Robotics Domain Task Force Preliminary Agenda ver.1.0.2 robotics/2013-03-01

OMG Technical Meeting - Reston, VA, USA -- March 18-22, 2013

http://robotics.omg.org/

		TF/SIG				
		Host	Joint (Invited)	Agenda Item	Purpose	Room
Monday: Plannning Committee (pm)						
10:00	12:00			Robotics Infrastructure WG - Noriaki Ando(AIST), Makoto Sekiya(Honda), and Beom-Su Seo (ETRI)	RFP drafting	Suite 1146, 11th FL
12:00	13:00			**LUNCH**		Grand Ballroom D, 2nd FL
13:00	18:00			Architecture Board Plenary		Lake Adubon, 2nd FL
13:00	17:00			Robotics Infrastructure WG - Noriaki Ando, Makoto Sekiya, and Beom-Su Seo	RFP drafting	Suite 1146, 11th FL
Tuesday: WG activity and Robotics Plenary						
9:00	12:00			Robotics Infrastructure WG - Noriaki Ando, Makoto Sekiya, and Beom-Su Seo	RFP drafting	Suite 1146, 11th FL
12:00	13:00			**LUNCH**		Grand Ballroom D, 2nd FL
13:00	15:00			Robotics Infrastructure WG - Noriaki Ando, Makoto Sekiya, and Beom-Su Seo	RFP drafting	Suite 1146, 11th FL
				Afternoon Break (30min)		
15:10	15:20	Robotics		Robotics-DTF Plenary Opening Session (minitues approval, minutes taker)	presentation and discussion	
15:20	16:00	Robotics		Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP 1st Review - **Makoto Sekiya** (Honda)	presentation and discussion	
16:00	16:40	Robotics		Proposal for establishment of "Hardware Abstraction Layer WG" - **Kenichi Nakamura** (JASA)	presentation and discussion	
16:40	17:10	Robotics		Experience with Component Based Development at Honda - **Antonello Ceravola** (Honda-RI-EU)	presentation and discussion	
17:10	17:20	Robotics		WG Reports and Discussion (Service WG, Infrastructure WG, Models in Robotics WG)	presentation and discussion	
17:20	17:30	Robotics		Robotics Information Day planning committee Discussion - Antonello Ceravola (Honda-RI-EU)	discussion	
17:30	17:40	Robotics		Contact Reports - Makoto Mizukawa(Shibaura-IT), and Young-Jo Cho(ETRI)	Information Exchange	
17:40	17:50	Robotics		Robotics-DTF Plenary Wrap-up Session (**DTF Co-Chair Election**, Roadmap and Next meeting Agenda)	Robotics plenary closing	
17:50				Adjourn Information Day meeting		
Wednesday: WG activitiy						
9:00	12:00			Robotics WG activity follow-up (tentative)	discussion	TBA
12:00	13:30			**LUNCH and OMG Plenary**		Grand Ballroom D, 2nd FL
13:30	17:00			Robotics WG activity follow-up (tentative)	discussion	TBA
18:00	20:00			**OMG Reception**		Grand Ballroom Foyer
Thursday: WG activitiy						
9:40	9:50	MARS	Robotics	Joint Plenary with MARS Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP - Makoto Sekiya	Information exchange	Lake Thoreau, 2nd FL
12:00	13:00			**LUNCH**		Grand Ballroom D, 2nd FL
13:00	18:00			Architecture Board Plenary		Lake Adubon, 2nd FL
Friday						
8:30	12:00			AB, DTC, PTC		Regency Ballroom ABC
12:00	13:00			**LUNCH**		Lake Fairfax, 2nd FL
Other Meetings of Interest						
Monday						
8:00	8:45	OMG		New Attendee Orientation		Town Center, 2nd FL
9:00	12:00	OMG		Introduction to OMG's Modeling and Middlewere Specifications Tutorial		Town Center, 2nd FL
9:30	10:00	SysA		System Assurance PTF		North Point, 2nd FL
13:00	17:30	MARS		Component Information Day		Grand Ballrom F, 2nd FL
Tuesday						
7:30	9:00	OMG		Liaison ABSC		Grand Ballroom C, 2nd FL
9:00	17:00	OMG		Tutorial on Semantics from Resarch to Reality : Implementing the Semantic Web		Grand Ballroom AB, 2nd FL
17:00	18:00	OMG		RTF-FTF Chair's Workshop		South Lake, 2nd FL
Wednesday						
8:45	17:00	OMG		Workshop and Information day on Semantics from Resarch to Reality : Implementing the Semantic Web		Grand Ballroom ABC, 2nd FL
9:00	14:00	OMG		Consortium for IT Software Quality (CISQ Seminar)		South Lakes, 2nd FL
9:00	17:00	DDS		Data Distribution Service Information Day		Lake Thoreau, 2nd FL
9:00	18:00	SysA		System Assurance PTF		Suite 1146, 11th FL
Thursday						
9:00	12:00	DDS		Data Distribution Service Tutorial		Grand Ballroom G, 2nd FL
9:00	10:30	OMG		IPR Policy Transition Briefing		Suite 1118, 11th FL
8:30	17:00	OMG		Workshop on Information Sharering and Safeguarding Standards		Grand Ballroom ABC, 2nd FL
9:00	17:00	OMG		The Physics of Notations Tutorial		North Point, 2nd FL
9:00	17:00	SysA		Structured Assurance Case Metamodel RTF		Suite 1146, 11th FL

Please get the up-to-date version from http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Minutes of the Robotics Domain Task Force Meeting
December 10-14, 2012
Burlingame, CA, USA
(robotics/2013-03-02)

Meeting Highlights

- **The Robotics Information Day 2012 was successfully held with 13 talks and 34 participants.**
- **The Robotics Demonstrations attracted lots of OMG participants. ETRI presented HRI demonstration (implementation of OMG RoIS specification), AIST exhibited a small humanoid robot controlled by OpenRTM-aist (implementation of OMG RTC-1.1 specification), Change Vision exhibited a newly released SysML tool, and Honda R&D exhibits the interoperability of two mobile robots controlled by OpenRTM-aist and Honda RTM respectively (implementations of OMG RTC-1.1 specification).**
- **Makoto Sekiya (Honda R&D) and Beom Su Seo (ETRI) were elected as additional Infrastructure WG co-chairs.**
- **We are planning to have the Robotics Information Day 2013 in Berlin collaborated with European Robotics Projects. Antonello Ceravola (Honda-RI-EU) was elected as an Organizing Committee chair.**

List of Generated Documents

robotics/2012-12-01 Final Agenda (Tetsuo Kotoku)
robotics/2012-12-02 Cambridge Meeting Minutes [approved] (Geoffrey Biggs and Seung-woog Jung)
robotics/2012-12-03 Intelligent RT Software Project - Natinal Project in Japan (Tomomasa Sato)
robotics/2012-12-04 Implementation of OPRoS to a human-friendly guide robot, FURO (Se-Kyeong Song)
robotics/2012-12-05 ISO Activity of Service Robot (Seungbin Moon)
robotics/2012-12-06 Disruptive Community Approach to Industrial Robotics Services (Paul Evans)
robotics/2012-12-07 Introduction to Robotic Technology Component (RTC-1.1) Specification (Geoffrey Biggs)
robotics/2012-12-08 An Inprementation of RoIS and RLS Spec. in Japan (Kenji Kamei)
robotics/2012-12-09 Dynamic Deployment and Configuration Standard for Robotic Technology Component: DDC4RTC (Noriaki Ando)
robotics/2012-12-10 Using SysML in a RTC-based Robotics Application : a case study with a demo (Kenji Hiranabe)
robotics/2012-12-11 A New Robotic Technology Middleware and Robotic Technology Component Interoperability demonstration (Makoto Sekiya)
robotics/2012-12-12 Implementation of RoIS to robots in ETRI (Su-Young Chi)
robotics/2012-12-13 Component Management in OPRoS (Seung-woog Jung)
robotics/2012-12-14 Cloud Networked Robotics and Acceleration Based Sensing (Miwako Doi)
robotics/2012-12-15 Introduction to OpenEL (Enbedded Library) for Robot (Kenichi Nakamura)
robotics/2012-12-16 OpenEL API specification ver.0.1.1 (Kenichi Nakamura)
robotics/2012-12-17 Opening Presentation (Tetsuo Kotoku)
robotics/2012-12-18 Infrastructure WG Progress Report (Noriaki Ando)
robotics/2012-12-19 Wrap-up Presentation (Tetsuo Kotoku)
robotics/2012-12-20 Roadmap for Robotics Activities (Tetsuo Kotoku)
robotics/2012-12-21 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)
robotics/2012-12-22 DTC Report Presentation (Tetsuo Kotoku)
robotics/2012-12-23 Burlingame Meeting Minutes - DRAFT (Seung-woog Jung and Takashi Suehiro)

Minutes

Wednesday 12 December, 2012, Sandpebble E, 1st FL
Robotics DTF Plenary Meeting Chair: Tetsuo Kotoku (AIST)
AIST, Change Vision, ETRI, Honda, JARA, UEC (Quorum: 3)

16:00 - 16:10 Robotics-DTF Opening Session, Tetsuo Kotoku (AIST)
- Minutes takers: Seung-Woog Jung (ETRI) and Takashi Suehiro(UEC)
- A Brief Summary of Cambridge meeting
  - 10 participants
  - 2 Contact Reports
  - 2 WG reports
- Cambridge Meeting minutes (robotics/2012-12-02) was approved.
  : AIST (motion), ETRI (second), UEC (white ballot)

16:10 - 16:45 WG Activity Reports
- **Infrastructure WG, Noriaki Ando (AIST)**
  . New work item meeting on Monday
  . New work items
    * Data port and data type
    * FSM component
  . 2 possible standardization processes for the new work items
    * RTC 2.0 on MARS
    * New Spec on Robotics DTF or MRAS
  . Possible standardization schedule of the new work items (Best Scenario)
    * submit RFP draft 4 weeks before of the next Reston meeting
    * 1st review in Reston (March 2013) meeting
    * 2nd review and AB review in Berlin (June 2013) meeting
    * Initial submission in Dec. 2013 meeting
    * Starting FTF in June 2014 meeting
    * FTF report in Jun 2015 meeting
    * Specification might be published at the end of 2015

16:45-17:00 **Robotics-DTF Plenary Wrap-up Session, Tetsuo Kotoku (AIST)**
Robotics-DTF Co-Chair (call for volunteer): postpone voting one more meeting
New Organization was approved
: AIST(motion), ETRI(second), UEC(white ballot)
* Infrastructure WG:
Seung-Woog Jung is difficult to attend upcoming meetings.
New Co-Chairs: BeomSu Seo (ETR) and Makoto Sekiya(Honda)
* Organizing Committee for Robotics Information Day in Berlin
New Chair: Antnello Ceravola (Honda-RI-EU)
Next meeting schedule

Plenary meeting attendee (17 attendees):
- Antonello Ceravola (Honda-RI-EU)
- Beom-Su Seo (ETRI)
- Byung-Tae Chun (Hanyang Univ)
- Geoffrey Biggs (AIST)

- Kenichi Nakamura (JASA)
- Kenji Hiranabe (ChangeVision)
- Koji Kamei (JARA/ATR)
- Makoto Sekiya (Honda)
- Noriaki Ando (AIST)
- Seung-Woog Jung (ETRI)
- Su-Young Chi (ETRI)
- Takashi Suehiro (UEC)
- Tetsuo Kotoku (AIST)
- Toshihiro Okamura (ChangeVision)
- Toshiki Iwanaga (ChangeVision)
- Toyotaka Torii (Honda)
- Young-Jo Cho (ETRI)

Robotics Information Day 2012 attendee (34 attendees):

- Antonello Corevola (Honda-RI-EU)
- Beom-Su Seo (ETRI)
- Byung-Tae Chun (Hankyoung Univ.)
- Chuck Zublic (NGC)
- Daniel Siegl (LieberLiever)
- Geoffrey Biggs (AIST)
- Gerardo Pardo-Castellote (RTI)
- Hajime Ueno (Fuji Xerox)
- Hugues Vincent (Thales)
- Isao Hara (AIST)
- Isashi Uchida (IPA)
- Julien Deantoni (INRIA)
- Kenichi Nakamura(JASA)
- Kenji Hiranabe (ChangeVision)
- Koji Kamei (ATR)
- Makoto Sekiya (Honda)
- Miwako Doi (Toshiba)
- Noriaki Ando (AIST)
- Paul Evans (SwRI)
- Russell Peak (Georgia Tech)
- Seiichi Shin (UEC)
- Se-Kyung Song (Future Robot)
- Seungbin Moon (Sejong Univ.)
- Seung-Woog Jung (ETRI)
- Su-Young Chi (ETRI)
- Takashi Suehiro (UEC)
- Takashi Tsubouchi (Univ. of Tsukuba)
- Tetsuo Kotoku (AIST)
- Tomomasa Sato (Univ. of Tokyo)
- Toshihiro Okamura (ChangeVison)
- Toshiki Iwanaga (ChangeVision)
- Toyotaka Torii (Honda)
- Young-Jo Cho (ETRI)
- Yutaka Matsuno (Nagoya Univ.)

Prepared and submitted by Seung-Woog Jung (ETRI) and Takashi Suehiro (UEC).

Robotics-DTF Plenary Meeting
Opening Session

March 19, 2013

Reston, VA, USA

Hyatt Regency Reston

Approval of Minutes

Meeting Quorum : 3

AIST, Honda, Infostroy, IPA, JARA,

Minutes taker(s):

- **Toshio Hori**

Burlingame Meeting Summary

Robotics Information Day: (34 participants)

- 4 Keynotes, 4 Specification Introductions, 6 Talks (includes 2 demonstrations)

Robotics Demonstrations:

- AIST: Small humanoid robot (OpenRTM-aist)
- Change Vision: RTC application in SysML
- Honda R&D: two mobile robots (Interoperability of Honda RTM and OpenRTM-aist)

Robotics Plenary: (17 participants)

- 1 WG Report
- Organizing Committee for Robotics Information Day 2013 in Berlin

Robotics Information Day

34 participants

- Antonello Corevola (Honda-RI-EU)
- Beom-Su Seo (ETRI)
- Byung-Tae Chun (Hankyoung Univ.)
- Chuck Zublic (NGC)
- Daniel Siegl (LieberLiever)
- Geoffrey Biggs (AIST)
- Gerardo Pardo-Castellote (RTI)
- Hajime Ueno (Fuji Xerox)
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- Toshiki Iwanaga (ChangeVision)
- Toyotaka Torii (Honda)
- Young-Jo Cho (ETRI)
- Yutaka Matsuno (Nagoya Univ.)

FSM4RTC
1st Draft

Infra. WG, Robotics DTF
Makoto Sekiya, Honda R&D
Noriaki Ando, AIST
robotics/2013-03-04

FSM4RTC

- Objective Discussion
- RFP for FSM type RT-Component
  - Getting state machine definition in a RTC
  - Getting state of FSM component
  - Receiving notification events for FSM
  - Additional information about port to realize FSM

Modification

- In Objective section
  - Added a sentence “Ways to execution of logic of FSM component”
- Term consistency
  - RT component, RT Component -> RTC

Problem Statement

- When implementer implement FSM component
  - No FSM definition
  - No ways to FSM definition
- Some sentences have changed to make clear difference between current RTC specification and the new specification.

Problem Statement

- FSM based systems are often used in robotic system.
- Such FSM component meets the following requirements.
  - A method to perform …
  - A method to obtain
  - A method to obtain information
  - A method to connect the FSM
- Proposed specification shall provides above mentioned functionality for FSM type component
- OMG RTC also defines FSM type component.
- The FSM type component specification remains freedom of implementation.
- Proposed specification are encouraged to reuse or compensate RTC's FSM component features.

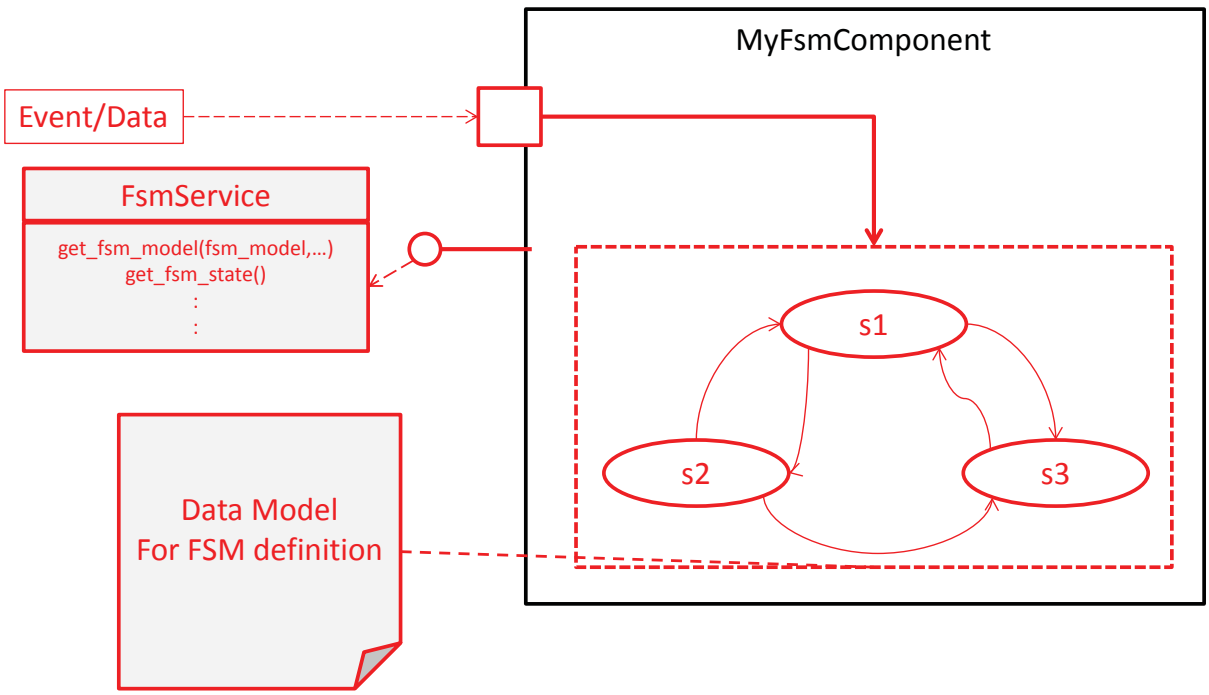
Scope

- Added "Mechanism for executing logic of FSM"
- Some sentences are modified.

Mandatory Requirements

- Ports
  - specify ports and the required information for the port configuration
  - specify the required information for the connection between ports
- Fsm
  - specify interfaces to externally obtain the definition of the state machine
  - interfaces to obtain the current state of the state machine
  - interfaces to receive the notification of the state transition

Mandatory Requirements



Optional Requirements

- Proposals may specify interface to access/manage a state machine for:
  - Updating state machine model regarding states and transitions.
- Proposals may specify ports communication profile including data type, interface type, data flow type, subscription type, push policy, push rate, buffering policy and so on.
- Proposals may reuse or extend the RTC specification.

Glossary

- FSM component: A component which is executed its logic based on a previously defined finite state machine by stimulated internal or external events.

