MyCCM

A Component Based Approach for Real-Time & Critical Systems

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Agenda

1) **Path toward CBSE for RTE**

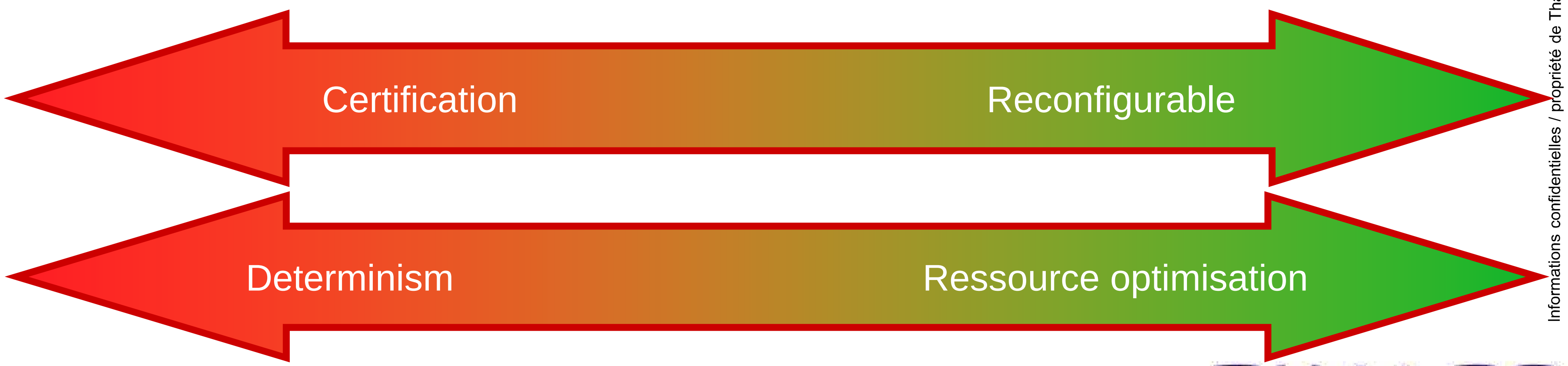
2) **The MyCCM Framework**

3) **Future orientation**

Path Toward CBSE

RTE Systems Characteristics

- Execution platform heterogenity
- Complex internal communication and interaction schemes
- Reuse of code is not obvious
  - Intricated with underlying technologies
- Complex to integrate and tune
- Difficult to test
- Domain specific method and tools



Targeted Improvements for RTE Systems

- **Capitalize on software architectures**
  - Better structuration of software
  - Reuse of business code
- **Common approach for several targets (HW, OS, MW)**
  - Software Design tooled up process
  - One source running on multi-target
  - For near-real-time to hi-integrity runtime environments
  - Complementary IVV tooled up process
- **Standalone to highly distributed**
- **Static to Reconfigurable**

CBSE with Component/Container/Connector principles allows to reach these goals

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From R&T to industrial adoption

Research Projects

ARTEMIS

ITEA 2 INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

AGENCE NATIONALE DE LA RECHERCHE ANR

Information Society Technologies

LES PÔLES DE COMPÉTITIVITÉ

Domain Needs

- ***Space***
- ***Software Radio***
- ***Optronic***
- ***Electronic Warfare***
- ***…***

CBSE dedicated to

Real Time Embedded Systems

- *Component Framework Basis*
- *Real Time constraints*
- *Safety and Security*
- *Connection with MDE*

MyCCM

- ***C++ (optro, vetro, SDR)***
- ***Ada (space, radar)***
- ***Java (ECS)***
- ***C (railway)***

