Component-based Engineering for Embedded Systems
USA – EU workshop
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Land & Joint Systems

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RT/E Systems Characteristics

Software part in RT/E Systems is increasing
- Move from fixed wired hardware \( \rightarrow \) flexible logics (software)
- ... but still heterogeneous HW platforms (GPP, DSP, FPGA)
  - Reconciled approach is needed

Software in RT/E Systems is becoming more complex:
- More functionality
- More variability, versatility
- More integration in large-scale systems:
  - More connectivity
  - More remote manageability
- Move towards dynamic (re)configuration:
  - Self-configuration
  - Self-organisation

RT/E Systems have still to deal with 'real' world and its constraints:
- Time/latency, available resources, (low) power, but also volume, weight, cost,
- Safety, reliability, dependability, QoS,…, security
- Certification, DO178B, DO254, …

How to manage all these trends?

*move from performance-centric to complexity-centric*…
...w/o loosing the performance and time support!
An abstraction of the HW platform

Hardware Dependent Software
- All the software that is directly depending on the underlying hardware

Middleware
- **Anything** that stands between the pure application code and the raw (networked) platform
  - Not only the communication support
  - Should be the mediator between the application code and the platform resources and services (HdS)

- What are the main characteristics for a RT/E middleware?
  - Affordable
  - Providing
    - Suitable support for application break-down in manageable (reusable) parts
    - Suitable support for RT/E non-functional properties
    - Separation of concerns
    - Isolation, partitions
Design Methodology and Tools

MIC approach
- Seamless design flow
- Modeling / Simulation / Code generation
- Strong connection to domain specific environments and tools (UML2, AADL, SystemC, C/C++, EmbeddedC, VHDL/verilog, …)
- RTOS
- CCM framework
- Support for legacy code integration
- Support for static & dynamic re-configuration
- Deployment – SCA3.x/CF

Real-Time and Embedded CCM framework:
- A Container/Component Model based on OMG Lightweight CCM (CCM ≠ CORBA)
- All CORBA dependencies are managed by the container
  - not visible by the application code
- All interactions are made using native calls
  - only CORBA dependency is with IDL
- Supports reusable components
- Extensions to support partitioned execution platform

EUREKA/ITEA -Martes project

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Back-up slide
Component/Container Model is a key architectural pattern

Explicit description of:
- provided services
- requested services

Separation of concerns:
- business logic
- 'technical' properties

(containers are provided as part of the infrastructure)
(based on descriptors move from fully programmatic to declarative)

✓ Easier deployment and reuse, needed for reconfiguration