Object Management Group

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Finite State Machine Component for Robotic Technology Components (FSM4RTC)

Request For Proposal

OMG Document: robotics/2013-03-05

Letters of Intent due: <day><month> <year>
Submissions due: <day><month> <year>

<Note to RFP Editors: spell out month name; e.g., January>

Objective of this RFP

This Request for Proposal solicits proposals for extending components with the Finite State Machine (FSM) for Robotic Technology Components.

In particular, the proposal shall provide:

- Ways to execute the logic of FSM components
- Ways to obtain the definition of the state machine in the FSM component.
- Ways to obtain the current state of the state machine from the FSM component.
- Ways to receive the notification of the state transition from the FSM component.
- Information of ports and connections, that is required for the communication between Robotic Technology Components.

For further details see Chapter 6 of this document.

1.0 Introduction

1.1 Goals of OMG

The Object Management Group (OMG) is the world's largest software consortium with an international membership of vendors, developers, and end users. Established in 1989, its mission is to help computer users solve enterprise integration problems by supplying open, vendor-neutral portability, interoperability and reusability specifications based on Model Driven Architecture (MDA). MDA defines an approach to IT system specification that separates the specification of system functionality from the specification of the implementation of that functionality on a specific technology platform, and provides a set of guidelines for structuring specifications expressed as models. OMG has established numerous widely used standards such as OMG IDL[IDL], CORBA[CORBA], Realtime CORBA [CORBA], GIOP/IIOP[CORBA], UML[UML], MOF[MOF], XMI[XMI] and CWM[CWM] to name a few significant ones.

1.2 Organization of this document

The remainder of this document is organized as follows:

Chapter 2 - *Architectural Context* - background information on OMG's Model Driven Architecture.

Chapter 3 - *Adoption Process* - background information on the OMG specification adoption process.

Chapter 4 - *Instructions for Submitters* - explanation of how to make a submission to this RFP.

Chapter 5 - *General Requirements on Proposals* - requirements and evaluation criteria that apply to all proposals submitted to OMG.

Chapter 6 - *Specific Requirements on Proposals* - problem statement, scope of proposals sought, requirements and optional features, issues to be discussed, evaluation criteria, and timetable that apply specifically to this RFP.

Appendix A – *References and Glossary Specific to this RFP*

Appendix B – General References and Glossary

1.3 Conventions

The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**may**", and "**optional**" in this document are to be interpreted as described in RFC 2119 [RFC2119].

1.4 Contact Information

Questions related to the OMG's technology adoption process may be directed to *omg-process@omg.org*. General questions about this RFP may be sent to *responses@omg.org*.

OMG documents (and information about the OMG in general) can be obtained from the OMG's web site *(http://www.omg.org/)*. OMG documents may also be obtained by contacting OMG at *documents@omg.org*. Templates for RFPs (like this document) and other standard OMG documents can be found at the OMG Template Downloads Page at *http://www.omg.org/technology/template_download.htm*

2.0 Architectural Context

MDA provides a set of guidelines for structuring specifications expressed as models and the mappings between those models. The MDA initiative and the standards that support it allow the same model specifying business system or application functionality and behavior to be realized on multiple platforms. MDA enables different applications to be integrated by explicitly relating their models; this facilitates integration and interoperability and supports system evolution (deployment choices) as platform technologies change. The three primary goals of MDA are portability, interoperability and reusability.

Portability of any subsystem is relative to the subsystems on which it depends. The collection of subsystems that a given subsystem depends upon is often loosely called the *platform,* which supports that subsystem. Portability – and reusability - of such a subsystem is enabled if all the subsystems that it depends upon use standardized interfaces (APIs) and usage patterns.

MDA provides a pattern comprising a portable subsystem that is able to use any one of multiple specific implementations of a platform. This pattern is repeatedly usable in the specification of systems. The five important concepts related to this pattern are:

1. *Model* – A model is a representation of a part of the function, structure and/or behavior of an application or system. A representation is said to be formal when it is based on a language that has a well-defined form ("syntax"), meaning ("semantics"), and possibly rules of analysis, inference, or proof for its constructs. The syntax may be graphical or textual. The semantics might be defined, more or less formally, in terms of things observed in the world being described (e.g. message sends and replies, object states and state changes, etc.), or by translating higher-level language constructs into other constructs that have a well-defined meaning. The optional rules of inference define what unstated properties you can deduce from the explicit statements in the model. In MDA, a representation that is not formal in this sense is not a model. Thus, a diagram with boxes and lines and arrows that is not supported by a definition of the meaning of a box, and the meaning of a line and of an arrow is not a model—it is just an informal diagram.

2. *Platform* – A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

3. *Platform Independent Model (PIM)* – A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

4. *Platform Specific Model (PSM)* – A model of a subsystem that includes information about the specific technology that is used in the realization of that subsystem on a specific platform, and hence possibly contains elements that are specific to the platform.

5. *Mapping* – Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel. A mapping may be expressed as associations, constraints, rules, templates with parameters that must be assigned during the mapping, or other forms yet to be determined.

For example, in case of CORBA the platform is specified by a set of interfaces and usage patterns that constitute the CORBA Core Specification [CORBA]. The CORBA platform is independent of operating systems and programming languages. The OMG Trading Object Service specification [TOS] (consisting of interface specifications in OMG Interface Definition Language (OMG IDL)) can be considered to be a PIM from the viewpoint of CORBA, because it is independent of operating systems and programming languages. When the IDL to C++ Language Mapping specification is applied to the Trading Service PIM, the C++-specific result can be considered to be a PSM for the Trading Service,

where the platform is the C++ language and the C++ ORB implementation. Thus the IDL to C++ Language Mapping specification [IDLC++] determines the mapping from the Trading Service PIM to the Trading Service PSM.

Note that the Trading Service model expressed in IDL is a PSM relative to the CORBA platform too. This highlights the fact that platform-independence and platform-specificity are relative concepts.

The UML Profile for EDOC specification [EDOC] is another example of the application of various aspects of MDA. It defines a set of modeling constructs that are independent of middleware platforms such as EJB [EJB], CCM [CCM], MQSeries [MQS], etc. A PIM based on the EDOC profile uses the middleware-independent constructs defined by the profile and thus is middleware-independent. In addition, the specification defines formal metamodels for some specific middleware platforms such as EJB, supplementing the already-existing OMG metamodel of CCM (CORBA Component Model). The specification also defines mappings from the EDOC profile to the middleware metamodels. For example, it defines a mapping from the EDOC profile to EJB. The mapping specifications facilitate the transformation of any EDOC-based PIM into a corresponding PSM for any of the specific platforms for which a mapping is specified.

Continuing with this example, one of the PSMs corresponding to the EDOC PIM could be for the CORBA platform. This PSM then potentially constitutes a PIM, corresponding to which there would be implementation language specific PSMs derived via the CORBA language mappings, thus illustrating recursive use of the Platform-PIM-PSM-Mapping pattern.

Note that the EDOC profile can also be considered to be a platform in its own right. Thus, a model expressed via the profile is a PSM relative to the EDOC platform.

An analogous set of concepts apply to Interoperability Protocols wherein there is a PIM of the payload data and a PIM of the interactions that cause the data to find its way from one place to another. These then are realized in specific ways for specific platforms in the corresponding PSMs.

Analogously, in case of databases there could be a PIM of the data (say using the Relational Data Model), and corresponding PSMs specifying how the data is actually represented on a storage medium based on some particular data storage paradigm etc., and a mapping from the PIM to each PSM.

OMG adopts standard specifications of models that exploit the MDA pattern to facilitate portability, interoperability and reusability, either through ab initio

development of standards or by reference to existing standards. Some examples of OMG adopted specifications are:

1. *Languages* – e.g. IDL for interface specification, UML for model specification, OCL for constraint specification, etc.

2. Mappings – e.g. Mapping of OMG IDL to specific implementation languages (CORBA PIM to Implementation Language PSMs), UML Profile for EDOC (PIM) to CCM (CORBA PSM) and EJB (Java PSM), CORBA (PSM) to COM (PSM) etc.

3. *Services* – e.g. Naming Service [NS], Transaction Service [OTS], Security Service [SEC], Trading Object Service [TOS] etc.

4. *Platforms* – e.g. CORBA [CORBA].

5. *Protocols* – e.g. GIOP/IIOP [CORBA] (both structure and exchange protocol), XML Metadata Interchange [XMI] (structure specification usable as payload on multiple exchange protocols).

6. *Domain Specific Standards* – e.g. Data Acquisition from Industrial Systems (Manufacturing) [DAIS], General Ledger Specification (Finance) [GLS], Air Traffic Control (Transportation) [ATC], Gene Expression (Life Science Research) [GE], Personal Identification Service (Healthcare) [PIDS], etc.

For an introduction to MDA, see [MDAa]. For a discourse on the details of MDA please refer to [MDAc]. To see an example of the application of MDA see [MDAb]. For general information on MDA, see [MDAd].

Object Management Architecture (OMA) is a distributed object computing platform architecture within MDA that is related to ISO's Reference Model of Open Distributed Processing RM-ODP[RM-ODP]. CORBA and any extensions to it are based on OMA. For information on OMA see [OMA].

3.0 Adoption Process

3.1 Introduction

OMG adopts specifications by explicit vote on a technology-by-technology basis. The specifications selected each satisfy the architectural vision of MDA. OMG bases its decisions on both business and technical considerations. Once a specification adoption is finalized by OMG, it is made available for use by both OMG members and non-members alike.

Request for Proposals (RFP) are issued by a *Technology Committee* (TC), typically upon the recommendation of a *Task Force* (TF) and duly endorsed by the *Architecture Board* (AB).

Submissions to RFPs are evaluated by the TF that initiated the RFP. Selected specifications are *recommended* to the parent TC after being *reviewed* for technical merit and consistency with MDA and other adopted specifications and *endorsed* by the AB. The parent TC of the initiating TF then votes to *recommend adoption* to the OMG Board of Directors (BoD). The BoD acts on the recommendation to complete the adoption process.

For more detailed information on the adoption process see the *Policies and Procedures of the OMG Technical Process* [P&P] and the *OMG Hitchhiker's Guide* [Guide]. In case of any inconsistency between this document and the [P&P] in all cases the [P&P] shall prevail.

3.2 Steps in the Adoption Process

A TF, its parent TC, the AB and the Board of Directors participate in a collaborative process, which typically takes the following form:

- *Development and Issuance of RFP*

  RFPs are drafted by one or more OMG members who are interested in the adoption of a standard in some specific area. The draft RFP is presented to an appropriate TF, based on its subject area, for approval and recommendation to issue. The TF and the AB provide guidance to the drafters of the RFP. When the TF and the AB are satisfied that the RFP is appropriate and ready for issuance, the TF recommends issuance to its parent TC, and the AB endorses the recommendation. The TC then acts on the recommendation and issues the RFP.

- *Letter of Intent (LOI)*

  A Letter of Intent (LOI) must be submitted to the OMG signed by an officer of the member organization which intends to respond to the RFP, confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements. (See section 4.3 for more information.). In order to respond to an RFP the organization must be a member of the TC that issued the RFP.

- *Voter Registration*

  Interested OMG members, other than Trial, Press and Analyst members, may participate in specification selection votes in the TF for an RFP. They may need to register to do so, if so stated in the RFP. Registration ends on a

specified date, 6 or more weeks after the announcement of the registration period. The registration closure date is typically around the time of initial submissions. Member organizations that have submitted an LOI are automatically registered to vote.

- *Initial Submissions*

  Initial Submissions are due by a specified deadline. Submitters normally present their proposals at the first meeting of the TF after the deadline. Initial Submissions are expected to be complete enough to provide insight on the technical directions and content of the proposals.

- *Revision Phase*

  During this time submitters have the opportunity to revise their Submissions, if they so choose.

- *Revised Submissions*

  Revised Submissions are due by a specified deadline. Submitters again normally present their proposals at the next meeting of the TF after the deadline. (Note that there may be more than one Revised Submission deadline. The decision to set new Revised Submission deadlines is made by the registered voters for that RFP.)

- *Selection Votes*

  When the registered voters for the RFP believe that they sufficiently understand the relative merits of the Revised Submissions, a selection vote is taken. The result of this selection vote is a recommendation for adoption to the TC. The AB reviews the proposal for MDA compliance and technical merit. An endorsement from the AB moves the voting process into the issuing Technology Committee. An eight-week voting period ensues in which the TC votes to recommend adoption to the OMG Board of Directors (BoD). The final vote, the vote to adopt, is taken by the BoD and is based on technical merit as well as business qualifications. The resulting draft standard is called the *Alpha Specification*.

- Business Committee Questionnaire

  The submitting members whose proposal is recommended for adoption need to submit their response to the BoD Business Committee Questionnaire [BCQ] detailing how they plan to make use of and/or make the resulting standard available in products. If no organization commits to make use of the standard, then the BoD will typically not act on the recommendation to adopt the standard - so it is very important to fulfill this requirement.

- Finalization

  A Finalization Task Force (FTF) is chartered by the TC that issued the RFP, to prepare an Alpha submission for publishing as a Formal (i.e. publicly available) specification, by fixing any problems that are reported by early users of the specification. Upon completion of its activity the FTF recommends adoption of the resulting Beta (draft) specification. The parent TC acts on the recommendation and recommends adoption to the BoD. OMG Technical Editors produce the Formal Specification document based on this Beta Specification.

- Revision

  A Revision Task Force (RTF) is normally chartered by a TC, after the FTF completes its work, to manage issues filed against the Formal Specification by implementers and users. The output of the RTF is a Beta specification reflecting minor technical changes, which the TC and Board will usually approve for adoption as the next version of the Formal Specification.

3.3 Goals of the evaluation

The primary goals of the TF evaluation are to:

- Provide a fair and open process
- Facilitate critical review of the submissions by members of OMG
- Provide feedback to submitters enabling them to address concerns in their revised submissions
- Build consensus on acceptable solutions
- Enable voting members to make an informed selection decision

Submitters are expected to actively contribute to the evaluation process.

4.0 Instructions for Submitters

4.1 OMG Membership

To submit to an RFP issued by the Platform Technology Committee the submitter or submitters must be either Platform or Contributing members on the date of the submission deadline, while for Domain Technology RFPs the submitter or submitters must be either Contributing or Domain members. Submitters sometimes choose to name other organizations that support a submission in some way; however, this has no formal status within the OMG

process, and for OMG's purposes confers neither duties nor privileges on the organizations thus named.

4.2 Submission Effort

An RFP submission may require significant effort in terms of document preparation, presentations to the issuing TF, and participation in the TF evaluation process. Several staff months of effort might be necessary. OMG is unable to reimburse submitters for any costs in conjunction with their submissions to this RFP.

4.3 Letter of Intent

A Letter of Intent (LOI) must be submitted to the OMG Business Committee signed by an officer of the submitting organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements. These terms, conditions, and requirements are defined in the *Business Committee RFP Attachment* and are reproduced verbatim in section 4.4 below.

The LOI should designate a single contact point within the submitting organization for receipt of all subsequent information regarding this RFP and the submission. The name of this contact will be made available to all OMG members. The LOI is typically due 60 days before the deadline for initial submissions. LOIs must be sent by fax or paper mail to the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

Here is a suggested template for the Letter of Intent:

This letter confirms the intent of <organization required> (the organization) to submit a response to the OMG <RFP name required> RFP. We will grant OMG and its members the right to copy our response for review purposes as specified in section 4.7 of the RFP. Should our response be adopted by OMG we will comply with the OMG Business Committee terms set out in section 4.4 of the RFP and in document omg/06-03-02.

<contact name and details required> will be responsible for liaison with OMG regarding this RFP response.

The signatory below is an officer of the organization and has the approval and authority to make this commitment on behalf of the organization.

<signature required>

4.4 Business Committee RFP Attachment

This section contains the text of the Business Committee RFP attachment concerning commercial availability requirements placed on submissions. This attachment is available separately as an OMG document omg/06-03-02.

Commercial considerations in OMG technology adoption

A1 Introduction

OMG wishes to encourage rapid commercial adoption of the specifications it publishes. To this end, there must be neither technical, legal nor commercial obstacles to their implementation. Freedom from the first is largely judged through technical review by the relevant OMG Technology Committees; the second two are the responsibility of the OMG Business Committee. The BC also looks for evidence of a commitment by a submitter to the commercial success of products based on the submission.

A2 Business Committee evaluation criteria

A2.1 Viable to implement across platforms

While it is understood that final candidate OMG submissions often combine technologies before they have all been implemented in one system, the Business Committee nevertheless wishes to see evidence that each major feature has been implemented, preferably more than once, and by separate organisations. Pre-product implementations are acceptable. Since use of OMG specifications should not be dependant on any one platform, cross-platform availability and interoperability of implementations should be also be demonstrated.

A2.2 Commercial availability

In addition to demonstrating the existence of implementations of the specification, the submitter must also show that products based on the specification are commercially available, or will be within 12 months of the date when the specification was recommended for adoption by the appropriate Task Force. Proof of intent to ship product within 12 months might include:

- *A public product announcement with a shipping date within the time limit.*
- *Demonstration of a prototype implementation and accompanying draft user documentation.*

Alternatively, and at the Business Committee's discretion, submissions may be adopted where the submitter is not a commercial software provider, and therefore will not make implementations commercially available. However, in this case the BC will require concrete evidence of two or more independent implementations of the specification being used by end- user organisations as part of their businesses. Regardless of which requirement is in use, the submitter must inform the OMG of completion of the implementations when commercially available.

A2.3 Access to Intellectual Property Rights

OMG will not adopt a specification if OMG is aware of any submitter, member or third party which holds a patent, copyright or other intellectual property right (collectively referred to in this policy statement as "IPR") which might be infringed by implementation or recommendation of such specification, unless OMG believes that such IPR owner will grant a license to organisations (whether OMG members or not) on non-discriminatory and commercially reasonable terms which wish to make use of the specification. Accordingly, the submitter must certify that it is not aware of any claim that the specification infringes any IPR of a third party or that it is aware and believes that an appropriate non-discriminatory license is available from that third party. Except for this certification, the submitter will not be required to make any other warranty, and specifications will be offered by OMG for use "as is". If the submitter owns IPR to which an use of a specification based upon its submission would necessarily be subject, it must certify to the Business Committee that it will make a suitable license available to any user on non- discriminatory and commercially reasonable terms, to permit development and commercialisation of an implementation that includes such IPR.

It is the goal of the OMG to make all of its technology available with as few impediments and disincentives to adoption as possible, and therefore OMG strongly encourages the submission of technology as to which royalty-free licenses will be available. However, in all events, the submitter shall also certify that any necessary licence will be made available on commercially reasonable, non-discriminatory terms. The submitter is responsible for disclosing in detail all known restrictions, placed either by the submitter or, if known, others, on technology necessary for any use of the specification.

A2.4 Publication of the specification

Should the submission be adopted, the submitter must grant OMG (and its sublicensees) a world- wide, royalty-free licence to edit, store, duplicate and distribute both the specification and works derived from it (such as revisions

and teaching materials). This requirement applies only to the written specification, not to any implementation of it.

A2.5 Continuing support

The submitter must show a commitment to continue supporting the technology underlying the specification after OMG adoption, for instance by showing the BC development plans for future revisions, enhancement or maintenance.

4.5 Responding to RFP items

4.5.1 Complete proposals

A submission must propose full specifications for all of the relevant requirements detailed in Chapter 6 of this RFP. Submissions that do not present complete proposals may be at a disadvantage.

Submitters are highly encouraged to propose solutions to any optional requirements enumerated in Chapter 6.