Standardisation

OMG OBJECT MANAGEMENT GROUP

- ***lwCCM (2003)***
- ***DDS4CCM (2008)***
- ***QoS4CCM (RTF 2007)***
- ***…UCM (2013 …)***

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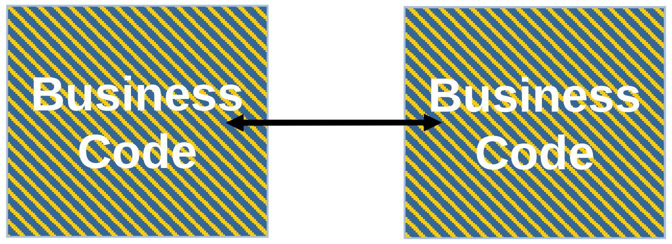
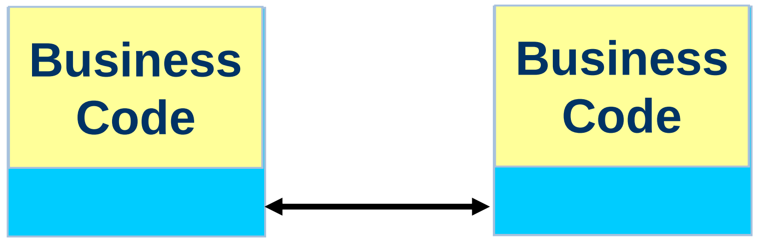
MyCCM Framework

Thales Communications

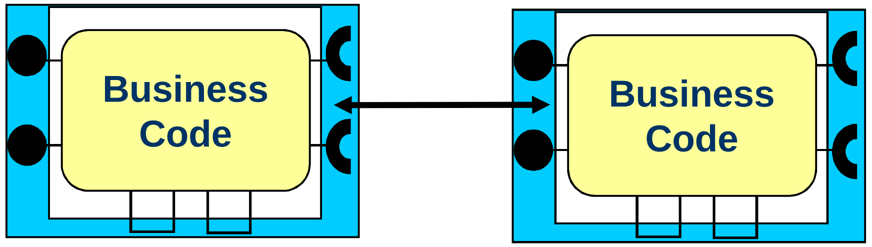
Component Based Approach



Non-structured code



Structured code, with abstraction API



Tooled Process (MDE)

MyCCM Approach enables the generation of technical code (communications, deployment, etc…)

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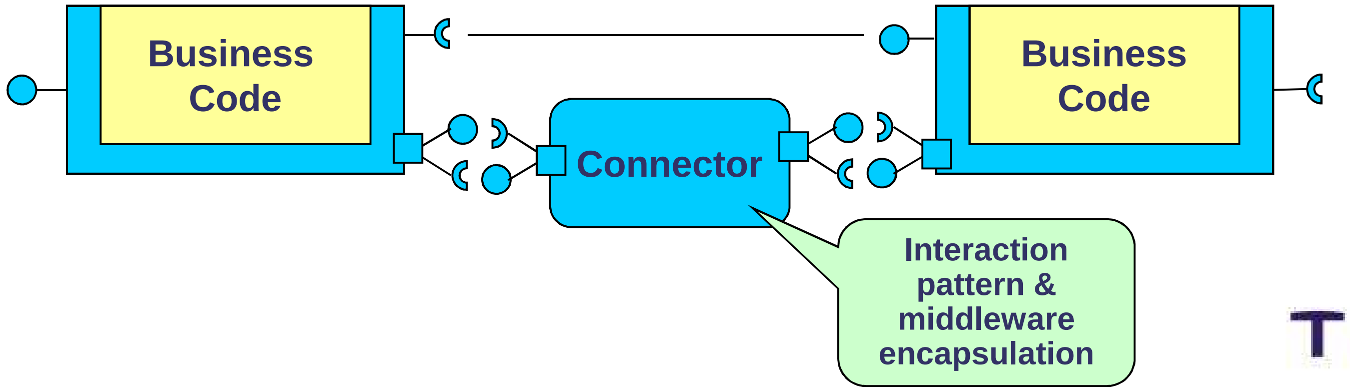
MyCCM Architecture Model

A common Architecture Description Formalism

- **Based on the Lightweight CCM Abstract Component Model**
  - Standard interaction patterns + Programming model
  - D&C for deployment
- **Specific Adaptations for RTE**
  - Non CORBA environments, static deployment
  - Very low footprint
- **Built-in Extension mechanisms (Connectors)**
  - Ability to define new interaction patterns and implementations



