Embedded Multicore Consortium

www.embeddedmulticore.org

Embedded Multicore Consortium

Connecting hardware/software/system vendors to help enabling multicore

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Nagoya University Masato Edahiro (President)

eSOL Masaki Gondo (Vice President)

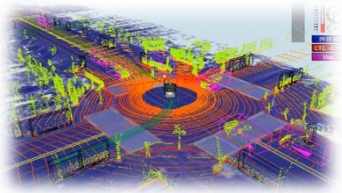
Embedded Multicore Consortium

Agenda

- Intelligent embedded systems
- Existing embedded multicore activities
- Challenges on embedded multicore
- Embedded Multicore Consortium
- SHIM
- Committee
- Membership

Intelligent embedded systems
Autonomous Vehicles

- A number of technologies are being developed for commercial use towards autonomous vehicles
- Need huge computing performance in recognition, understanding, and decision
- Multicore based ECUs are already in production



Intelligent embedded systems

Real-time image processing in medical

- Real-time image processing supports advanced medical diagnosis assistance systems
- Currently employs dedicated hardware
- Increasing diversity and complexity of algorithms, along with need of reuse, are posing issues
- Reliable, high-performance multicore processors are good candidates for resolution

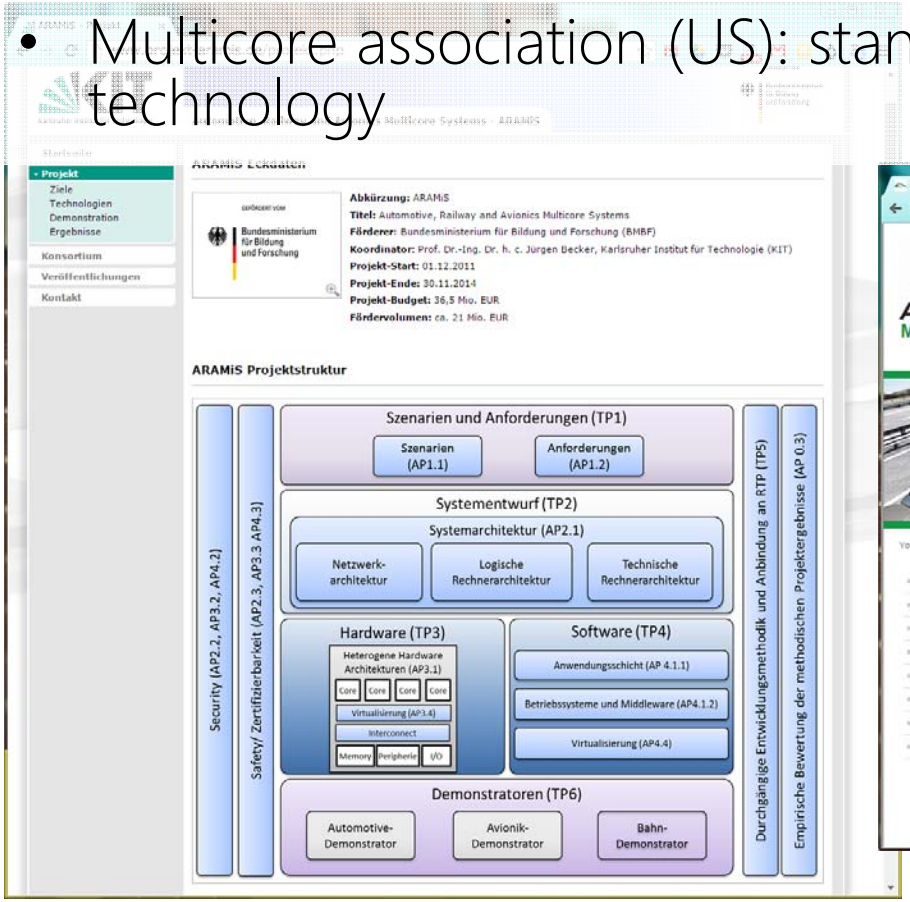
Needs of multicore

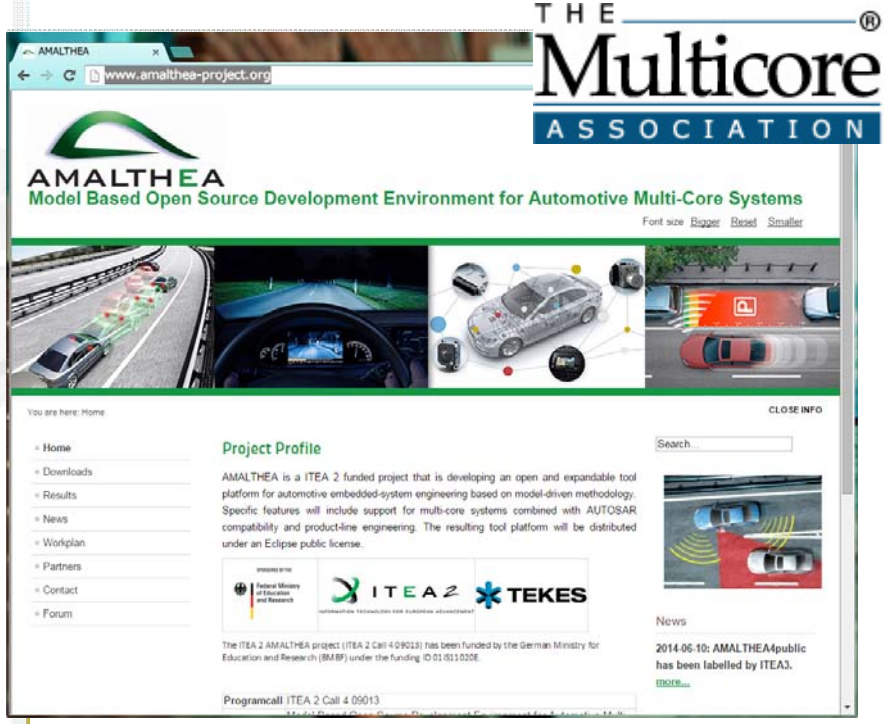