4.5.2 Additional specifications

Submissions may include additional specifications for items not covered by the RFP that they believe to be necessary and integral to their proposal. Information on these additional items should be clearly distinguished.

Submitters must give a detailed rationale as to why these specifications should also be considered for adoption. However submitters should note that a TF is unlikely to consider additional items that are already on the roadmap of an OMG TF, since this would pre-empt the normal adoption process.

4.5.3 Alternative approaches

Submitters may provide alternative RFP item definitions, categorizations, and groupings so long as the rationale for doing so is clearly stated. Equally, submitters may provide alternative models for how items are provided if there are compelling technological reasons for a different approach.

4.6 Confidential and Proprietary Information

The OMG specification adoption process is an open process. Responses to this RFP become public documents of the OMG and are available to members and

non-members alike for perusal. No confidential or proprietary information of any kind will be accepted in a submission to this RFP.

4.7 Copyright Waiver

Every submission document must contain: (i) a waiver of copyright for unlimited duplication by the OMG, and (ii) a limited waiver of copyright that allows each OMG member to make up to fifty (50) copies of the document for review purposes only. See Section 4.9.2 for recommended language.

4.8 Proof of Concept

Submissions must include a "proof of concept" statement, explaining how the submitted specifications have been demonstrated to be technically viable. The technical viability has to do with the state of development and maturity of the technology on which a submission is based. This is not the same as commercial availability. Proof of concept statements can contain any information deemed relevant by the submitter; for example:

> "This specification has completed the design phase and is in the process of being prototyped."
>
> "An implementation of this specification has been in beta-test for 4 months."
>
> "A named product (with a specified customer base) is a realization of this specification."

It is incumbent upon submitters to demonstrate the technical viability of their proposal to the satisfaction of the TF managing the evaluation process. OMG will favor proposals based on technology for which sufficient relevant experience has been gained.

4.9 Format of RFP Submissions

This section presents the structure of a submission in response to an RFP. *All submissions* must contain the elements itemized in section 4.9.2 below before they can be accepted as a valid response for evaluation or a vote can be taken to recommend for adoption.

4.9.1 General

- Submissions that are concise and easy to read will inevitably receive more consideration.

- Submitted documentation should be confined to that directly relevant to the items requested in the RFP. If this is not practical, submitters must make clear what portion of the documentation pertains directly to the RFP and what portion does not.
- The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**may**", and "**optional**" shall be used in the submissions with the meanings as described in RFC 2119 [RFC2119].

4.9.2 Required Outline

A three-part structure for submissions is required. Part I is non-normative, providing information relevant to the evaluation of the proposed specification. Part II is normative, representing the proposed specification. Specific sections like Appendices may be explicitly identified as non-normative in Part II. Part III is normative specifying changes that must be made to previously adopted specifications in order to be able to implement the specification proposed in Part II.

PART I

- •A cover page carrying the following information (a template for this is available [Inventory]):
  - The full name of the submission
  - The primary contact for the submission
  - The acronym proposed for the specification (e.g. UML, CORBA)
  - The name and document number of the RFP to which this is a response
  - The document number of the main submission document
  - An inventory of all accompanying documents, with OMG document number, short description, a URL where appropriate, and whether they are normative.
- List of OMG members making the submission (see 4.1) listing exactly which members are making the submission, so that submitters can be matched with LOI responders and their current eligibility can be verified.
- Copyright waiver (see 4.7), in a form acceptable to the OMG.

  One acceptable form is:

"Each of the entities listed above: (i) grants to the Object Management Group, Inc. (OMG) a nonexclusive, royalty-free, paid up, worldwide license to copy and distribute this document and to modify this document and distribute copies of the modified version, and (ii) grants to each member of the OMG a nonexclusive, royalty-free, paid up, worldwide license to make up to fifty (50) copies of this document for internal review purposes only and not for distribution, and (iii) has agreed that no person shall be deemed to have infringed the copyright in the included material of any such copyright holder by reason of having used any OMG specification that may be based hereon or having conformed any computer software to such specification."

If you wish to use some other form you must get it approved by the OMG legal counsel before using it in a submission.

- For each member making the submission, an individual contact point who is authorized by the member to officially state the member's position relative to the submission, including matters related to copyright ownership, etc. (see 4.3)
- Overview or guide to the material in the submission
- Overall design rationale (if appropriate)
- Statement of proof of concept (see 4.8)
- Resolution of RFP requirements and requests

  Explain how the proposal satisfies the specific requirements and (if applicable) requests stated in Chapter 6. References to supporting material in Part II should be given.

  In addition, if the proposal does not satisfy any of the general requirements stated in Chapter 5, provide a detailed rationale.

- Responses to RFP issues to be discussed

  Discuss each of the "Issues To Be Discussed" identified in Chapter 6.

PART II

The contents of this part should be structured based on the template found in [FORMS] and should contain the following elements as per the instructions in the template document cited above:

- Scope of the proposed specification
- Proposed conformance criteria

Submissions should propose appropriate conformance criteria for implementations.

- Proposed normative references

  Submissions should provide a list of the normative references that are used by the proposed specification

- Proposed list of terms and definitions

  Submissions should provide a list of terms that are used in the proposed specification with their definitions.

- Proposed list of symbols

  Submissions should provide a list of special symbols that are used in the proposed specification together with their significance

- Proposed specification

PART III

- Changes or extensions required to existing OMG specifications

  Submissions must include a full specification of any changes or extensions required to existing OMG specifications. This should be in a form that enables "mechanical" section-by-section revision of the existing specification.

4.10 How to Submit

Submitters should send an electronic version of their submission to the *RFP Submissions Desk* (*omg-documents@omg.org*) at OMG Headquarters by 5:00 PM U.S. Eastern Standard Time (22:00 GMT) on the day of the Initial and Revised Submission deadlines. Acceptable formats are Adobe FrameMaker source, ODF (ISO/IEC 26300), OASIS Darwin Information Typing Architecture (DITA) or OASIS DocBook 4.x (or later).

Submitters should make sure they receive electronic or voice confirmation of the successful receipt of their submission. Submitters should be prepared to send a single hardcopy version of their submission, if requested by OMG staff, to the attention of the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

5.0 General Requirements on Proposals

5.1 Requirements

5.1.1 Submitters are encouraged to express models using OMG modeling languages such as UML, MOF, CWM and SPEM (subject to any further constraints on the types of the models and modeling technologies specified in Chapter 6 of this RFP). Submissions containing models expressed via OMG modeling languages shall be accompanied by an OMG XMI [XMI] representation of the models (including a machine-readable copy). A best effort should be made to provide an OMG XMI representation even in those cases where models are expressed via non-OMG modeling languages.

5.1.2 Chapter 6 of this RFP specifies whether PIM(s), PSM(s), or both are being solicited. If proposals specify a PIM and corresponding PSM(s), then the rules specifying the mapping(s) between the PIM and PSM(s) shall either be identified by reference to a standard mapping or specified in the proposal. In order to allow possible inconsistencies in a proposal to be resolved later, proposals shall identify whether the mapping technique or the resulting PSM(s) are to be considered normative.

5.1.3 Proposals shall be *precise* and *functionally complete*. All relevant assumptions and context required for implementing the specification shall be provided.

5.1.4 Proposals shall specify *conformance criteria* that clearly state what features all implementations must support and which features (if any) may *optionally* be supported.

5.1.5 Proposals shall *reuse* existing OMG and other standard specifications in preference to defining new models to specify similar functionality.

5.1.6 Proposals shall justify and fully specify any *changes or extensions* required to existing OMG specifications. In general, OMG favors proposals that are *upwards compatible* with existing standards and that minimize changes and extensions to existing specifications.

5.1.7 Proposals shall factor out functionality that could be used in different contexts and specify their models, interfaces, etc. separately. Such *minimalism* fosters re-use and avoids functional duplication.

5.1.8 Proposals shall use or depend on other specifications only where it is actually necessary. While re-use of existing specifications to avoid duplication will be encouraged, proposals should avoid gratuitous use.

5.1.9 Proposals shall be *compatible* with and *usable* with existing specifications from OMG and other standards bodies, as appropriate. Separate specifications offering distinct functionality should be usable together where it makes sense to do so.

5.1.10 Proposals shall preserve maximum *implementation flexibility*. Implementation descriptions should not be included and proposals shall not constrain implementations any more than is necessary to promote interoperability.

5.1.11 Proposals shall allow *independent implementations* that are *substitutable* and *interoperable*. An implementation should be replaceable by an alternative implementation without requiring changes to any client.

5.1.12 Proposals shall be compatible with the architecture for system distribution defined in ISO's Reference Model of Open Distributed Processing [RM-ODP]. Where such compatibility is not achieved, or is not appropriate, the response to the RFP must include reasons why compatibility is not appropriate and an outline of any plans to achieve such compatibility in the future.

5.1.13 In order to demonstrate that the specification proposed in response to this RFP can be made secure in environments requiring security, answers to the following questions shall be provided:

- What, if any, are the security sensitive elements that are introduced by the proposal?
- Which accesses to security-sensitive elements must be subject to security policy control?
- Does the proposed service or facility need to be security aware?
- What default policies (e.g., for authentication, audit, authorization, message protection etc.) should be applied to the security sensitive elements introduced by the proposal? Of what security considerations must the implementers of your proposal be aware?

The OMG has adopted several specifications, which cover different aspects of security and provide useful resources in formulating responses. [CSIV2] [SEC] [RAD].

5.1.14 Proposals shall specify the degree of internationalization support that they provide. The degrees of support are as follows:

a) Uncategorized: Internationalization has not been considered.

b) Specific to <region name>: The proposal supports the customs of the specified region only, and is not guaranteed to support the customs of any other region. Any fault or error caused by requesting the services outside of a context in which the customs of the specified region are being consistently followed is the responsibility of the requester.

c) Specific to <multiple region names>: The proposal supports the customs of the specified regions only, and is not guaranteed to support the customs of any other regions. Any fault or error caused by requesting the services outside of a context in which the customs of at least one of the specified regions are being consistently followed is the responsibility of the requester.

d) Explicitly not specific to <region(s) name>: The proposal does not support the customs of the specified region(s). Any fault or error caused by requesting the services in a context in which the customs of the specified region(s) are being followed is the responsibility of the requester.

5.2 Evaluation criteria

Although the OMG adopts model-based specifications and not implementations of those specifications, the technical viability of implementations will be taken into account during the evaluation process. The following criteria will be used:

5.2.1 Performance

Potential implementation trade-offs for performance will be considered.

5.2.2 Portability

The ease of implementation on a variety of systems and software platforms will be considered.

5.2.3 Securability

The answer to questions in section 5.1.13 shall be taken into consideration to ascertain that an implementation of the proposal is securable in an environment requiring security.

5.2.4 Conformance: Inspectability and Testability

The adequacy of proposed specifications for the purposes of conformance inspection and testing will be considered. Specifications should provide sufficient constraints on interfaces and implementation characteristics to ensure that conformance can be unambiguously assessed through both manual inspection and automated testing.

5.2.5 Standardized Metadata

Where proposals incorporate metadata specifications, usage of OMG standard XMI metadata [XMI] representations must be provided as this allows specifications to be easily interchanged between XMI compliant tools and applications. Since use of XML (including XMI and XML/Value [XML/Value]) is evolving rapidly, the use of industry specific XML vocabularies (which may not be XMI compliant) is acceptable where justified.

6.0 Specific Requirements on Proposals

6.1 Problem Statement

FSM based systems are often used in robotics system. Such FSM component meets the following requirements.

- a method to perform state transition in response to the input event on the FSM component;
- a method to obtain the structure of state machine in the FSM component;
- a method to obtain information from the FSM component; and
- a method to connect the FSM components with RTCs through ports connections.

Proposed specification shall provide above mentioned functionalities for FSM type component. OMG RTC specification also defines FSM type component. However, the FSM type component specification remains freedom of its implementation. Proposed specification is encouraged to reuse or compensate RTC's FSM component features.

6.2 Scope of Proposals Sought

This RFP solicits proposals to specify the following interfaces and communication procedures that are required to provide and utilize the FSM components of the OMG RTC as middleware.

The proposals shall include a PIM, using UML in the most recent public available version, and one or more PSMs, including one based on OMG IDL (Interface Definition Language) and XML (eXtensible Mark-up Language).

(１) Mechanisms for executing logic of the FSM components

(２) Interfaces for accessing/managing the date model which describes the definition of the state machines from the FSM components.

(３) Interfaces for obtaining and/or notifying the current state of the FSM components and interfaces for receiving the notification of the state transitions.

(４) Ports for sending and receiving the events and data to/from other RTCs and the data model for describing the details of ports and its connection.

6.3 Relationship to other OMG Specifications and activities

6.3.1 Relationship to OMG specifications

RTC v1.1 - http://www.omg.org/spec/RTC/1.1/

6.3.2 Relationship to other OMG Documents and work in progress

None

6.4 Related non-OMG Activities, Documents and Standards

☐ CLARAty: Coupled Layer Architecture for Robotic Autonomy http://robotics.jpl.nasa.gov/tasks/claraty/homepage.html

☐ Network Robot Forum http://www.scat.or.jp/nrf/

☐ IEEE Robotics and Automation Society, Technical Committee on Network Robot

☐ IEEE Robotics and Automation Society, Technical Committee on Programming Environments in Robotics and Automation

☐ OpenRT Platform http://www.openrtp.jp

☐ OpenRTM-aist http://www.openrtm.org

☐ OpenRAVE: http://openrave.programmingvision.com

☐ OPRoS: http://www.opros.or.kr

☐ OROCOS: Open Robot Control Software, Open Realtime Control Service http://www.orocos.org/

☐ Orca: http://orca-robotics.sourceforge.net/

☐ ORiN :Open Robot/Resource Interface for the Network: http://www.orin.jp/

☐ Player/Stage: http://playerstage.sourceforge.net/

☐ Ptolemy Project: http://ptolemy.eecs.berkeley.edu/

☐ RCS (Realtime Control Systems Architecture): http://www.isd.mel.nist.gov/projects/rcs/

☐ ROS: http://www.ros.org

☐ RSi: Robot Service Initiative: http://www.robotservice.org/

☐ SAE AADL (Society for Automotive Engineers, Architecture Analysis and Design Language): http://www.aadl.info/

☐ RETF (Robotics Engineering Task Force): http://www.robo-etf.org/

☐ URC (Ubiquitous Robotic Companion) Project

☐ Yaorozu Project: http://www.8mg.jp/

6.5 Mandatory Requirements

6.5.1 Proposal shall specify mechanisms to execute logic of the FSM components. Execution mechanisms include:

- receiving an event/data;
- making a state transition; and
- invoking an action related to state and /or transition.

6.5.2 Proposals shall specify interface to access/manage a state machine for:

- obtaining description of a sate machine; and
- obtaining and/or notifying the current state of a state machine.

6.5.3 Proposal shall specify data model which describes the definition of a state machine.

6.5.4 Proposal shall specify mechanisms for communicating events/data.

6.6 Optional Requirements

6.6.1 Proposals may specify interface to access/manage a state machine for:

- Updating state machine model regarding states and transitions.

6.6.2 Proposals may specify ports communication profile including data type, interface type, data flow type, subscription type, push policy, push rate, buffering policy and so on.

6.6.3 Proposals may reuse or extend the RTC specification.

6.7 Issues to be discussed

These issues will be considered during submission evaluation. They should not be part of the proposed normative specification. (Place them in Part I of the submission.)

6.7.1 Proposals shall discuss the format to deal with the information of the state machine such as SCXML.

6.7.2 Proposals shall discuss the graphical notation of the FSM model based on UML state machine diagram.

6.7.3 Proposals shall discuss whether the profile of the extended ports and connectors should be reflected to the existing definition of FSM components in OMG RTC specification.

6.8 Evaluation Criteria

6.8.1 Demonstration of a proposal with a working implementation may aid in selection.

6.8.2 Reuse of existing technology, such as the RTC specification and UML specification, is considered important.

6.9 Other information unique to this RFP

None

6.10 RFP Timetable

The timetable for this RFP is given below. Note that the TF or its parent TC may, in certain circumstances, extend deadlines while the RFP is running, or may elect to have more than one Revised Submission step. The latest timetable can always be found at the OMG *Work In Progress* page at http://www.omg.org/schedules under the item identified by the name of this RFP. Note that "<month>" and "<approximate month>" is the name of the month spelled out; e.g., January.

Event or Activity	Actual Date
Preparation of RFP by TF	
RFP placed on OMG document server	*May 20 2013*
Approval of RFP by Architecture Board *Review by TC*	*June 2013*
TC votes to issue RFP	*June 2013*
LOI to submit to RFP due	*September 11 2013*
Initial Submissions due and placed on OMG document server ("Four week rule")	*November 11 2013*
Voter registration closes	*December day 2013*
Initial Submission presentations	*December day 2013*
Preliminary evaluation by TF	
Revised Submissions due and placed on OMG document server ("Four week rule")	*May day 2014*
Revised Submission presentations	*June day 2014*
Final evaluation and selection by TF *Recommendation to AB and TC*	
Approval by Architecture Board *Review by TC*	
TC votes to recommend specification	*June day 2014*
BoD votes to adopt specification	*September day 2014*

Appendix A References and Glossary Specific to this RFP

A.1 References Specific to this RFP

[CCM] CORBA Components Specification,
http://www.omg.org/technology/documents/formal/components.htm

[RTC] Robotic Technology Component specification,
http://www.omg.org/spec/RTC/1.1
/
[SDO] Super distributed Object Specification,
http://www.omg.org/spec/SDO/1.1/

A.2 Glossary Specific to this RFP

Robot application –A software application that controls a robot's behavior. Examples include a vacuum cleaning robot and a butler robot.
Super Distributed Object (SDO) – A logical representation of a hardware device or a software component that provides well-known functionality and services.
Robotic Technology Component (RTC) –A logical representation of a hardware
and/or software entity that provides well-known functionality and services.
RTC-based system –A system comprised of RTCs connected in a network representing a robotic system, including robot hardware and software algorithms.
Robotic Technology (RT) – Robotic Technology (RT) is a general term of the technology originating in robotics, and it means not only the standalone robot but technical element which constitutes robots.
RT-component profile – A description that represents the static state of an RT Component that is referred to other RT Components.
RTC-based system profile - A description of how RT-components are connected and interact with each other, and RT-component configuration parameters.
FSM component – A component which is executed its logic based on a previously defined finite state machine by stimulated internal or external events.

Appendix B General Reference and Glossary

B.1 General References

The following documents are referenced in this document:

[ATC] Air Traffic Control Specification,
http://www.omg.org/technology/documents/formal/air_traffic_control.htm

[BCQ] OMG Board of Directors Business Committee Questionnaire,
http://doc.omg.org/bc/07-08-06

[CCM] CORBA Core Components Specification,
http://www.omg.org/technology/documents/formal/components.htm

[CORBA] Common Object Request Broker Architecture (CORBA/IIOP),
http://www.omg.org/technology/documents/formal/corba_iiop.htm

[CSIV2] [CORBA] Chapter 26

[CWM] Common Warehouse Metamodel Specification,
http://www.omg.org/technology/documents/formal/cwm.htm

[DAIS] Data Acquisition from Industrial Systems,
http://www.omg.org/technology/documents/formal/dais.htm

[EDOC] UML Profile for EDOC Specification,
http://www.omg.org/techprocess/meetings/schedule/UML_Profile_for_EDOC_FTF.html

[EJB] "Enterprise JavaBeans™", *http://java.sun.com/products/ejb/docs.html*

[FORMS] "ISO PAS Compatible Submission Template".
http://www.omg.org/cgi-bin/doc?pas/2003-08-02

[GE] Gene Expression,
http://www.omg.org/technology/documents/formal/gene_expression.htm

[GLS] General Ledger Specification ,
http://www.omg.org/technology/documents/formal/gen_ledger.htm

[Guide] The OMG Hitchhiker's Guide,, *http://www.omg.org/cgi-bin/doc?hh*

[IDL] ISO/IEC 14750 also see [CORBA] Chapter 3.