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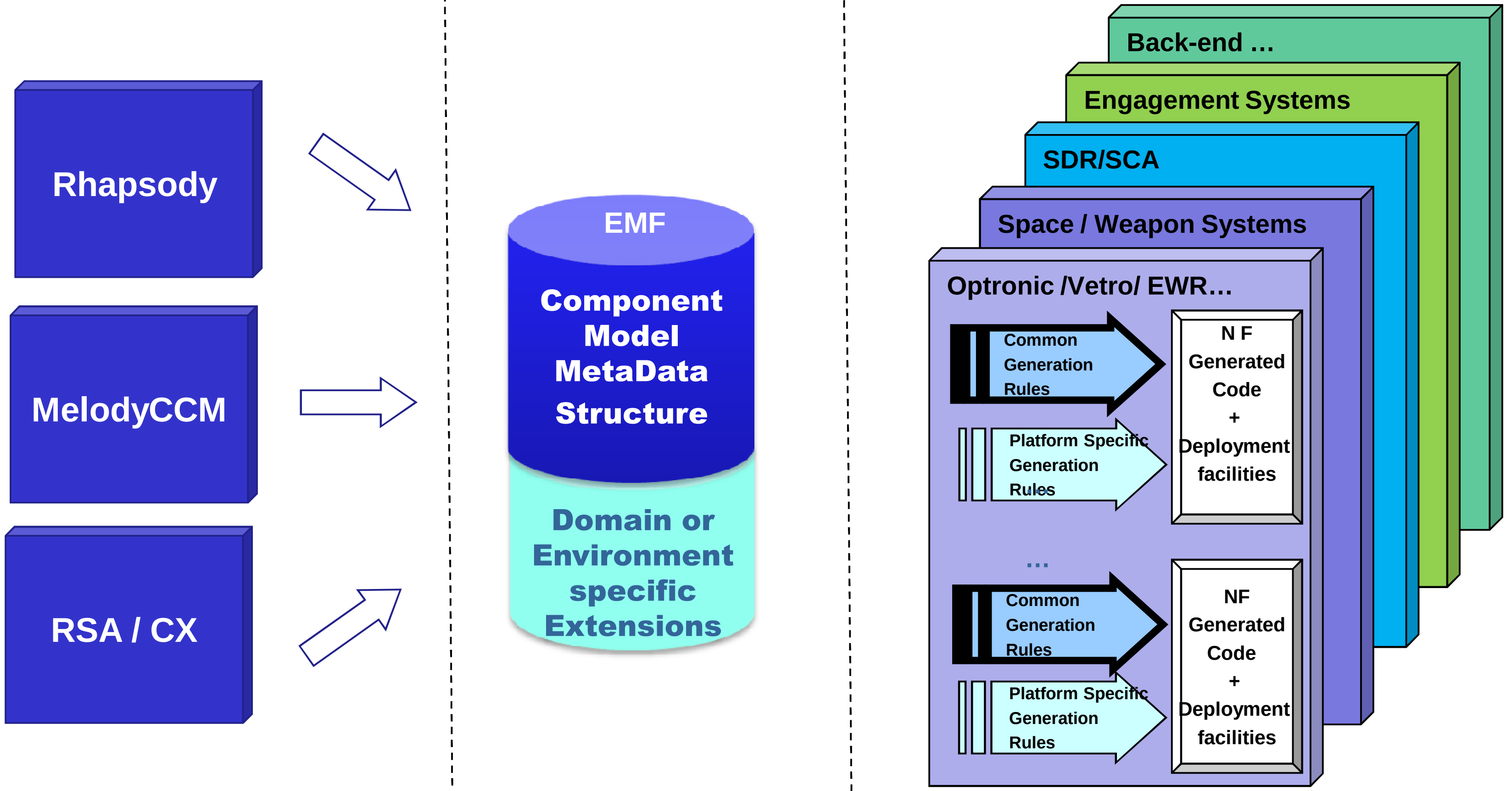
MyCCM Framework Architecture