- Rapidly growing intelligence in embedded systems such as automotive, medical, and robot systems
- Software implementation is the key for rapid evolution of intelligence
- Such software require high-performance computing
- Embedded systems with high dependability **can** use but **can not** depend on cloud computing
- High-performance computing platform is necessary for embedded systems

Multi-many-core platforms with high software development efficiency are needed

Existing embedded multicore activities

- ARAMIS (EU): dependable multicore platform project for automotive, avionics, railway systems (€36M)
- AMALTEHEA (EU): model-based development methodology for multicore (€8M)
- Multicore association (US): standardization of multicore technology





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Challenges in embedded multicore

- Multicore processors have diverse architectures – tools and platforms to support them are indispensable
- To mix and match different tools/technologies, vast amount of knowledge are needed
- This calls for collaboration of multiple vendors and OEMs to:
  - Guide effective use of multicore
  - Facilitate business collaboration
  - Accelerate market adaption

Need to bring together academics and industries to colllaborate

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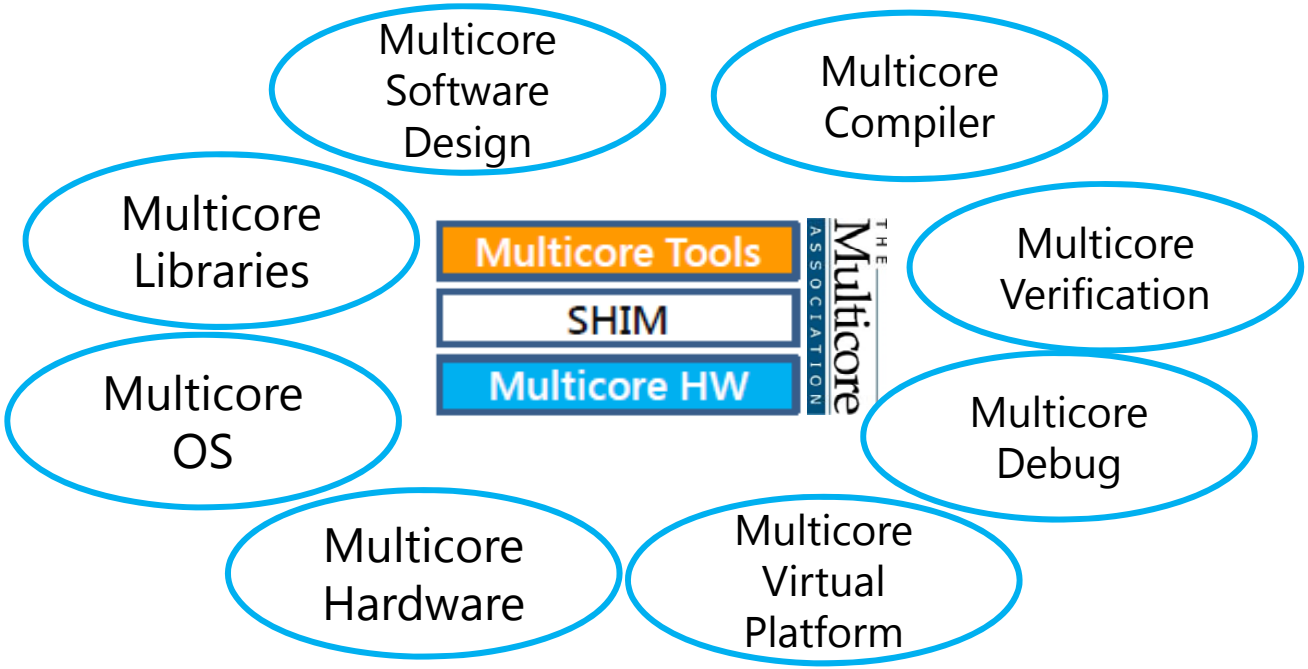