[IDLC++] IDL to C++ Language Mapping,
http://www.omg.org/technology/documents/formal/c++.htm

[Inventory] Inventory of Files for a Submission/Revision/Finalization,
http://doc.omg.org/smsc/2007-09-05

[MDAa] OMG Architecture Board, "Model Driven Architecture - A Technical Perspective*", http://www.omg.org/mda/papers.htm*

[MDAb] "Developing in OMG's Model Driven Architecture (MDA),"
http://www.omg.org/docs/omg/01-12-01.pdf

[MDAc] "MDA Guide" (*http://www.omg.org/docs/omg/03-06-01.pdf*)

[MDAd] "MDA "The Architecture of Choice for a Changing World™"",
http://www.omg.org/mda

[MOF] Meta Object Facility Specification,
http://www.omg.org/technology/documents/formal/mof.htm

[MQS] "MQSeries Primer",
http://www.redbooks.ibm.com/redpapers/pdfs/redp0021.pdf

[NS] Naming Service,
http://www.omg.org/technology/documents/formal/naming_service.htm

[OMA] "Object Management Architecture™", *http://www.omg.org/oma/*

[OTS] Transaction Service,
http://www.omg.org/technology/documents/formal/transaction_service.htm

[P&P] Policies and Procedures of the OMG Technical Process,
http://www.omg.org/cgi-bin/doc?pp

[PIDS] Personal Identification Service,
http://www.omg.org/technology/documents/formal/person_identification_service.htm

[RAD] Resource Access Decision Facility,
http://www.omg.org/technology/documents/formal/resource_access_decision.htm

[RFC2119] IETF Best Practices: Key words for use in RFCs to Indicate Requirement Levels, (*http://www.ietf.org/rfc/rfc2119.txt*).

[RM-ODP] ISO/IEC 10746

[SEC] CORBA Security Service,
http://www.omg.org/technology/documents/formal/security_service.htm

[TOS] Trading Object Service,
http://www.omg.org/technology/documents/formal/trading_object_service.htm

[UML] Unified Modeling Language Specification,
http://www.omg.org/technology/documents/formal/uml.htm

[UMLC] UML Profile for CORBA,
http://www.omg.org/technology/documents/formal/profile_corba.htm

[XMI] XML Metadata Interchange Specification,
http://www.omg.org/technology/documents/formal/xmi.htm

[XML/Value] XML Value Type Specification,
http://www.omg.org/technology/documents/formal/xmlvalue.htm

B.2 General Glossary

Architecture Board (AB) - The OMG plenary that is responsible for ensuring the technical merit and MDA-compliance of RFPs and their submissions.

Board of Directors (BoD) - The OMG body that is responsible for adopting technology.

Common Object Request Broker Architecture (CORBA) - An OMG distributed computing platform specification that is independent of implementation languages.

Common Warehouse Metamodel (CWM) - An OMG specification for data repository integration.

CORBA Component Model (CCM) - An OMG specification for an implementation language independent distributed component model.

Interface Definition Language (IDL) - An OMG and ISO standard language for specifying interfaces and associated data structures.

Letter of Intent (LOI) - A letter submitted to the OMG BoD's Business Committee signed by an officer of an organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements.

Mapping - Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel.

Metadata - Data that represents models. For example, a UML model; a CORBA object model expressed in IDL; and a relational database schema expressed using CWM.

Metamodel - A model of models.

Meta Object Facility (MOF) - An OMG standard, closely related to UML, that enables metadata management and language definition.

Model - A formal specification of the function, structure and/or behavior of an application or system.

Model Driven Architecture (MDA) - An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform.

Normative – Provisions that one must conform to in order to claim compliance with the standard. (as opposed to non-normative or informative which is explanatory material that is included in order to assist in understanding the standard and does not contain any provisions that must be conformed to in order to claim compliance).

Normative Reference – References that contain provisions that one must conform to in order to claim compliance with the standard that contains said normative reference.

Platform - A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

Platform Independent Model (PIM) - A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

Platform Specific Model (PSM) - A model of a subsystem that includes information about the specific technology that is used in the realization of it on a specific platform, and hence possibly contains elements that are specific to the platform.

Request for Information (RFI) - A general request to industry, academia, and any other interested parties to submit information about a particular technology area to one of the OMG's Technology Committee subgroups.

Request for Proposal (RFP) - A document requesting OMG members to submit proposals to an OMG Technology Committee. Such proposals must be received by a certain deadline and are evaluated by the issuing Task Force.

Task Force (TF) - The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).

Technology Committee (TC) - The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – the *Platform TC* (PTC) focuses on IT and modeling infrastructure related standards; while the *Domain TC* (DTC) focuses on domain specific standards.

Unified Modeling Language (UML) - An OMG standard language for specifying the structure and behavior of systems. The standard defines an abstract syntax and a graphical concrete syntax.

UML Profile - A standardized set of extensions and constraints that tailors UML to particular use.

XML Metadata Interchange (XMI) - An OMG standard that facilitates interchange of models via XML documents.

Proposal for establishment of Hardware Abstraction Layer WG

March 19, 2013

Kenichi Nakamura
Director
Chairman of Applied Technology Research Committee
Chairman of Platform Research Group
Japan Embedded Systems Technology Association(JASA)

Agenda

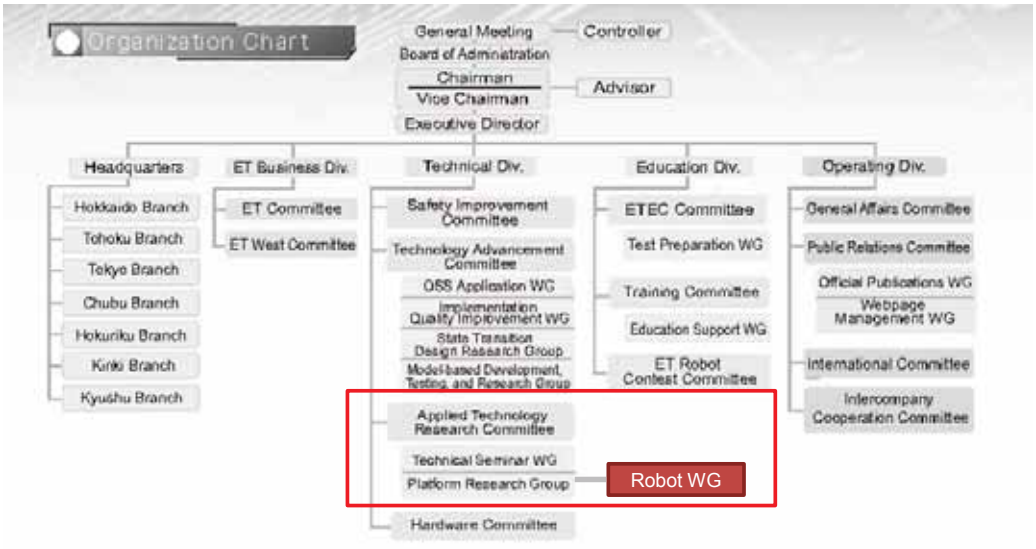
- About JASA
- Platforms for Robots
- Current Problems in robots control
- Challenge and Solution to solve the problems
  - Concept of OpenEL®
  - OpenEL® Version 0.x
  - Architecture of OpenEL® Version 0.x
  - Demo of OpenEL® Version 0.x
- Results and Next Challenge
- Roadmap
- Summary

About JASA(Japan Embedded Systems Technology Association)

- Established in 1986.
- More than 200 embedded systems companies in Japan
  - ALPINE, CORE, dSPACE, Hitachi, Imagination, JVC Kenwood, Microsoft, Mentor, Panasonic, RICOH, RENESAS, Toshiba etc.
- Main Activities
  - Embedded Technology, a Comprehensive Exhibit of Embedded Systems Technology(Yokohama and Osaka)
  - Implementation and Expansion of ETEC(Embedded Technology Engineer Certification)

- Study and Research Activities for Technological Advancement
  - Case studies of safe design, surveying of techniques and methods recommended by safety standards, research and study into safety-related products, and support for IEC 61508 and ISO 26262.
  - Research and study on modeling and verification for the achievement of reliable embedded software development and public awareness activities and dissemination of case studies for the education of engineers.
- Embedded Technology Robot Software Design Contest

JASA Organization Chart



Platform Research Group

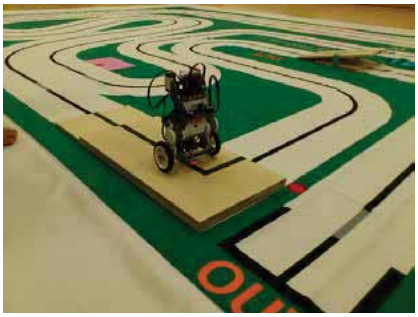
- Started to work in 2000.
- Members
  - CORE, NDD, CIC, ZUKEN ELMIC, Oriental Motor, Upwind Technology etc.
- Advisors
  - Tetsuo Kotoku Dr.Eng. The National Institute of Advanced Industrial Science and Technology (AIST)
  - Naoyuki Takesue, Associate Professor, Intelligent System Design Tokyo Metroporitan University
  - Akihito Sano, Professor, Department of Mechanical Engineering, Department of Engineering Physics, Electronics and Mechanics, Nagoya Institute of Technology
  - Junji Furusho, Professor, Faculty of Engineering, Department of Management Information Science, Fukui University of Technology
- Activities
  - Research and study into technological and business trends in the platforms that serve as the common foundation for our business.
  - Drafting of the specifications of “OpenEL for Robots”, a software platform for robotics that is being proposed by JASA.

Platforms for Robots

- Miro – Middleware for Robots
  - http://miro-middleware.berlios.de/
- OROCOS
  - http://www.orocos.org/
- RT Middleware
  - http://www.openrtm.org/openrtm/en
- OPRoS(Open Platform for Robotic Services)
  - http://opros.or.kr/
- ROS
  - http://www.ros.org/wiki/
- More more platforms…

Current Problems in robots control

- Lots of methods to control Motors and sensors.
- It depends on a platform.
- Example of LEGO Mindstoms NXT
  - 2 APIs to control motors in nxtOSEK
    - nxt_motor_set_speed(U32 n, int speed_percent, int brake)
    - ecrobot_set_motor_speed(U8 port_id, S8 speed)
  - Grammar is different
  - Arguments are different
  - Types are different
  - Convenient for us? -> No!

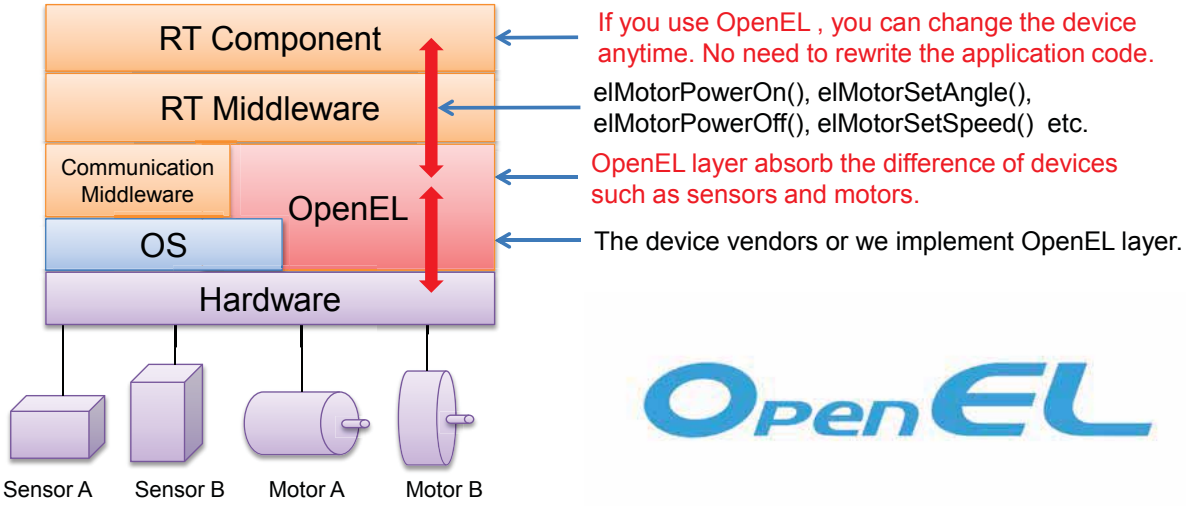


Challenge and Solution to solve the problems

- In 2011, JASA proposed to unify these interfaces which were different for each device manufacturer, each platform, each OS and so on.
- JASA focused on robotics and control systems.
- JASA named these interface as OpenEL®(Open Embedded Library)
- JASA has started drafting OpenEL specifications.
- JASA introduced OpenEL® Version 0.1.1 at OMG Robotics day in Burlingame, CA in December, 2012.

Concept of OpenEL platform

- Specifically, OpenEL is API (Application Program Interface) standardized on the layer below the middleware.
- It is a mechanism for device control, such as the output to the motor, the input from the sensor and so on.
- Naming Convention : el + Device + Command (ex. elMotorSetAngle())



OpenEL® Version 0.x

- After last OMG Technical meeting JASA continued drafting OpenEL specifications.
- On March 19, Current Version is 0.x (0.6 or 0.7. still not 1.0)
  - In May, JASA will announce and release OpenEL® Version 1.0.
- In Version 0.x, OpenEL® unified the interface to initialize devices.
  - Motors, Sensors, etc.

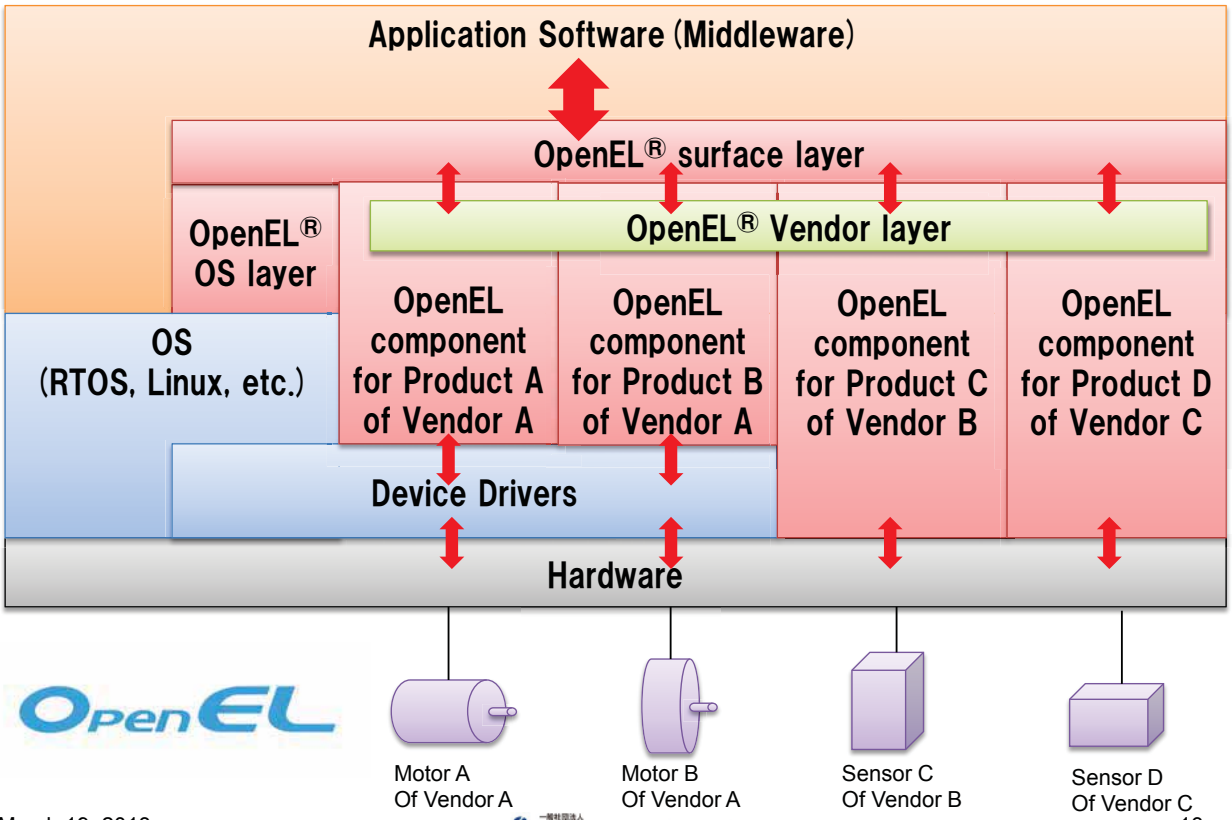
OpenEL® Version 0.x

- To initialize Motors and Sensors.
- elInit(OpenEL Component, PhysicalPortID)
- Naming Convention of OpenEL Component(Function Table by Vendor)
  - el + Device Name + Vendor Name + Series Name
  - Device Name : Motor, Sensor, etc.
  - Vendor Name : OM(Oriental Motor), etc. (2-16 charactors, First character is capital letter)
- Examples
  - elMotorOMABC(Oriental Motor's ABC Motor)
  - elMotorUTIXx(Upwind Technology's Xx Motor)
  - elSensorYYYZzz(YY's Zzz Sensor)

OpenEL® Version 0.x

- Naming Convention of Physical ID
- Type : unsigned 32bit
- Bit definition
  - upper 16bits is OpenEL specifications.
  - We define 65535 components.
    - 0x0010 – 0xFFFE
    - 0x0000 and 0xFFFF are for development use only.
    - 0x0001 – 0x 000F are reserved.
  - Lower 16bits depend on vendor.

Architecture of OpenEL® Version 0.x



Demo of OpenEL® Version 0.x

- One Motor vendor in Japan has already ported OpenEL Version 0.x into their real products.

Results and Next Challenge

- OpenEL® is the specifications only in a part of Japan.
- It's convenient for the robotics software developers in a part of Japan.
- But, Not in the world.
- Because, OpenEL® don't support any motors and sensors in the world at this time.
- So, What and How should we do next?
- We should discuss about Hardware Abstraction Layer like OpenEL® in OMG.
- When do we do? - It's Now!

Schedule

2013/03/19	Establishment of Hardware Abstraction Layer WG
2013/06	RFI
2013/09	Fix Response
2013/12	Fix Response, Start to write a draft
2014/03	RFP draft
2014/06	RFP
2014/09	LOI
2014/12	LOI 1st
2015/03	LOI 2nd
2015/06	Standard specification inside OMG
2015/09	Start FTF(Finalization Task Force)
2015/12	FTF
2016/03	FTF
2016/06	Standard specification for public
	Establishment of ISO WG
	Start to work for ISO IS

Proposal

- Shall we establish Hardware Abstraction Layer WG together?
- Let's discuss about establishment of Hardware Abstraction Layer WG.