Software Architecture

Shared Architectural Principles

NF Code Generation & Deployment on Targets


Rhapsody
MelodyCCM
RSA / CX
EMF
Component Model MetaData Structure
Domain or Environment specific Extensions
Back-end …
Engagement Systems
SDR/SCA
Space / Weapon Systems
Optronic /Vetro/ EWR…
Common Generation Rules
Platform Specific Generation Rules
N F Generated Code + Deployment facilities
…
Common Generation Rules
Platform Specific Generation Rules
NF Generated Code + Deployment facilities

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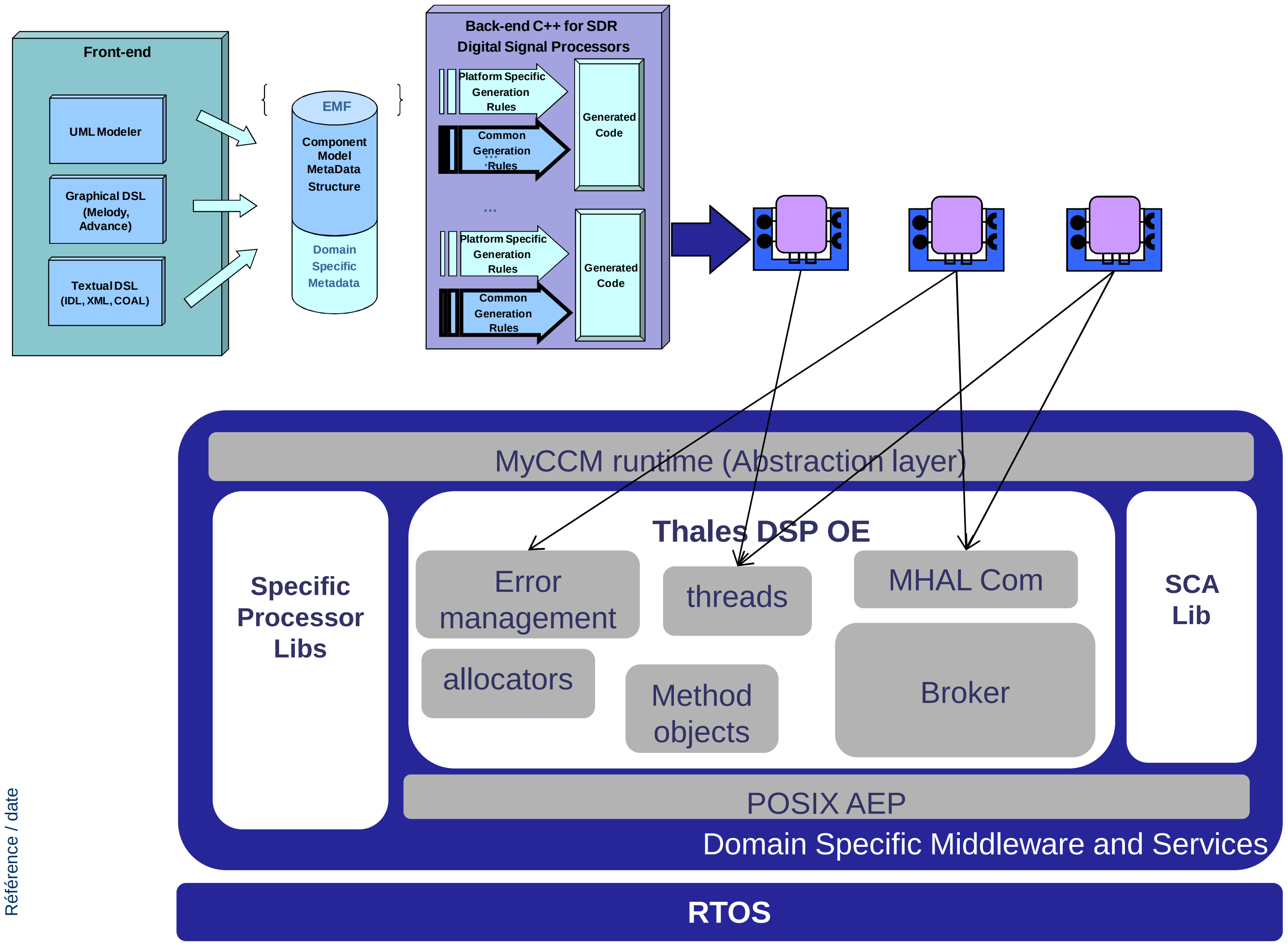
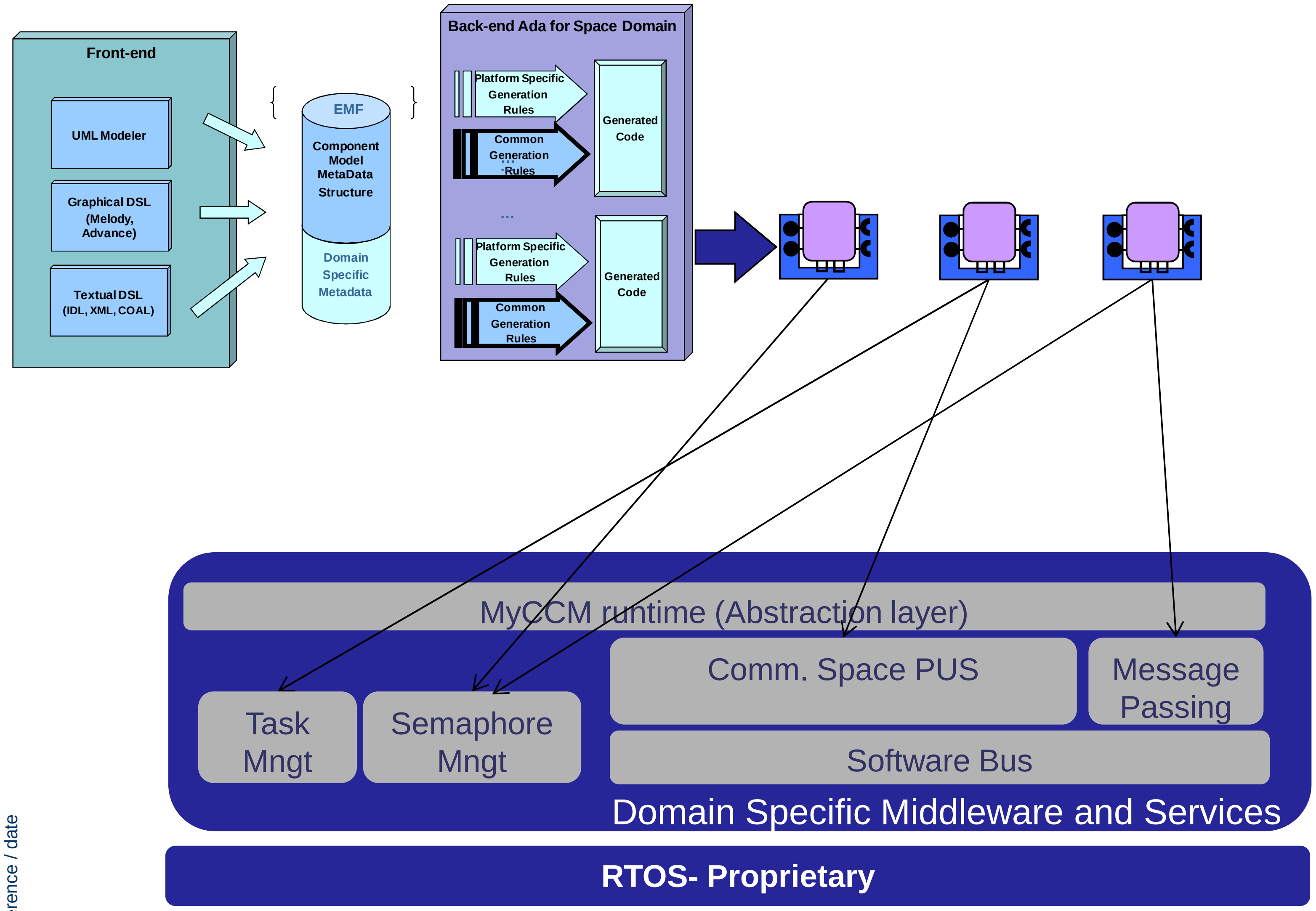
MyCCM applied to SDR Signal processing