- A forum to collaborate system, software, tool, semiconductor vendors and create ecosystem
- Accelerate technology development and utilization of embedded multicores
- Establish design flow with collaborated vendor tools
- Alliance to multicore association (MCA)

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SHIM

Multicore Tools
SHIM
Multicore HW

Software-Hardware Interface for Multi-many-core

- XML for abstracted description of hardware platform
  - Machine-readable hardware info. for software / tools such as numbers and types of cores, memory map, communication, core-to-memory performance, etc., instead of thousand pages of user's manual
  - e.g.: (best, typ, worst) latency from core A to memory address X
  - Provide common methods for tools and OSs to adapt a variety of hardware platforms by sharing SHIM
- Download SHIM spec at:
  - http://www.multicore-association.org/workgroup/shim.php

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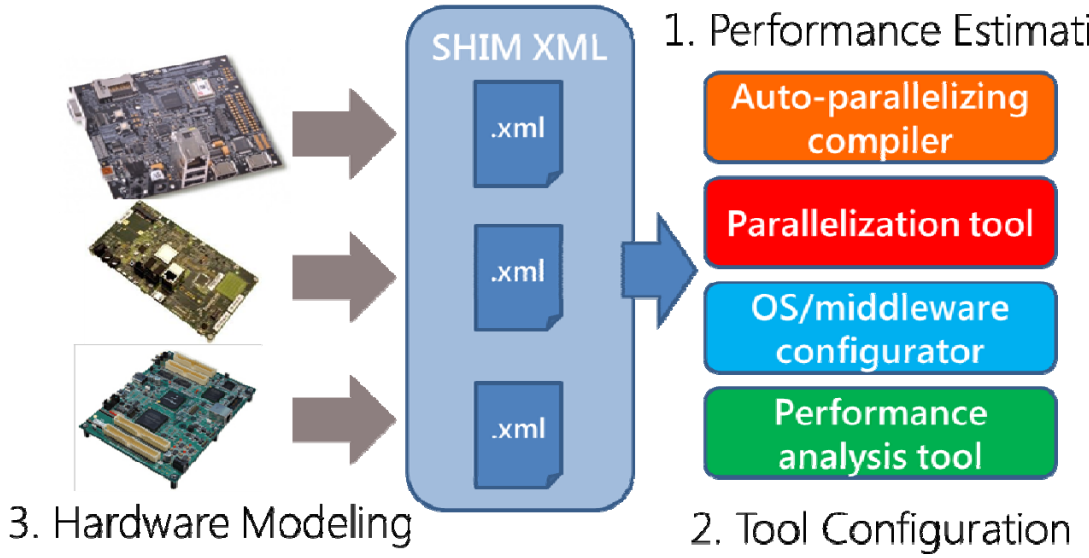
SHIM description for core-to-memory performance

Use cases of SHIM



- System performance estimation
- Hardware modeling / Facilitation of adapting multiple hardware
- Tool configuration

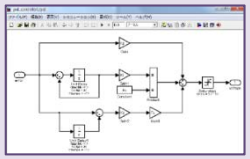
- Execution performance estimation on multicore
- Execution performance comparison at selection of multicore
- Performance estimation when porting on different multicore
- Software development targeting multiple platforms
- Performance estimation when planning specific multicore platform for specific application
- Cost reduction of software design tools for multicore and formation of ecosystem of tools