APPENDIX SPECIFICATIONS

OpenEL API Version 0.1.1

■ Macros

```
#define   EL_TRUE   1
#define   EL_FALSE   0
#define   EL_NXT_PORT_A   0
#define   EL_NXT_PORT_B   1
#define   EL_NXT_PORT_C   2
#define   EL_NXT_PORT_S1   0
#define   EL_NXT_PORT_S2   1
#define   EL_NXT_PORT_S3   2
#define   EL_NXT_PORT_S4   3
#define   OPENEL_MAJOR   0
#define   OPENEL_MINOR   1
#define   OPENEL_VERSION   "OpenEL 0.1.1"
```

■ Typedefs

```
typedef signed char          ELChar
typedef unsigned char        ELUChar
typedef signed char          ELInt8
typedef signed short         ELInt16
typedef signed int           ELInt32
typedef signed long long     ELInt64
typedef unsigned char        ELUInt8
typedef unsigned short       ELUInt16
typedef unsigned int         ELUInt32
typedef unsigned long long   ELUInt64
typedef float                ELFloat32
typedef double               ELFloat64
typedef unsigned char        ELBool
```


OpenEL API Version 0.1.1

■ Functions for Motors

```
ELFloat64  elMotorGetAngle (ELUInt32 portid)
ELFloat64  elMotorSetAngle (ELUInt32 portid, ELFloat64 angle, ELInt32 speed)
void       elMotorResetEncoder (ELUInt32 portid)
ELInt32    elMotorGetSpeed (ELUInt32 portid)
void       elMotorSetSpeed (ELUInt32 portid, ELInt32 speed)
ELBool     elMotorGetBrake (ELUInt32 portid)
void       elMotorSetBrake (ELUInt32 portid, ELBool brake)
```

■ Functions for Sensors

```
ELUInt16  elGyroSensorGetValue (ELUInt32 portid)
ELUInt16  elGyroSensorGetOffset (ELUInt32 portid)
void      elGyroSensorSetOffset (ELUInt32 portid, ELUInt16 offset)
ELUInt16  elLightSensorGetValue (ELUInt32 portid)
ELBool    elLightSensorGetLED (ELUInt32 portid)
void      elLightSensorSetLED (ELUInt32 portid, ELBool light)
ELBool    elTouchSensorGetState (ELUInt32 portid)
ELUInt16  elBatteryGetVoltage (void)
ELBool    elSpeakerOutput (ELUInt32 freq, ELUInt32 ms, ELUInt32 vol)
void      elSonarSensorInitialize (ELUInt32 portid)
void      elSonarSensorTerminate (ELUInt32 portid)
ELInt32   elSonarSensorGetValue (ELUInt32 portid)
```

OpenEL API Version 0.1.1

■ Functions for Bluetooth

```
void      elBluetoothInitializeMaster (const ELUChar *addr, const char *pin)
void      elBluetoothInitializeSlave (const char *pin)
void      elBluetoothTerminate (void)
ELUInt32 elBluetoothSendData (const void *buf, ELUInt32 offset, ELUInt32 len)
ELUInt32 elBluetoothReceiveData (void *buf, ELUInt32 offset, ELUInt32 len)
ELBool    elBluetoothGetDeviceName (char *name)
ELBool    elBluetoothSetDeviceName (const char *name)
ELInt32   elBluetoothGetStatus (void)
ELInt16   elBluetoothGetSignalStrength (void)
```


Title : Proposal for establishment of Hardware Abstraction Layer WG

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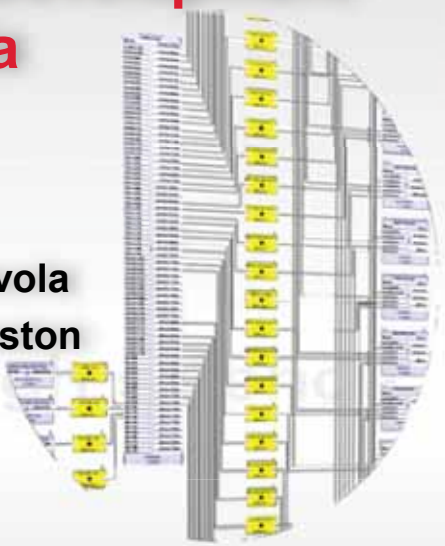
FAX : +81-3-5821-0444
URL : http://www.jasa.or.jp/top/en/index.html

Experience with Component Based Development at Honda



Antonello Ceravola

March 2013 - Reston

Outlook

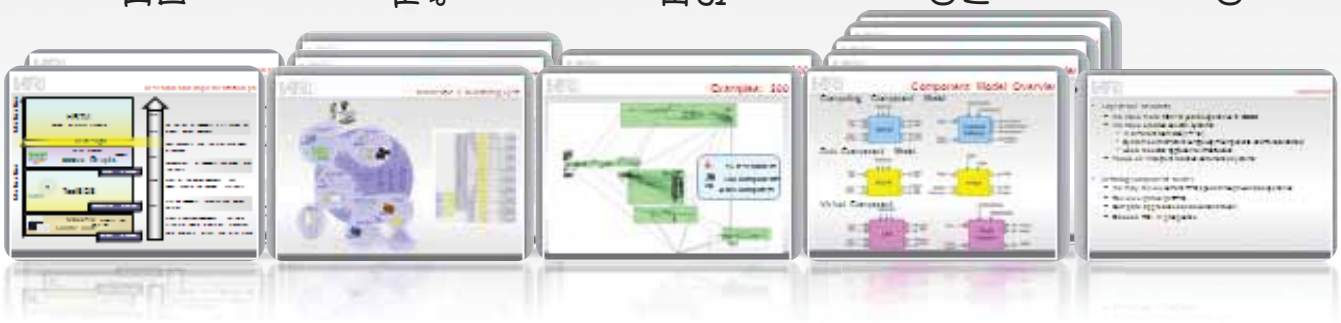
Infrastructure Development

Functions & Workflow

Example of Systems

Component Models

Conclusions



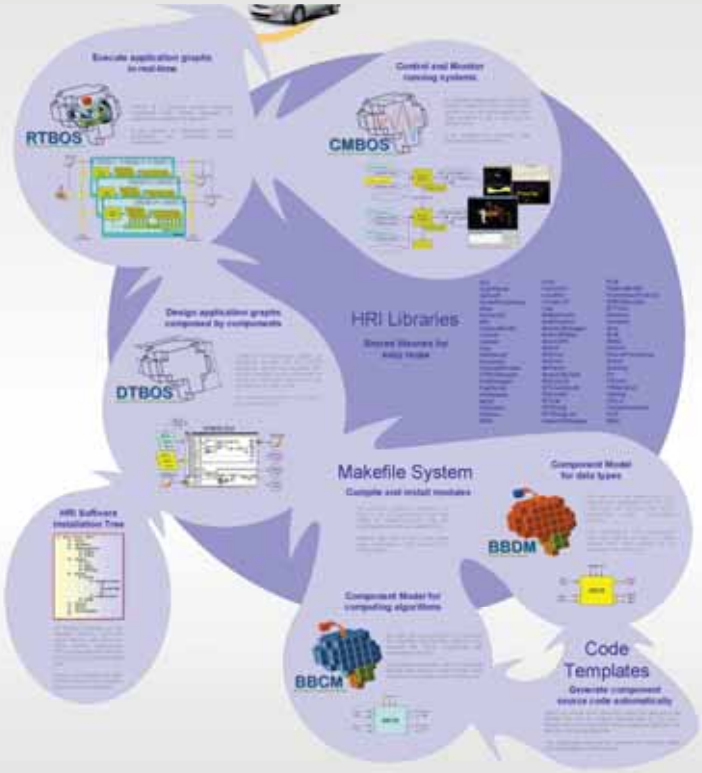
Infrastructure Research and Development Process

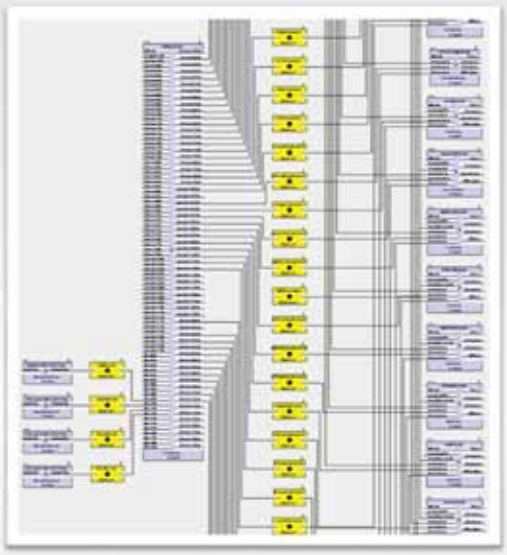
Consideration on R&D Process

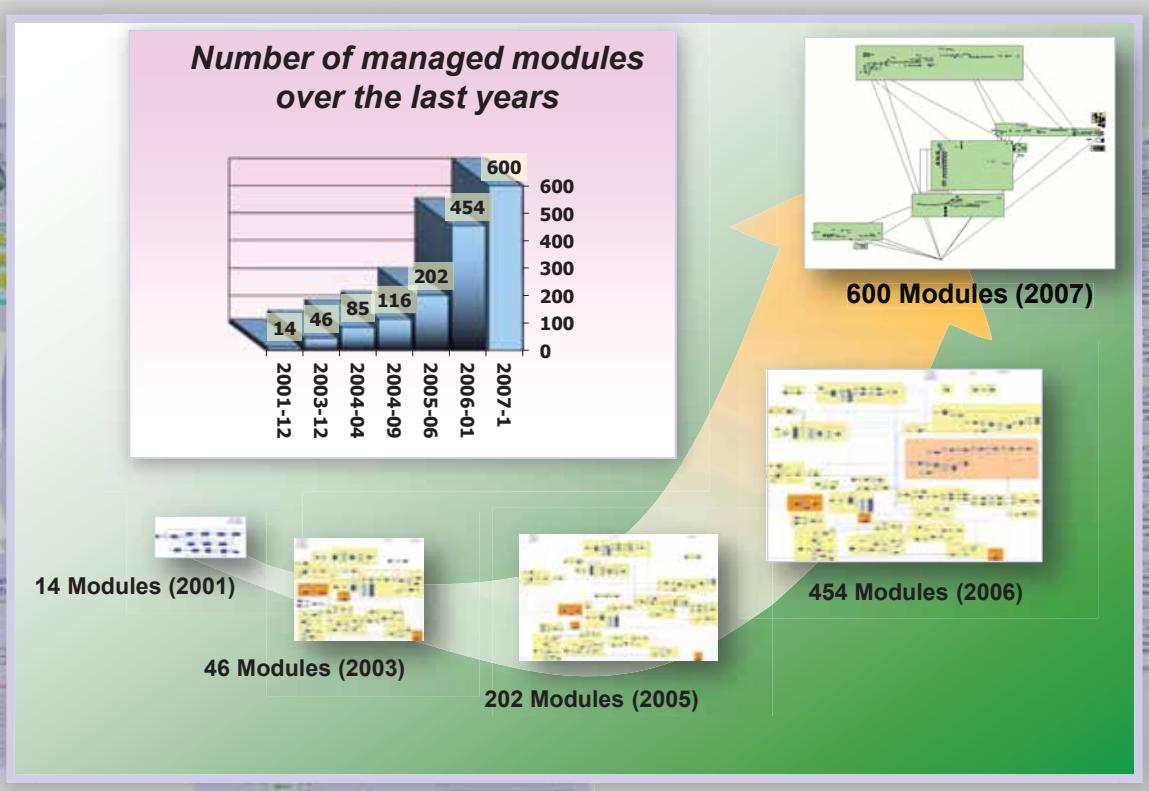
- Following a Bottom-Up approach:
  - \+ Main focus on simplicity and performance
  - \+ Consider user interaction at every abstraction level
  - ○ Important to keep systematic approach between levels
  - – Overload of functionality for users
  - – More complex integration between levels

Infrastructure Overview & Workflow

ToolBOS Software Infrastructure

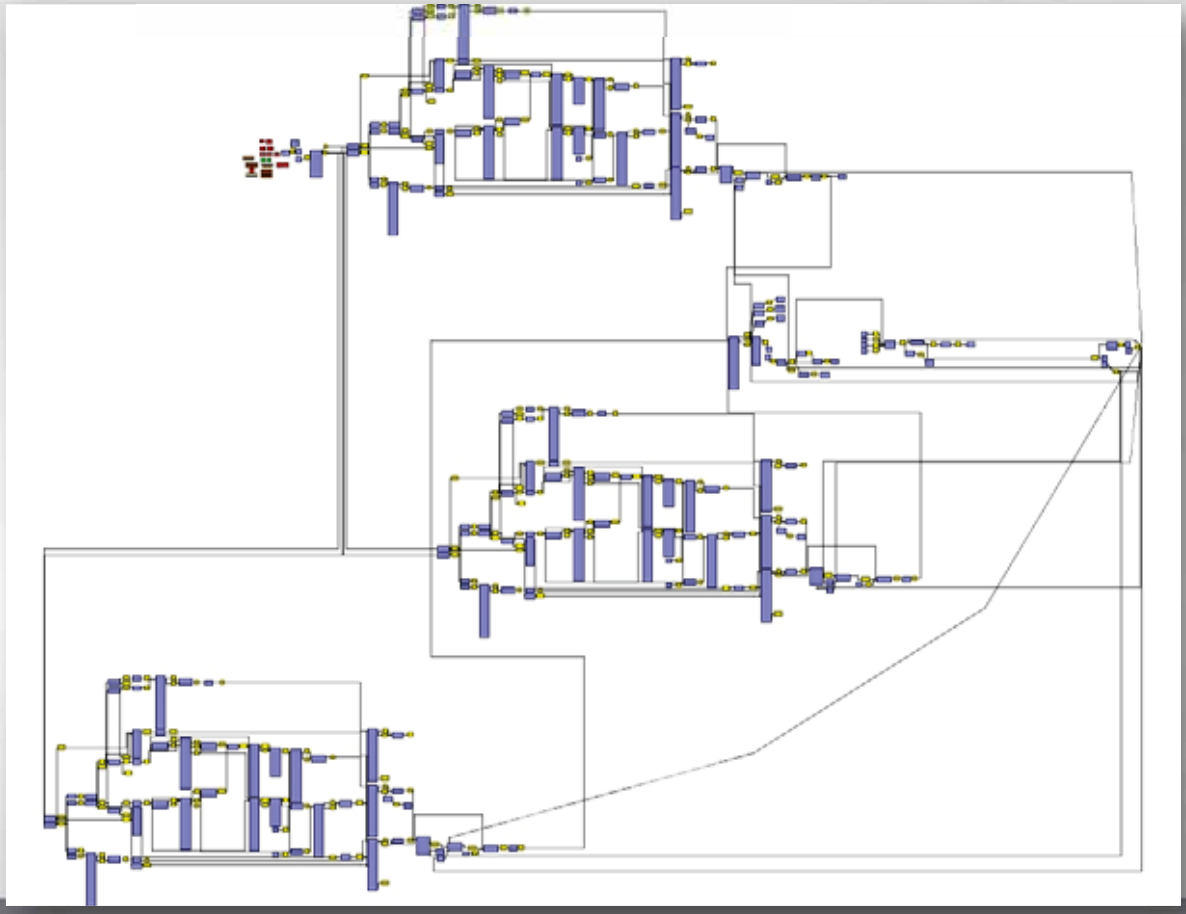






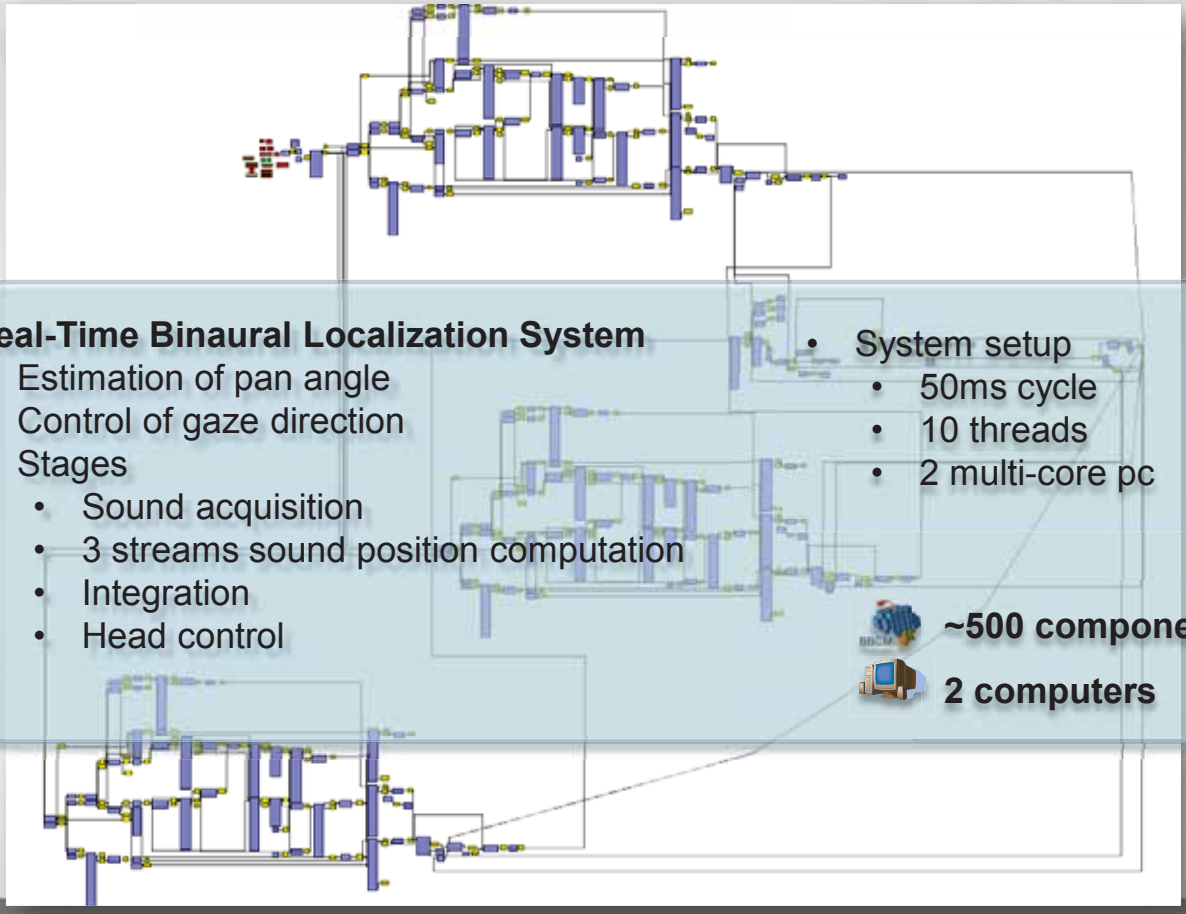
Systems Example

Examples: CASA - 2004



HRI

Examples: CASA - 2004



Real-Time Binaural Localization System

- Estimation of pan angle
- Control of gaze direction
- Stages
  - Sound acquisition
  - 3 streams sound position computation
  - Integration
  - Head control