Front-end
UML Modeler
Graphical DSL (Melody, Advance)
Textual DSL (IDL, XML, COAL)
EMF
Component Model MetaData Structure
Domain Specific Metadata
Back-end C++ for SDR Digital Signal Processors
Platform Specific Generation Rules
Common Generation Rules
Generated Code
...
Platform Specific Generation Rules
Common Generation Rules
Generated Code
MyCCM runtime (Abstraction layer)
Specific Processor Libs
Thales DSP OE
Error management
threads
MHAL Com
allocators
Method objects
Broker
SCA Lib
POSIX AEP
Domain Specific Middleware and Services
RTOS

MyCCM applied to Space Domain


Front-end
UML Modeler
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Textual DSL (IDL, XML, COAL)
EMF
Component Model MetaData Structure
Domain Specific Metadata
Back-end Ada for Space Domain
Platform Specific Generation Rules
Common Generation Rules
Generated Code
...
Platform Specific Generation Rules
Common Generation Rules
Generated Code
MyCCM runtime (Abstraction layer)
Task Mngt
Semaphore Mngt
Comm. Space PUS
Message Passing
Software Bus
Domain Specific Middleware and Services
RTOS- Proprietary

MyCCM in Short

A tooled approach to software engineering

- Model Driven
- Component-Based Architecture Approach
- Promotes the use of Automatic code Generation

Focus on value added code

- Reduce the amount of time and effort on non value-added code

Improve reusability

- Identify reusable application blocks
- Integration of legacy code

Reduce integration costs

- Ensure Interfaces are properly defined
- Ease testing activities

Do not impose a framework but integrate domain expertise in a CBSE tooled approach "Make Your CCM"

MyCCM in THALES Programs

Optronic (C++)

- Since 2007
- 3 programs

Vetronic (C++)

- Since 2009
- 2 programs

Electronic Warfare (C++)

- Since 2011
- 2 programs

Control Station (Java)

- Since 2008
- 1 program

Software Defined Radio (C++)

- Since 2012
- Support for GPP and DSP targets

Space Domain (Ada)

- since 2010
- Used in 5 programs

Weapon systems (Ada)

- To be deployed in 2013

Railway Domain (C)

- Under evaluation
- Targeted deployment in 2014

Future Orientations

A CBSE based on Component / Container / Connector

- **A MDE component-based design**
  - Based on a meta-model capturing CBSE main concepts
  - Extensible (capability to add new features for specific needs)
  - Target several execution frameworks
- **Middleware agnostic**
  - Interactions fully managed by connectors
    - Interaction patterns instead of specific interfaces
  - Optional compatibility with IDL/IDL3
- **Support native languages for component implementation**
  - Remove CORBA specific language mappings (or Optional)
  - C++11 or subset supported by current compilers
  - Java
- **Reduce dramatically the complexity of the programming model**