Technical committee

- SHIM
  - Discussion for SHIM V2 specification
- Model-based parallelization
  - Parallelization method and design flow from Simulink models along with SHIM
- Development process
  - TBD

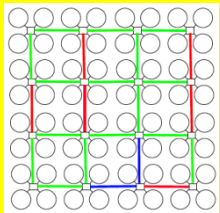
Model-Base Parallelization

Synthesizable Model



Simulink

Auto / Hand-written code. Intermediate Representation



Task Mapping

Model Design Cycle

Block Level Structure BLXML& BL-GRAPH

Performance Evaluation

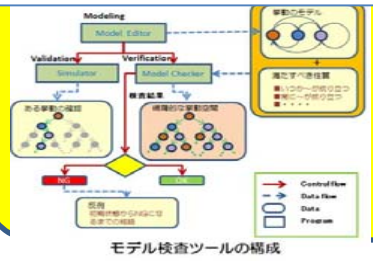
Tuning Cycle

Performance Info. Fed back to Model

Performance Estimation

Concurrent Model Generation

Concurrent/Parallel Code Generation



モデル検査ツールの構成

Verification of Concurrent Processes

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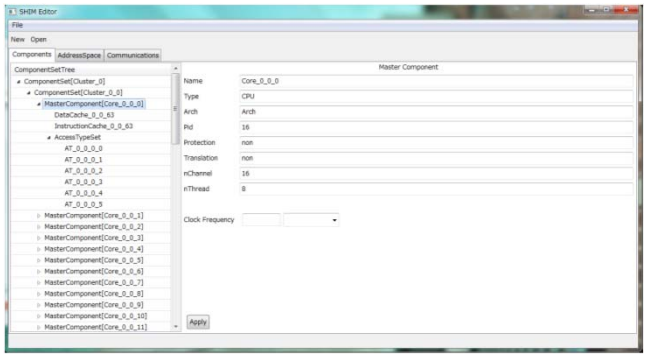
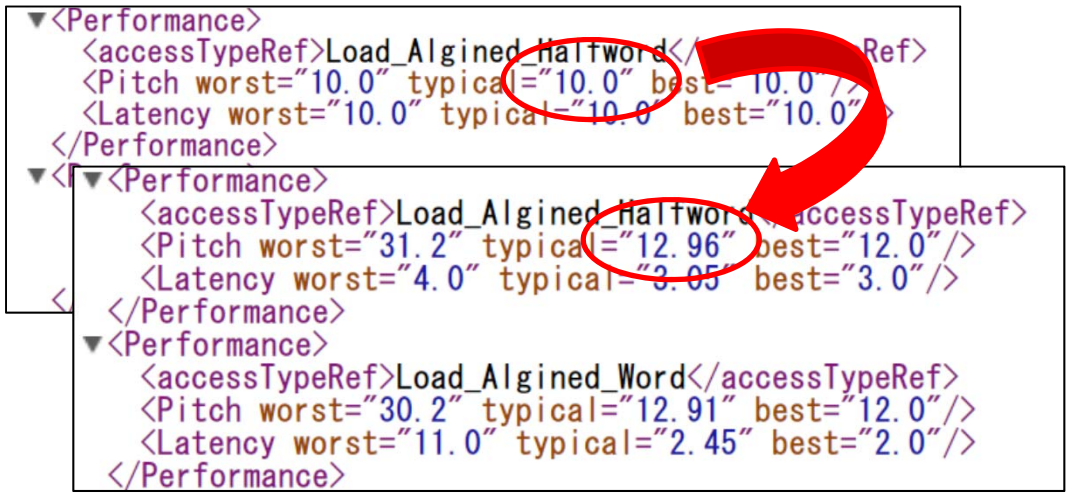
Release for members (incl. Plan)

- Sample programs using SHIM
  - Access functions, sample programs to extract performance values from SHIM
  - In addition to Open SHIM at https://github.com/openshim
- Partial Japanese translation of English specification to foster adaption in Japan

