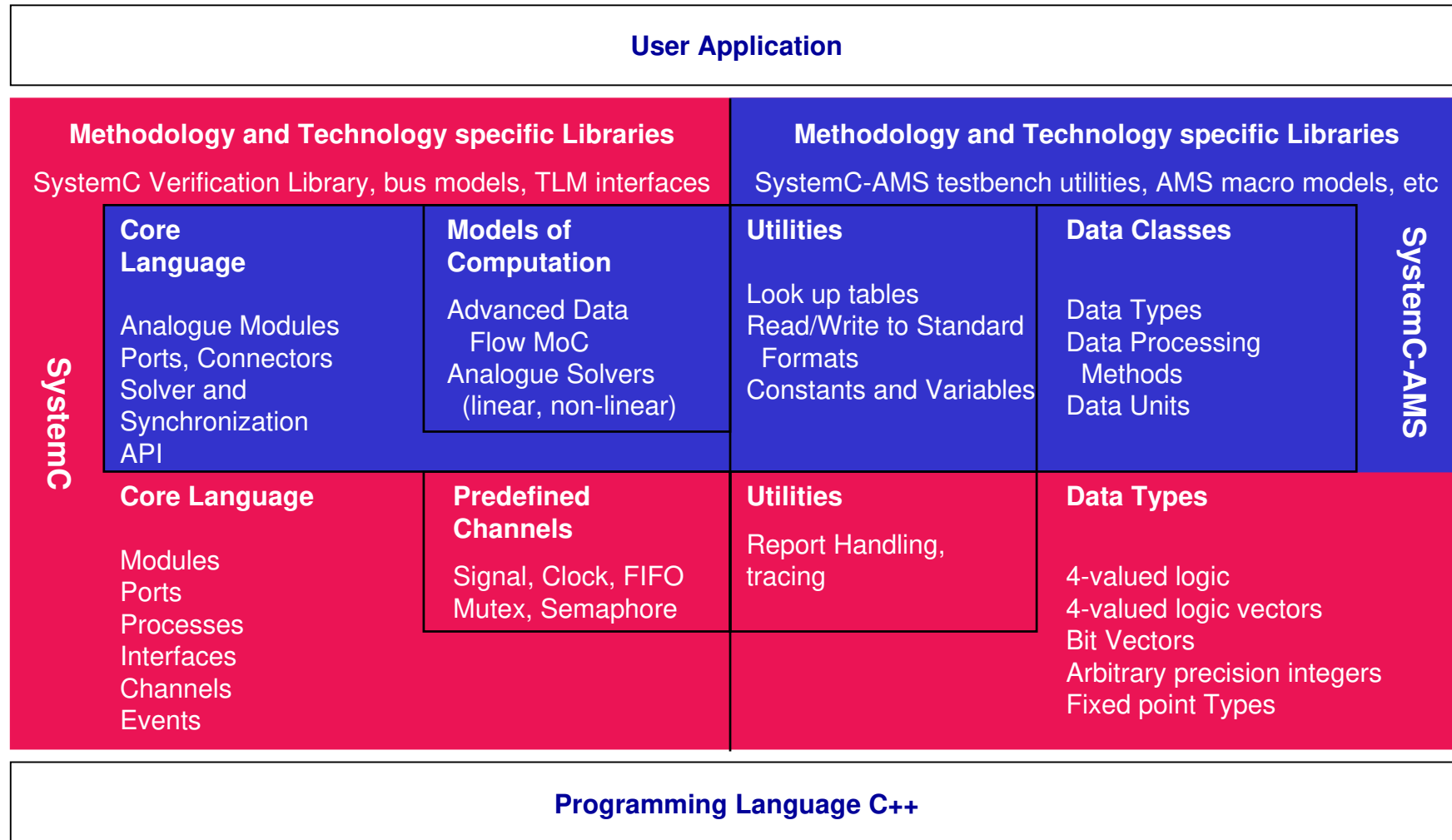
- **Your contribution in this process is very welcome !**
 - Main reason to organise this workshop

Language Reference Manual

- **Submit proposal for AMS extensions for**
 - Elaboration and simulation semantics
 - Core language class definitions
 - (API to other) models of computation
 - Utility class definition
 - Data types and classes

- **Interface and align LRM extensions with OSCI LRM Working Group**
 - Start of implementation phase after LRM WG approval

SystemC and SystemC-AMS framework



In definition: Work Packages

■ **User WP**

- Manage requirements specification
- Evaluate and benchmark AMS extensions
- Publication of white paper(s)

■ **Language WP**

- Make AMS extension proposal for Language Reference Manual (LRM)
- Interface to OSCI LRM Working Group

■ **Implementation WP**

- Architecture definition of the AMS extension
- Implementation of simulation framework
- Implementation of API to interface to 3rd party solvers

Conclusions

- **SystemC is a standardized modeling platform for system-level design**
 - Driven and supported by broad range of companies, universities and individuals
 - Gaining interest in virtual prototyping for SW development and creating reference models for functional verification

- **OSCI AMS Working Group established**
 - Aiming to extend SystemC usage in wireless, wired, automotive and imaging sensor applications and market segments
 - Requirement specification for AMS systems defined
 - Architecture and code review and LRM definition started
 - We welcome new participants from CAD/EDA tool vendors, universities and semiconductor industries

References

- **Open SystemC Initiative (OSCI):**
 - <https://www.systemc.org/>
- **SystemC User Group Survey Trends**
 - http://www.systemc.org/projects/sitedocs/document/OSCI_Survey_Trends_Report_2007/en/1
- **OSCI AMS Working Group project page:**
 - <https://www.systemc.org/projects/ams-wg/>
- **How to Join OSCI**
 - https://www.systemc.org/web/sitedocs/how_to_join.html



Thank You