- System setup
  - 50ms cycle
  - 10 threads
  - 2 multi-core pc

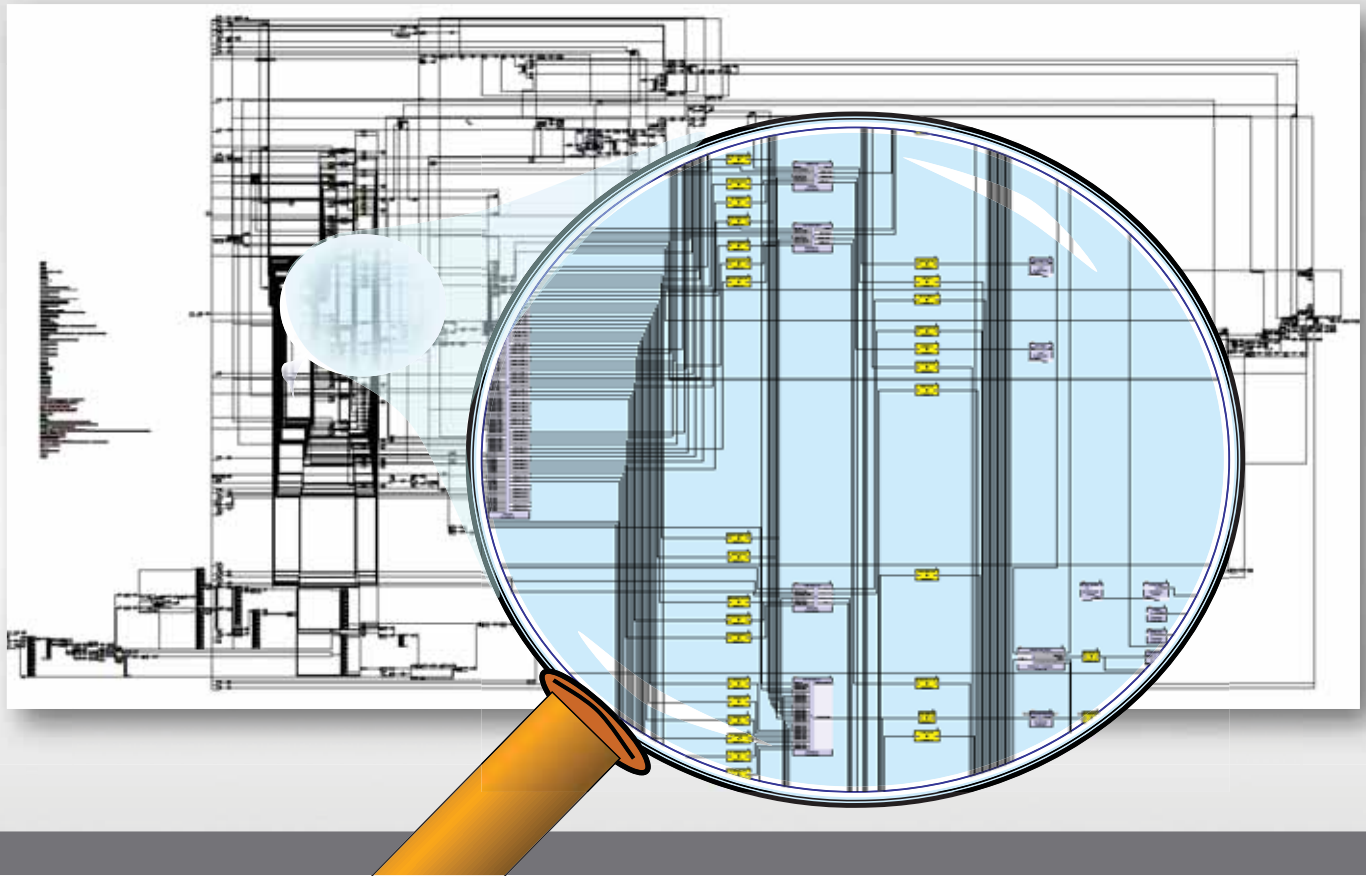
~500 components

2 computers

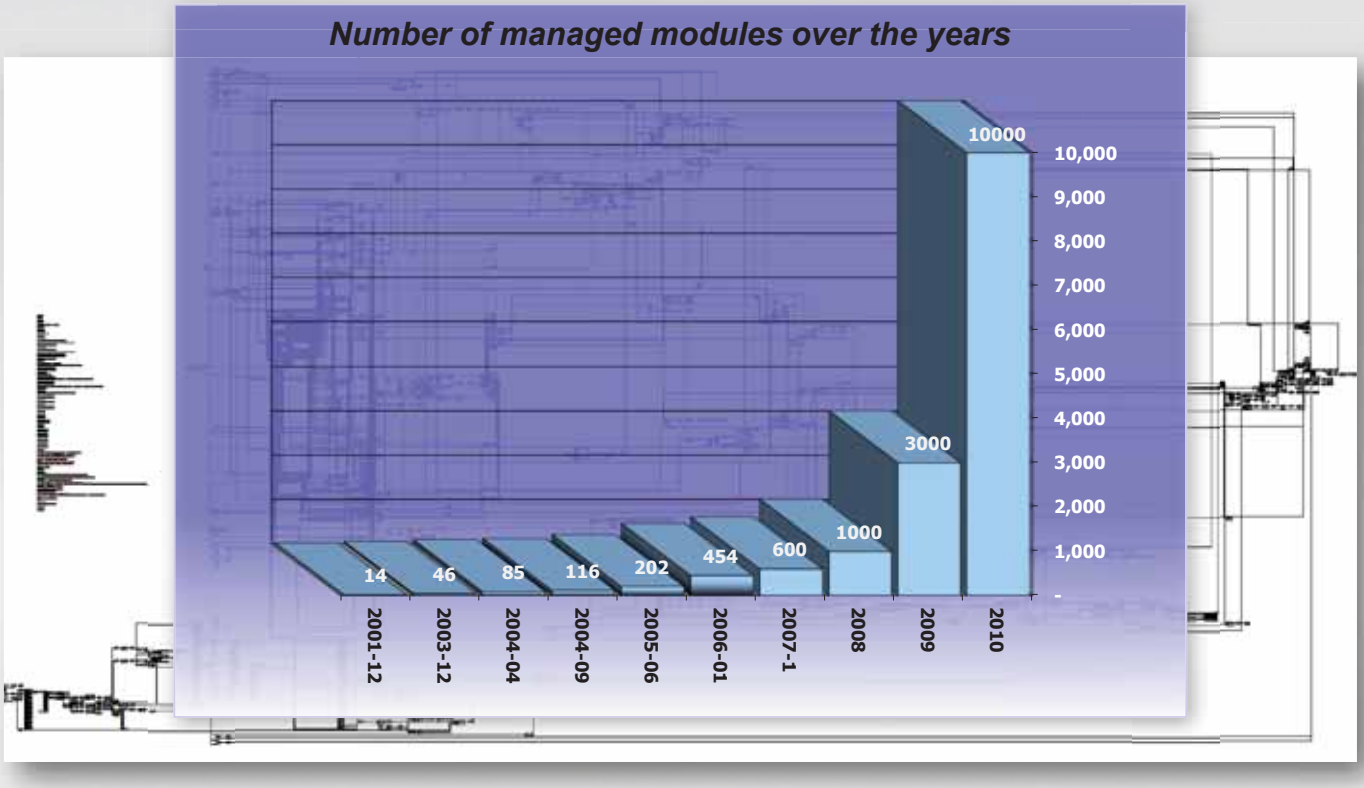
Examples: 2007

HRI

Examples: 2007



Examples

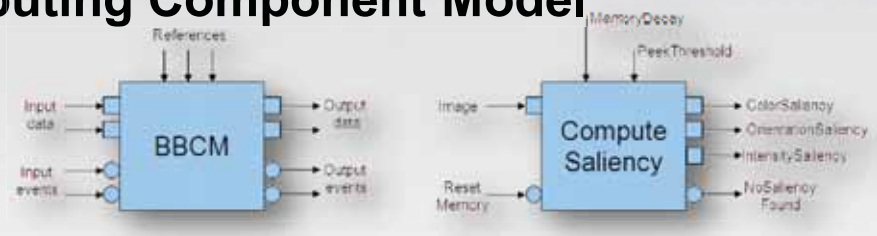


Consideration on Systems Creation

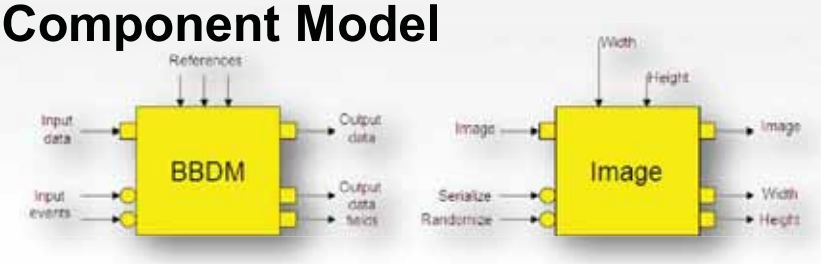
- Defined minimum set of rules for component creation
- Clear component publishing/reuse process
- Handle component/library/system versioning from beginning
  - Allow us to execute any version of any system any time
  - Forced to introduce porting process to new systems
- Considerable investment in data type definition
- Issue of component granularity
- Crucial factors for reusability:
  - Component documentation
  - Good base of general purpose components
  - Customizable components (setup parameters)
  - Non technical factors as well

Component Model

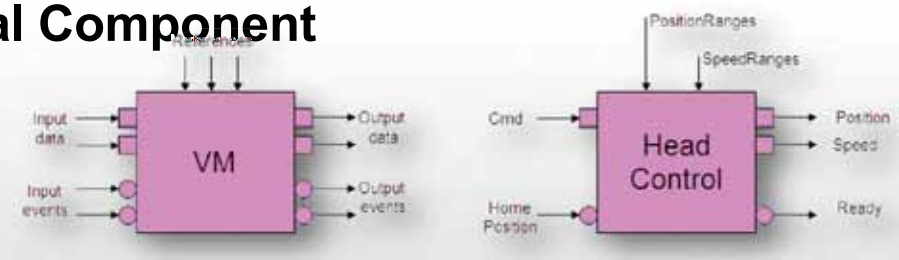
Computing Component Model



Data Component Model

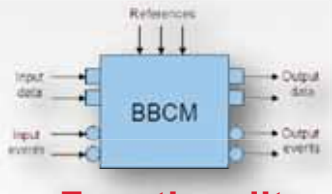


Virtual Component

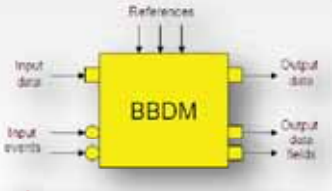


Consideration on the 3 Models

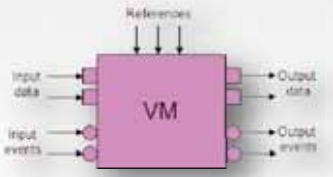
- **In any computational system, 3 issues occurs:**
  - How functionality are defined?
  - How exchanged data is defined?
  - How to manage system growth?



Functionality



Communication

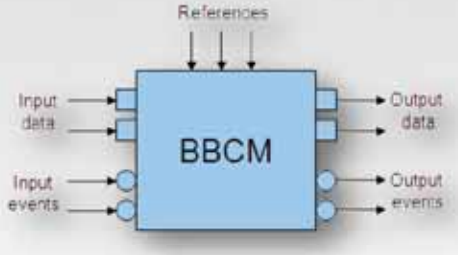


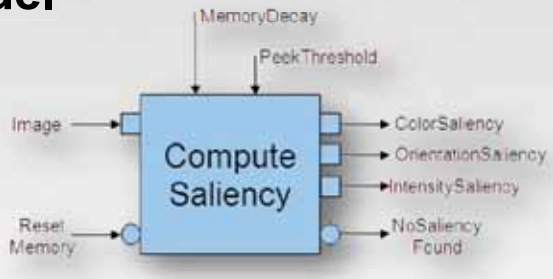
Scalability

- **Relations to be considered:**
  - BBCMs communicate with each other through data (BBDM)
  - Data modules may require common setting/properties
  - In larger systems some functionalities needs abstractions
    - How these abstractions encapsulate the context?

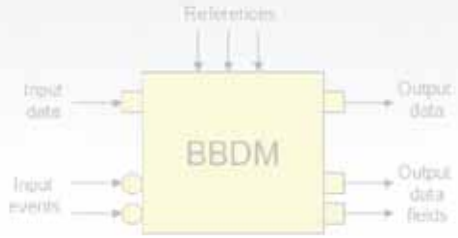
Component Model Overview

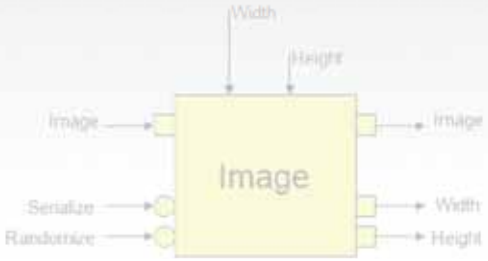
Computing Component Model



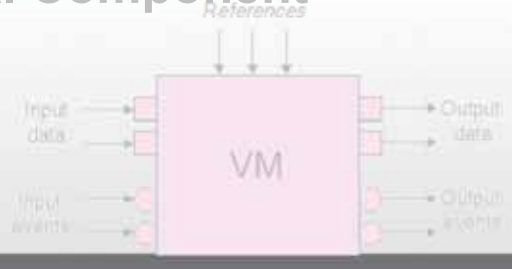


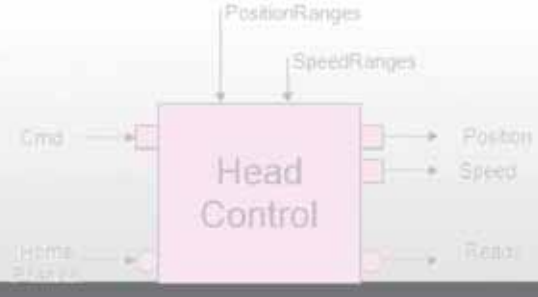
Data Component Model



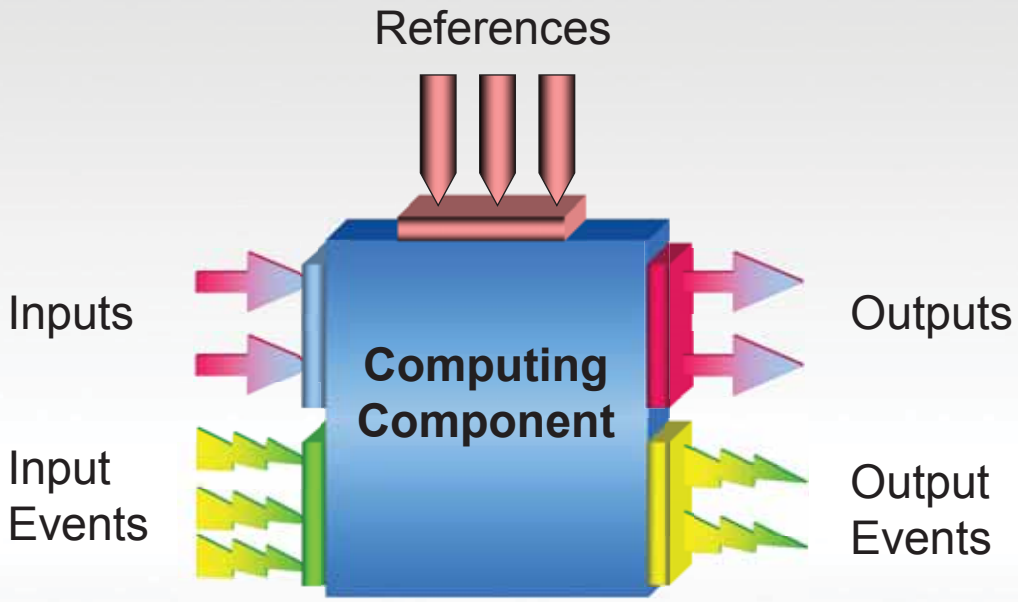


Virtual Component



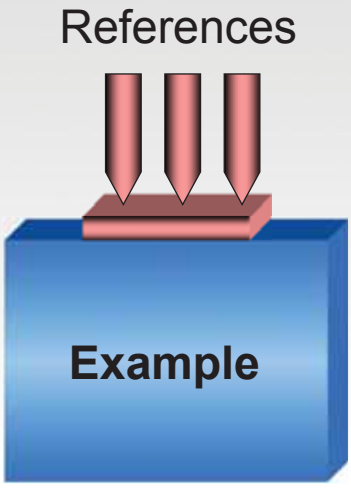


The BBCM Interface



Defining "References"

References:
start-up values for customizing component instances



Definition:

Example_**init**(Example *self, int **integrationTime**) {…}

Example_**initFromString**(Example *self, char *initString) {…}

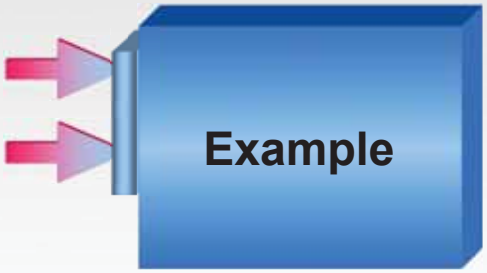
Example_**setup**(Example *self) {…}

Usage:

```
Example *e = (Example*)NULL;
e = Example_new();
Example_initFromString( e, "integrationTime = 25" );
Example_setup( e );
```

Defining “Input Data”

Input Data:
dynamic signals that go to the component carrying a data value



Definition:

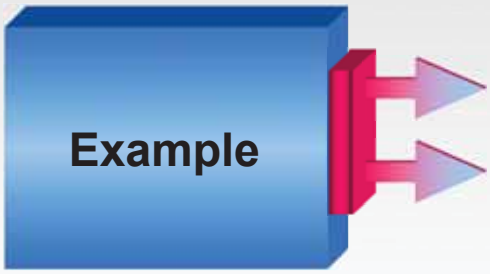
```
Example_inImage( Example *self, Block2D *image )  {…}

Example_doImage( Example *self )  {…}
```

Usage:

```
Image *b = (Image*)NULL;
…
Example_inImage( e, b );
…
for ( idx = 0; idx < MyImage_lenght; idx++ )
{
  Block2D_loadImageFromFile( b, MyImage[ idx ] );
  Example_doImage( e );
}
```

Defining “Output Data”