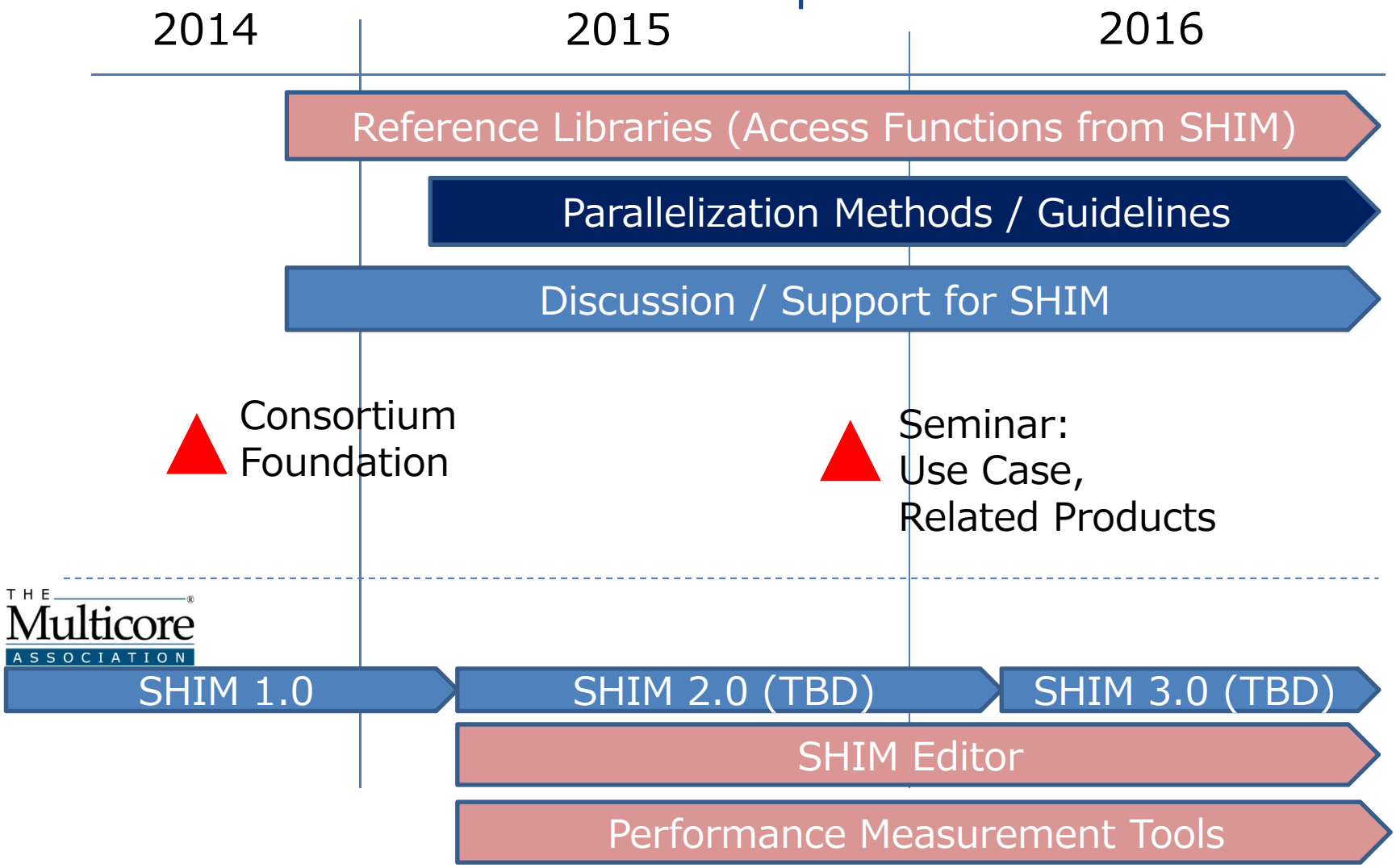


SHIM Editor



Performance Measurement Tool

Roadmap


2014
2015
2016
Reference Libraries (Access Functions from SHIM)
Parallelization Methods / Guidelines
Discussion / Support for SHIM
Consortium Foundation
Seminar: Use Case, Related Products
THE Multicore ASSOCIATION
SHIM 1.0
SHIM 2.0 (TBD)
SHIM 3.0 (TBD)
SHIM Editor
Performance Measurement Tools