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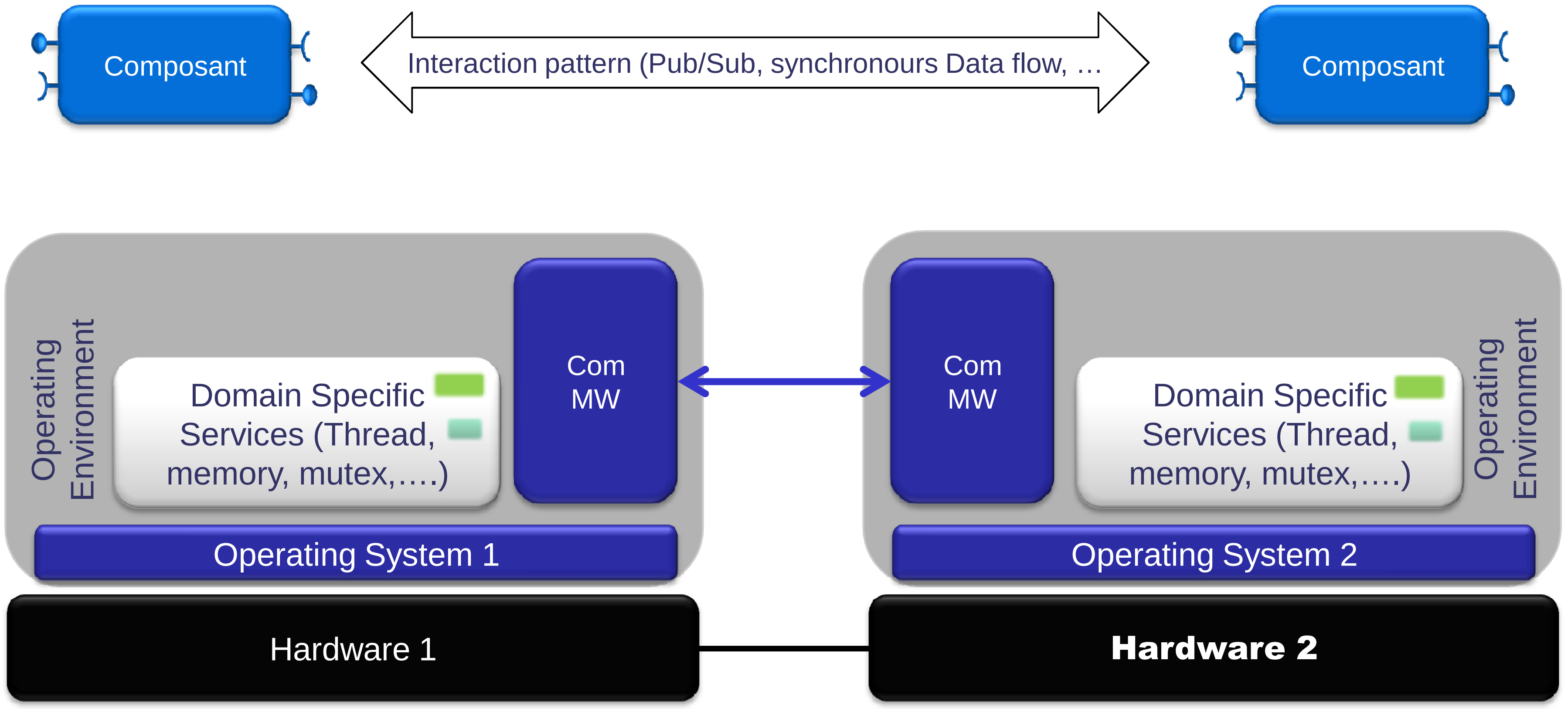
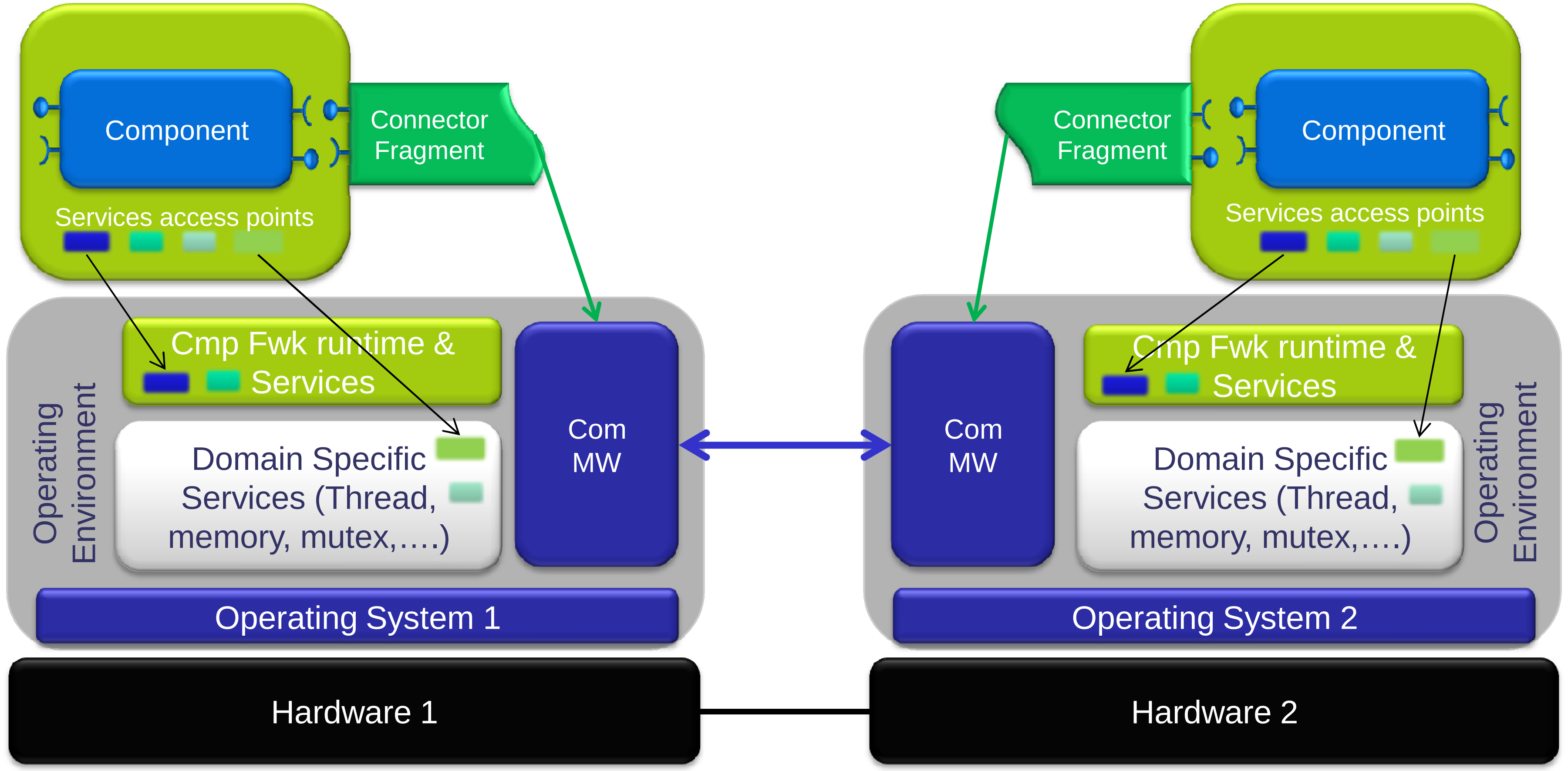
Future Component Framework Vision

Software Architectural View


Composant
Interaction pattern (Pub/Sub, synchronours Data flow, …
Composant
Operating Environment
Domain Specific Services (Thread, memory, mutex,….)
Com MW
Operating System 1
Hardware 1
Com MW
Domain Specific Services (Thread, memory, mutex,….)
Operating Environment
Operating System 2
Hardware 2

Future Component Framework Vision

Execution Framework View



MyCCM Open Source Initiative

Promote an Open Source core MyCCM (C++ first)

- **Select the core building blocks**
  - Meta model, runtime, code generators, deployment
  - Ensure modularity on meta models, generators, deployment
  - Allowing to add new features as « plug-in »
- **Identify the appropriate Open Source community**
  - Providing facilities to host and promote the project
  - With LGPL or EPL license policies style

Contribute to its evolution toward UCM Standard

- **COMET project (French R&T) with Prismtech**
  - Make MyCCM middleware agnostic and contribute to lwCCM evolution
- **Commit new services and connectors when necessary**

Thank you!