Output Data:
dynamic signals that come from the component carrying a data value



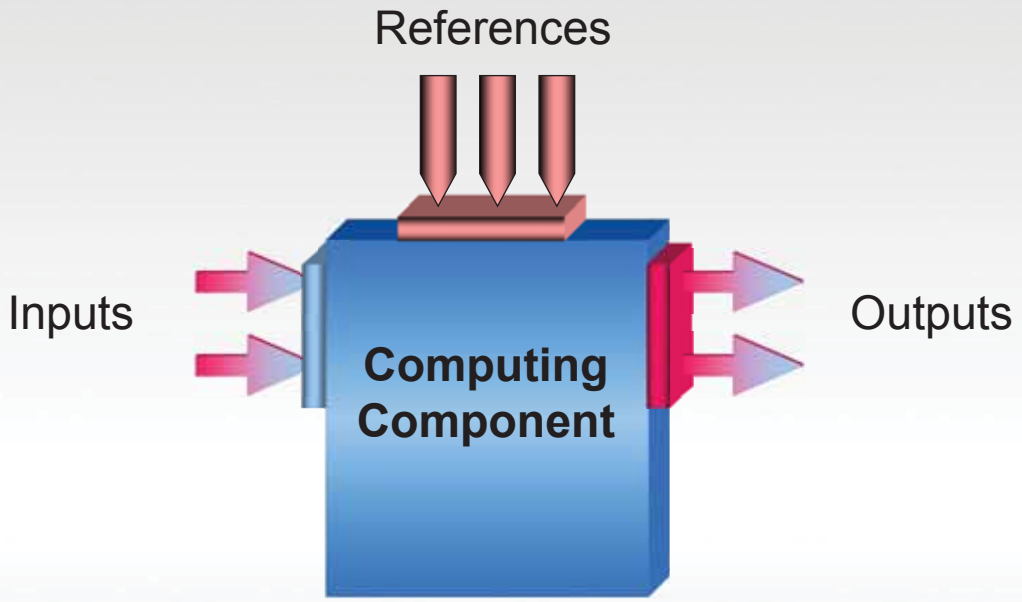
Definition:

```
Example_outAverageLuminancel( Example *self,
                              int* averageLuminance )  {…}

Example_onAverageLuminance( Example *self,
                            void (*function)( void* ),
                            void *functionParam )       {…}
```

Usage:

```
int avgLuminance = 0;
Example_outAverageLuminance( e, &avgLuminance );
Example_onAverageLuminance ( e, MyProgram_displayLuminance, self );
…
MyProgram_displayLuminance( MyProgram *self )
{
  sprintf( self->msg, “Average Lux: %d”, avgLuminance );
  MyProgram_drawText( self, 100, 25, self->msg );
}
```

The BBCM Interface

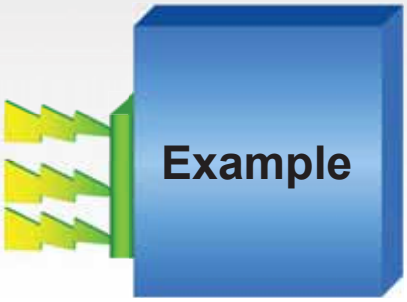


Defining "Input Events"

Input Event:
dynamic signals that go to the component

Definition:

Example_do**ResetAverage**(Example *self) {…}



Usage:

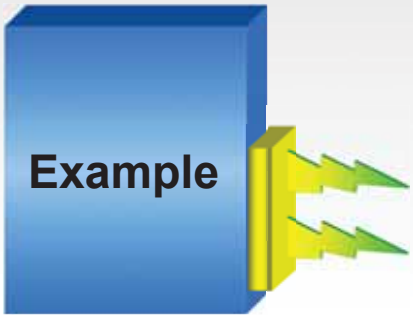
…
Example_doResetAverage(e);
…

Defining "Output Events"

Output Events:
dynamic signals that come from the component

Definition:

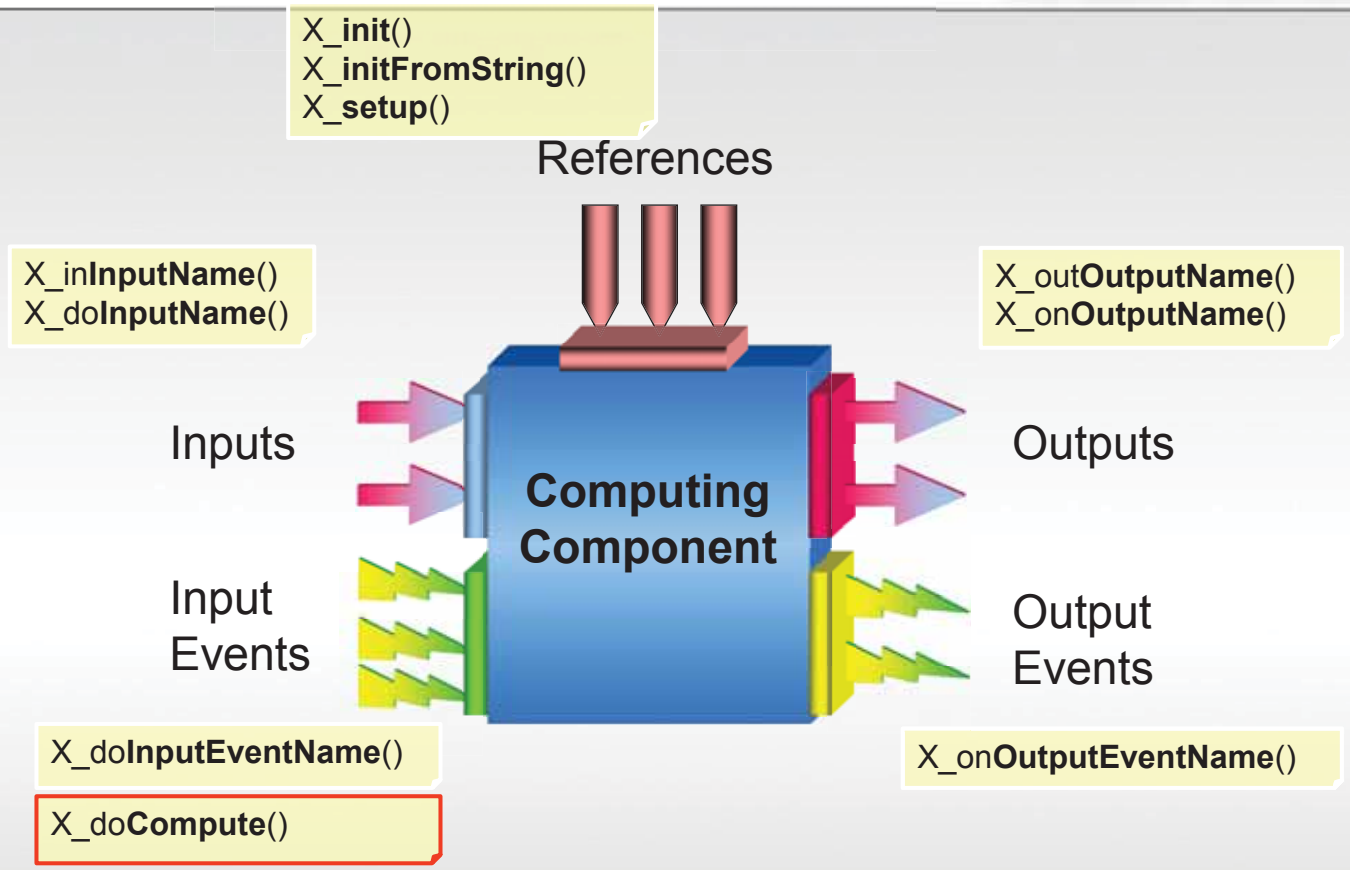
```
Example_onBlackImage( Example *self,
                      void (*function)( void* ),
                      void *functionParam )      {…}
```



Usage:

```
…
Example_onBlackImage( e, MyProgram_skipComputation, self );
…
MyProgram_skipComputation( MyProgram *self )
{
  self->skipComputation = true:
  …
}
```

The BBCM Interface



Full Component Model Interface

```
X_init( … )                          // References
X_initFromString( char* )            // References
X_setup ( *self )                    // References

X_inInputName( *self, *in )          // Input data Pointer
X_doInputName( *self )               // Input Event

X_outOutputName( *self, *out )       // Output data pointer
X_onOutputName( *self, … )           // Output Event

X_doInputEventName( *self )          // Input Event
X_doCompute( *self )                 // “Compute Event”

X_onOutputEventName( *self, …)       // Output Event
```

The BBCM Interface

Given our experience we could consider to simplify to:

```
X_init()                             // References
X_initFromString( char* )            // References
X_setup ( *self )                    // References

X_inInputName( *self, *in )          // Input data Pointer
X_doInputName( *self )               // Input Event

X_outOutputName( *self, *out )       // Output data pointer
X_onOutputName( *self, … )           // Output Event

X_doInputEventName( *self )          // Input Event
X_doCompute( *self )                 // “Compute Event”

X_onOutputEventName( *self, …)       // Output Event
```

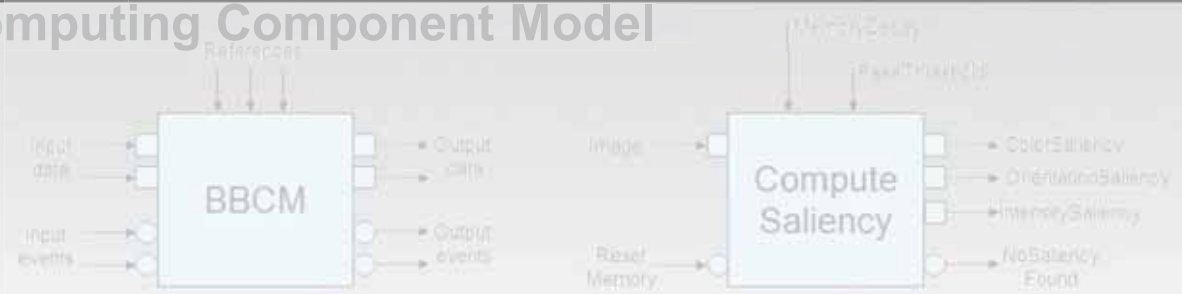
Given our experience we could consider to simplify to:

```
X_initFromString( char* )          // References
X_setup()                          // References

X_inInputName( *self, *in )        // Input data Pointer

X_outOutputName( *self, *out )     // Output data pointer

X_doInputEventName( *self )        // Input Event
X_doCompute( *self )               // "Compute Event"

X_onOutputEventName( *self, …)     // Output Event
```

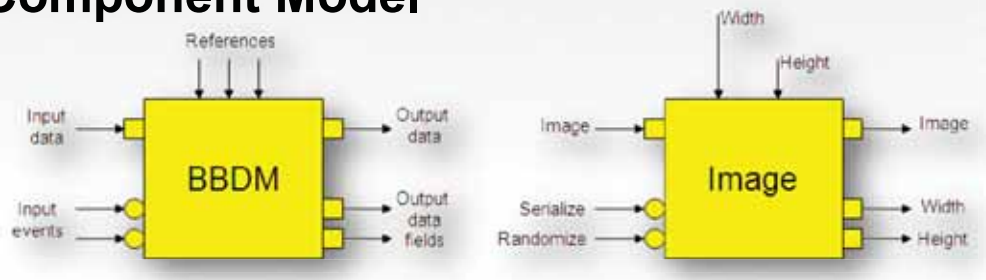

- **Why a simpler Component Interface?**
  - Middleware become simpler
  - Easier porting components to other systems/middleware
  - Component creation focused on few elements
  - Higher scalability on different component granularity
  - Components more compatible with each other
  - …

- **Question to ask while designing a component model**
  - What is the smallest function a component may implement?
  - What is the biggest function a component may implement?
  - What CBSE matters to my development process?
  - How many components a system may be composed of?
    - Is a 5 component system good?
    - 100? 1.000? 10.000? 100.000 → **WHY?**

Computing Component Model



Data Component Model



Virtual Component

References

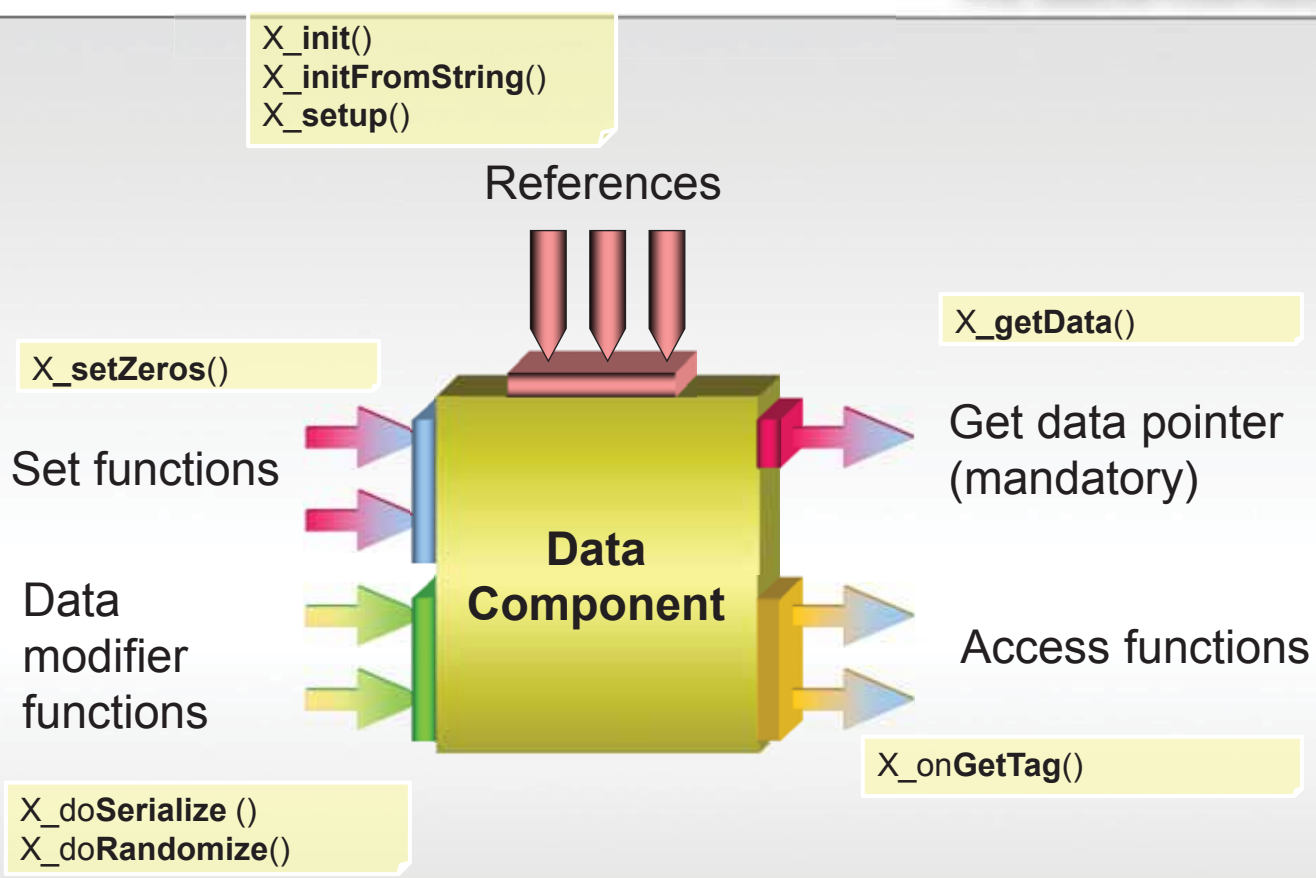
Set functions

Data modifier functions

Data Component

Get data pointer (mandatory)

Access functions



Full Component Model Interface

```
X_init( … )                    // References
X_initFromString( char* )      // References
X_setup()                      // References

X_getData( *self )             // Input/Output data

X_doSerialize( *self )         // Input Event
X_doRandomize( *self )         // Input Event

X_getTag( *self )              // Access Functions
```

Given our experience we could consider to simplify to:

```
X_init( ... )                  // References
X_initFromString( char* )      // References
X_setup()                      // References

X_getData( *self )             // Input/Output data

X_doSerialize( *self )         // Input Event
X_doRandomize( *self )         // Input Event

X_getTag( *self )              // Access Functions
```

The BBDM Interface

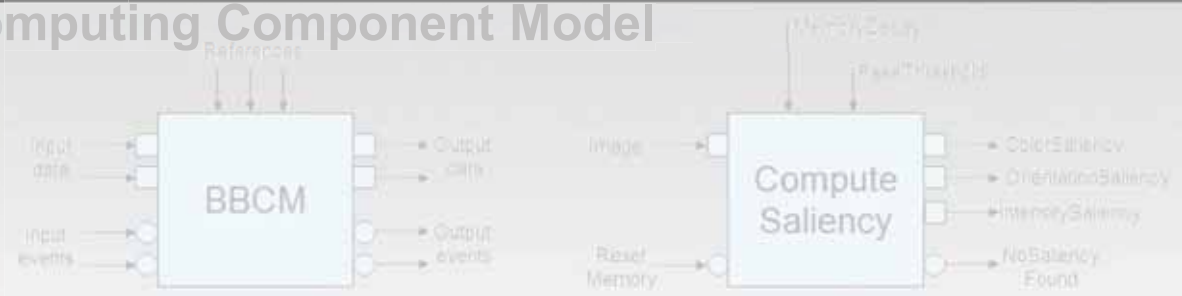
Given our experience we could consider to simplify to:

```
X_initFromString( char* )      // References

X_getData( *self )             // Input/Output data

X_doSerialize( *self )         // Input Event
X_doRandomize( *self )         // Input Event

X_getTag( *self )              // Access Functions
```

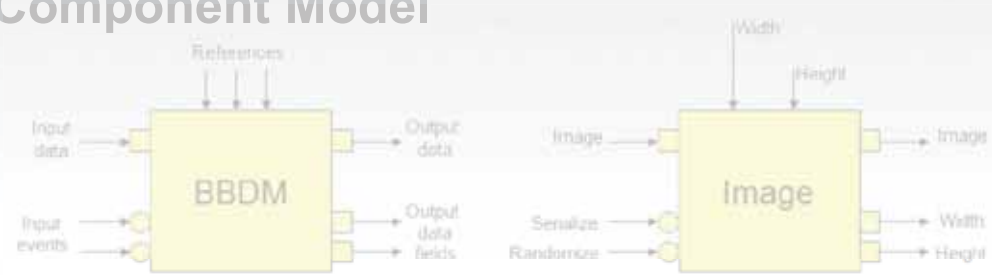
- **Why defining Data Component?**
  - Computing component interface signature is only one part of the interface
  - Data definition plays a crucial role in making components compatible
  - In big systems, data initialization easily require shared properties
  - Standardizing data imply:
    - Easy handling of network communication (e.g. endianess)
    - Easier to tap into data and to check value
    - Higher reuse within/among systems → higher compatibility
    - …

- **Handling data modules in our experience:**
  - Semantic-less data are better:
    - from **ArmSpeed** to **Float**
  - We started with about 30 different data types and finally reached 5
  - Standard serialization/deserialization functions
  - But, difficult to get the best visualization to display data