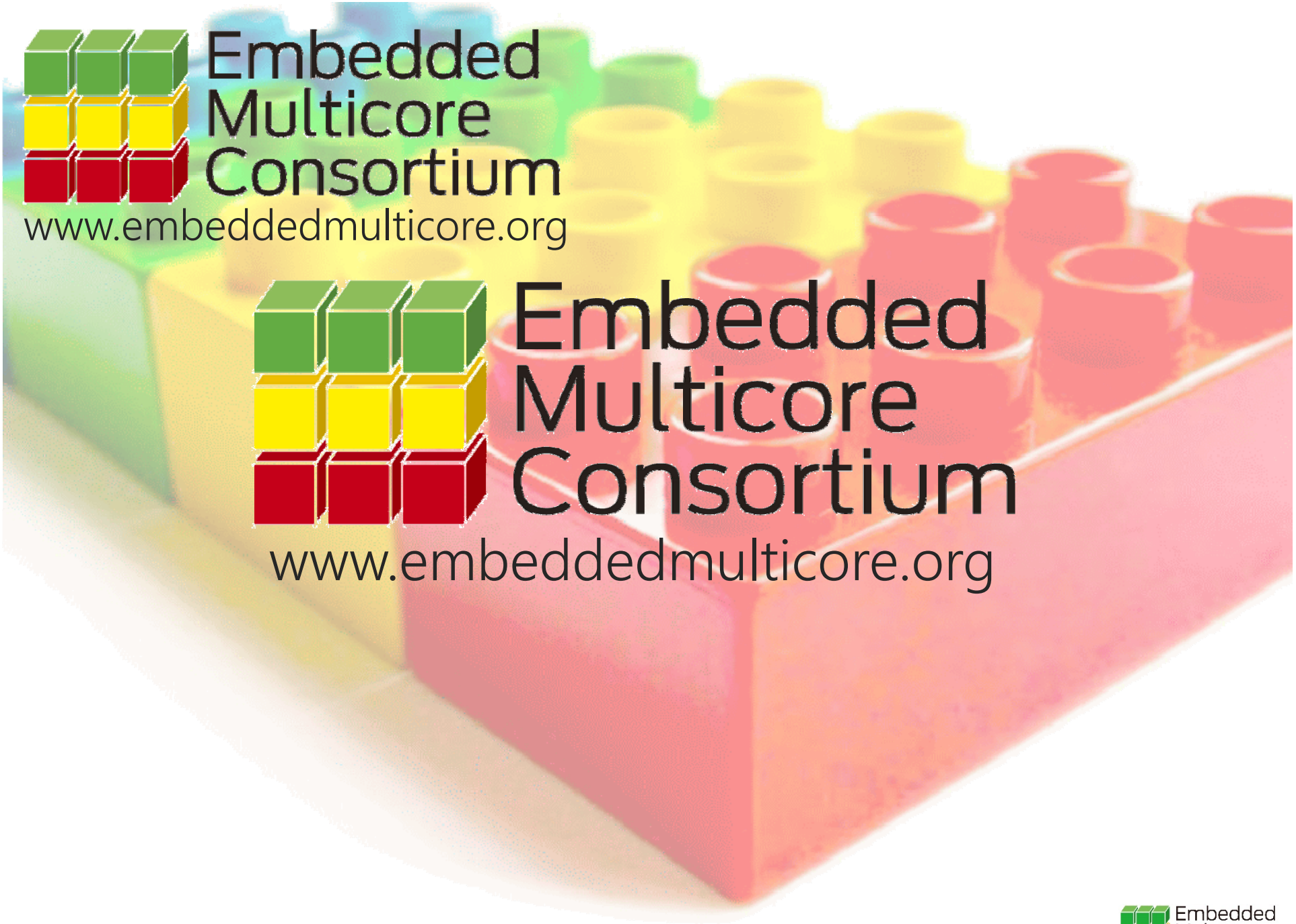
Benefits of joining EMC

- Obtaining expert knowledge on a variety of multicore platform
  - Product information of multicore, software, tools
  - Information, use cases, know-hows related to SHIM
  - Utilization assistance of reference tools
  - MCA (Multicore Association) related information
- Discuss the requirement on multicore tools with different vendors
- Provide input to international standardization activities such as MCA

Membership

- Board members
  - Nagoya University, eSOL, CATS
- Current members (14 members (July 2015))
  - AISIN comCruise, Artiza Networks, Aval Data, CATS, DENSO, dSPACE, eSOL, HAGIWARA ELECTRIC, Nagoya University, Olympus, Renesas Electronics, Village Island, Waseda University, etc.
- Fees
  - $2000 annual

- (MCA) SHIM WG primary contributing members
  - Cavium Networks, CriticalBlue, eSOL, Freescale, Nagoya University, PolyCore Software, Renesas, Texas Instruments, TOPS Systems, Vector Fabrics, and Wind River.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