Computing Component Model

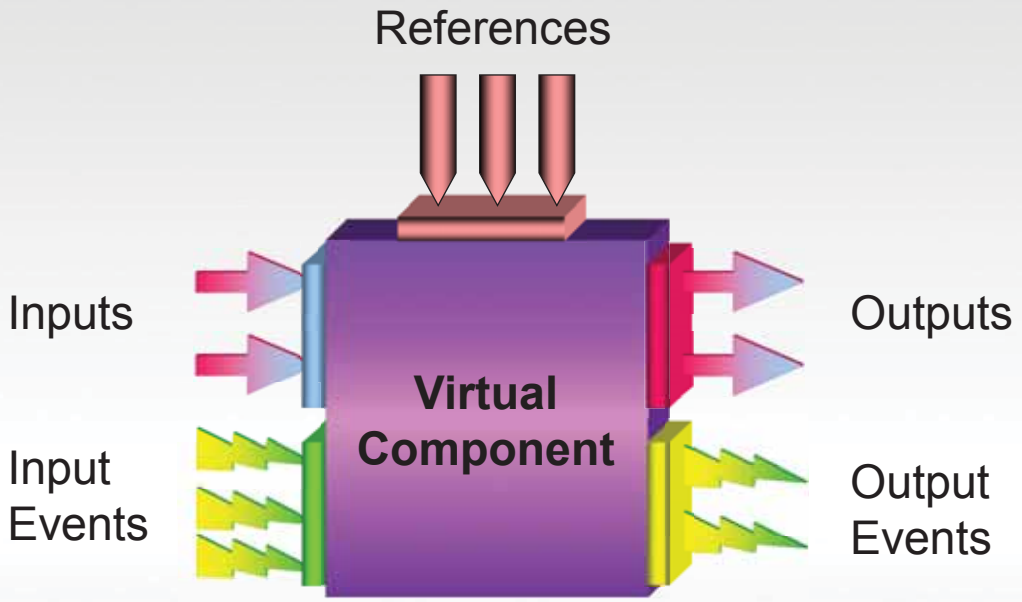


Data Component Model

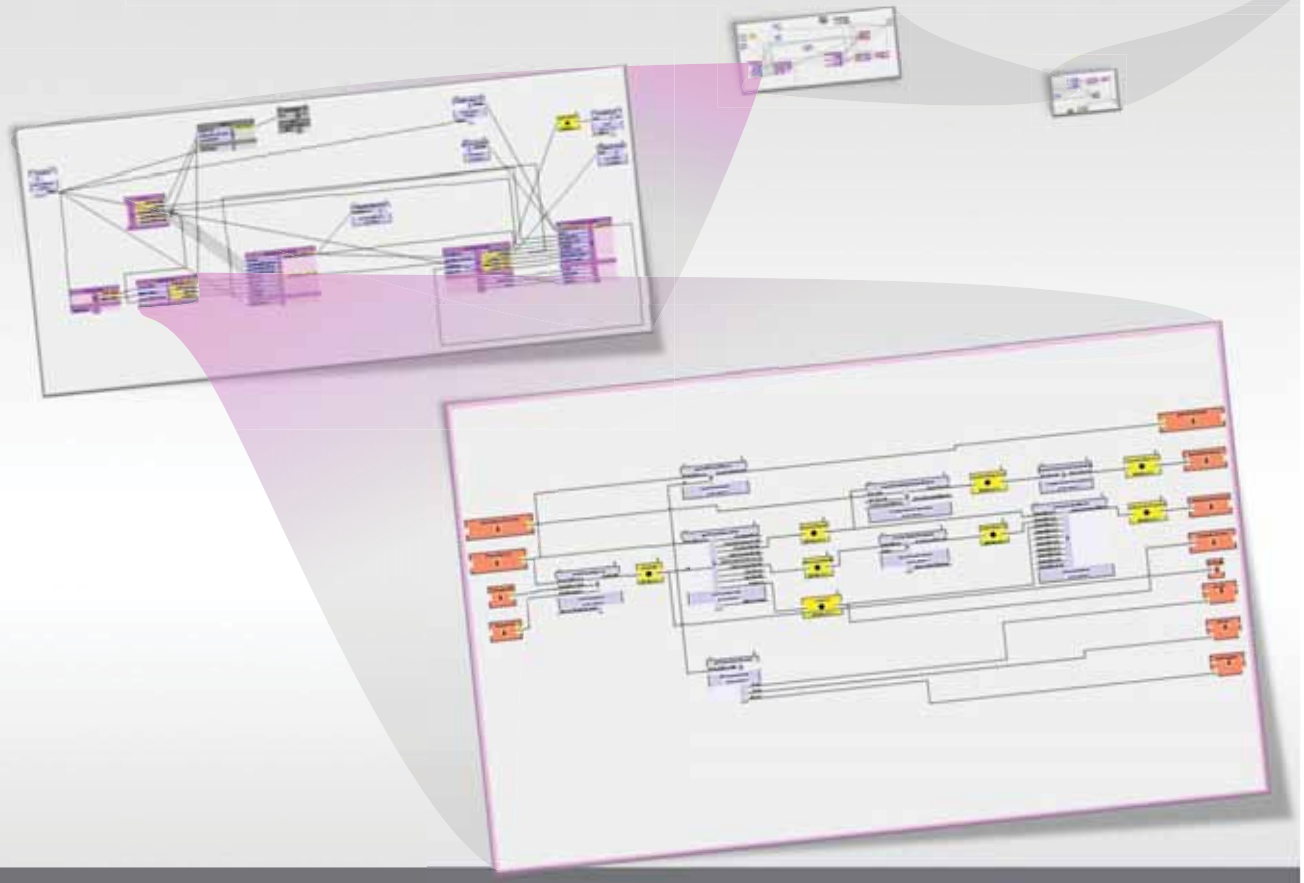


Virtual Component

The BBVM Interface



Hierarchical Systems



Consideration on Virtual Modules

- **Main characteristics to consider:**
  - Simple representation (file, memory, …)
  - Flattering virtual modules at middleware level maybe not the best solution
  - Threading & process allocation not trivial to be handled
  - Should VM have a standard interface?
    - Is VM input always connected to data component or to computing components?
    - Should not VM be simply used for grouping portion of graphs?
    - How reusable VM should be? How specific?
    - …
- **Our experience with Virtual Modules:**
  - Nice to structure systems in hierarchical form
  - VM easily hide a level of complexity which should be shown
    - Easy to loose track on overall system complexity
  - VM are not the final target, other paradigm should be researched

HRI

Conclusions

Conclusions

- **Experience at Honda**
  - We spent more than 10 years on CBSE
  - We have created several systems:
    - In different team size (1 – 15)
    - About 30 different systems per year (with high reusability)
    - Systems with different complexity (#components and #functionalities)
    - Used research approach to infrastructure
  - Focus on intelligent robotics/automotive systems

- **Defining Component Model**
  - We may review current RTC specs through Honda experience
  - LightweightRTC, can we make it lighter?
  - Compare approaches and solutions taken
  - Discuss ROI, in perspective to future

Thank You

Infrastructure WG Progress Report (Reston meeting)

Infra. WG, Robotics DTF
Makoto Sekiya, Honda R&D
Noriaki Ando, AIST
robotics/2013-03-08

Overview

- Infrastructure WG meeting on Monday
- New RFP: FSM4RTC(robotics/13-02-01) reviewed
  - Modifications
    - Objectives
    - Problem Statement
    - Scope of Proposals
    - Mandatory Requirements
    - Optional Requirements
    - Issues to be discussed
    - Evaluation Criteria
    - Glossary
- 1st review in Robotics RTF plenary

Robotic Functional Service WG
WG Report

WG Co-Chair: Toshio Hori
2013/03/19

robotics/2013-03-09

WG activities before this meeting

- Specification of Robotic Interaction Service (RoIS) Framework Ver.1.0 was published and open to public on the OMG Web server (Feb. 19th, 2013)
  - http://www.omg.org/spec/RoIS/

WG activities during this meeting

- No activity is held in this meeting

robotics/2013-03-09

Schedule hereafter

- RoIS RTF may be chartered and proposed in the OMG Berlin meeting (June, 2013).
  - Expected members (tentative): Hori (AIST, Chair), Kamei (ATR, Chair), Doi (Univ. of Tokyo), Tsubouchi (Univ. of Tsukuba), Sakamoto (Shibaura Inst. of Tech.)
- Seeks new topics related to robotic services ☺

Contact Report: ISO/TC184/SC2 Activity

Tetsuo KOTOKU
AIST, Japan

Santa Clara WG Meeting

WG8/SG Modularity (Mon, Jan. 28, 2013)

21 participants (Korea:7, China:5, Germany:3, Japan:2, Netherland:1, Sweeden:1, UK:1, USA:1)

Plan to setup new WG (China)

3 area discussion task force

- Software Interface ⇐ OMG
- Electrical Interface
- Mechanical Interface

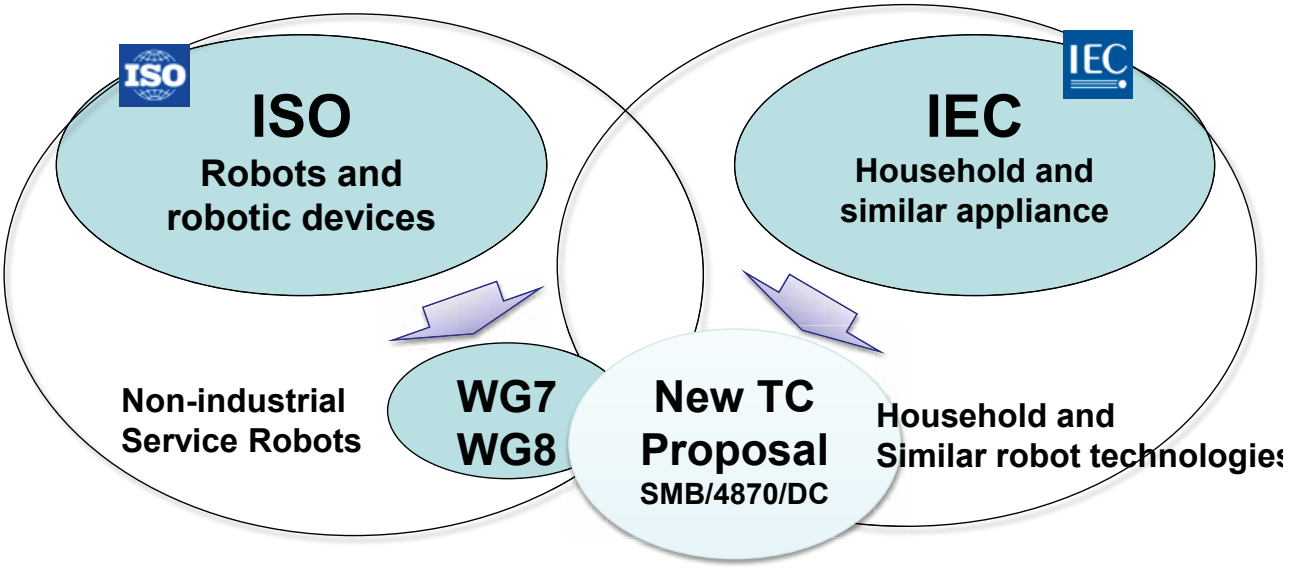
report back by Bristol WG meeting in June 2013

ISO/TC184/SC2 Schedule

- 2013 May Karlsruhe, Germany
  ISO Workshop during ICRA
- 2013 June Bristol, UK WG Meeting
- 2013 Oct. Beijing, CN WG Meeting and
  SC2 Plenary
- 2014 Jan./Feb. Spain WG Meeting

IEC/SMB/AHG47

Household and similar robot technologies



report back by SMB meeting 147 in June 2013

Robotics-DTF Plenary Meeting
Wrap-up Session

December 19, 2013

Reston, VA, USA

Hyatt Regency Reston

Document Number

robotics/2013-02-01 Finite State Machine Component for Robotics Technology Components (FSM4RTC) DRAFT RFP (Makoto Sekiya)

robotics/2013-03-01 Final Agenda (Tetsuo Kotoku)
robotics/2013-03-02 Burlingame Meeting Minutes [approved] (Takashi Suehiro and Seung-woog Jung)
robotics/2013-03-03 Opening Presentation (Tetsuo Kotoku)
robotics/2013-03-04 1st Draft of Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP (Makoto Sekiya)
robotics/2013-03-05 Updated Draft of Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP (Makoto Sekiya)
robotics/2013-03-06 Proposal for establishment of "Hardware Abstraction Layer WG" (Kenichi Nakamura)
robotics/2013-03-07 Experience with Component Based Development at Honda (Antonello Ceravola)
robotics/2013-03-08 Infrastructure WG Progress Report (Reston meeting) (Makoto Sekiya)

Document Number (cont.)

robotics/2013-03-09 Robotic Functional Service WG Report (Toshio Hori)
robotics/2013-03-10 Contact report: ISO/TC184/SC2 (Tetsuo Kotoku)
robotics/2013-03-11 Wrap-up Presentation (Tetsuo Kotoku)
robotics/2013-03-12 Roadmap for Robotics Activities (Tetsuo Kotoku)
robotics/2013-03-13 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)
robotics/2013-03-14 MARS Presentation of Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP [mars/2013-03-23] (Makoto Sekiya)
robotics/2013-03-15 DTC Report Presentation (Tetsuo Kotoku)
robotics/2013-03-16 Reston Meeting Minutes - DRAFT (Toshio Hori)

Organization (from March 19th, 2012)

Robotics-DTF
- Tetsuo Kotoku (AIST, Japan)
- Young-Jo Cho (ETRI, Korea)

Publicity Committee
- Abheek Bose (ADA Software, India)

Contacts Committee
- Makoto Mizukawa (Shibaura-IT, Japan)
- Young-Jo Cho (ETRI, Korea)
- Yun Koo Chung (ETRI, Korea)

Information Day 2013 Organizing Committee
- Antonello Ceravola (Honda-RI-EU, Germany)
- [Laurent Rioux (Thales, France)]

Technical WGs

Infrastructure WG
- Noriaki Ando（AIST, Japan)
- Beom Su Seo (ETRI, Korea)
- Makoto Sekiya (Honda, Japan)

Robotic Functional Services WG
- Su-Young *Chi* (ETRI, Korea)
- Koji Kamei (ATR, Japan)
- Toshio Hori (AIST, Japan)

Modelling for Robotics WG
- Takeshi Sakamoto (Technologic Arts)
- Toby McClean (Zeligsoft)

Hardware Abstraction Layer WG
- [Kenichi Nakamura (JASA, Japan)]

Call for volunteer

- Robotics-DTF Co-Chair

  => Postpone voting one more meeting

Next Meeting Agenda

June 17-21, 2013 (Berlin, Germany)

Monday:

FSM4RTM 2nd review and voting (am)
Component Information Day (pm)

Tuesday:

WG activity (am)
Robotics-DTF Plenary Meeting (pm)
- **Guest and Member Presentation**
- **Contact reports**

Wednesday:

WG activity follow-up

Thursday:

FSM4RTM 3rd review and voting (am)

Plenary Attendee (10 participants)

- Alexander Chelombitko (Infostroy)
- Alexander Lipanov (Infostroy)
- Antonello Ceravola (Honda-RI-EU)
- Geoffrey Biggs (AIST)
- Isashi Uchida (IPA)
- Kenichi Nakamura (JASA)
- Makoto Sekiya (Honda)
- Noriaki Ando (AIST)
- Tetsuo Kotoku (AIST)
- Toshio Hori (JARA/AIST)

Robotics Activities Roadmap

robotics/2013-03-12

Item	Status	Burlingame CA Dec-2012	Reston VA Mar-2013	Berlin Germany Jun-2013	New Bunswick Sep-2013	Santa Clara CA Dec-2013	POC / Comment
Flyer of Robotics-DTF [Publicity Sub-Committee]	**Suspended**						
Finite State Machine Component for Robotic Technology Components (FSM4RTC) RFP [Infrastructure WG]	**Planned**		Draft Review	RFP Issue		Initial Submission	Makoto Sekiya (Honda)
Data-Centric Port for Robotic Technology Components (DCP4RTC) RFP [Infrastructure WG]	**Suspended**						Makoto Sekiya (Honda)
Robotic Hardware Abstruction Layer RFI [Hardware Abstruction Layer WG]	**Planned**			Draft Review		RFI Issue	Kenichi Nakamura (JASA)
etc…	**Future**						
Robotics Exhibition	**Planned**	**Exhibition**		**Exhibition**			
Robotics Information Day [Technology Showcase]	**Planned**	**Info. Day**					Antonello Corevola (Honda-RI-EU)
Component Information Day [Technology Showcase]	**Planned**			**Info. Day**			Antonello Corevola (Honda-RI-EU)
DDC4RTC Finalization Task Force	**In Process**			**FTF Report**			Noriaki Ando (AIST)

Related Events

Chu-suk (Special Holidays in Korea)

Robotics Domain Task Force Preliminary Agenda ver.0.0.1 robotics/2013-03-13

OMG Technical Meeting - Berlin, Germany -- June 17-21, 2013

http://robotics.omg.org/

		TF/SIG				
		Host	Joint (Invited)	Agenda Item	Purpose	Room
Sunday: WG activites(pm)						
13:00	17:00			Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP Submitters' meeting	Arrangement	
Monday: Plannning Committee (pm)						
8:45	9:00	Robotics		Robotics-DTF Plenary Opening Session (minitues approval, minutes taker)	Robotics plenary openning	
9:00	10:00	Robotics		**Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP 2nd Review, Vote-to-Vote, and Voting**	2nd review and Vote to issue	
				Morning Break (30min)		
10:30	12:00			Hardware Abstruction Layer WG - Kenichi Nakamura (JASA)	RFI drafting	
12:00	13:00	**LUNCH**				
13:00	18:00			Architecture Board Plenary		
13:00	17:30	MARS	Robotics	**Compornet Information Day - Johnny Willemsen (Remedy-IT)**	Information Exchange	
Tuesday: WG activity and Robotics Plenary						
9:00	12:00			Infrastructure WG - Noriaki Ando(AIST), Makoto Sekiya(Honda), and Beom-Su Seo (ETRI)	RFP drafting	
12:00	13:00	**LUNCH**				
13:00	14:30			Infrastructure WG - Noriaki Ando, Makoto Sekiya, and Beom-Su Seo	RFP drafting	
				Afternoon Break (30min)		
15:00	15:45	Robotics		Guest Talk: (45min) - TBA	presentation and discussion	
15:45	16:30	Robotics		Guest Talk: (45min) - TBA	presentation and discussion	
16:30	17:00	Robotics		WG Reports and Discussion (Service WG, Infrastructure WG, Models in Robotics WG, Hadware Abstraction	presentation and discussion	
17:00	17:15	Robotics		Contact Reports - Makoto Mizukawa(Shibaura-IT), and Young-Jo Cho(ETRI)	Information Exchange	
17:15	17:30	Robotics		Robotics-DTF Plenary Wrap-up Session (**DTF Co-Chair Election**, Roadmap and Next meeting Agenda)	Robotics plenary closing	
17:30				Adjourn Information Day meeting		
Wednesday: WG activitiy						
9:00	12:00			Robotics WG activity follow-up	discussion	
12:00	14:00	**LUNCH and OMG Plenary**				
14:00	17:00			Robotics WG activity follow-up	discussion	
18:00	20:00	**OMG Reception**				
Thursday: WG activitiy						
10:00	10:30	Robotics		**Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP 3rd Review (tentative) - Makoto Sekiya**	Vote to Issue	
10:30	12:00			Robotics WG activity follow-up (tentative)	discussion	
12:00	13:00	**LUNCH**				
13:00	18:00			Architecture Board Plenary		
Friday						
8:30	12:00			AB, DTC, PTC		
12:00	13:00	**LUNCH**				
Other Meetings of Interest						
Monday						
8:00	8:45	OMG		New Attendee Orientation		
Tuesday						
7:30	9:00	OMG		Liaison ABSC		

Please get the up-to-date version from http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Finite State Machine for Robotic Technology Components (FSM4RTC)

Makoto Sekiya, Honda R&D Co., Ltd.
Noriaki Ando, AIST
mars/13-03-23

Motivation

- State machines are often used in robotic software
- UML statechart can reduce development cost and improve quality of robotic software
- We developed a GUI tool to generate code of state machines from UML statechart and incorporated it with RTC (demonstrated in the last Burlingame Robotics Information Day)
- We want to define interfaces and data model to manage FSM components and exchange/reuse structures of state machines.

Objectives

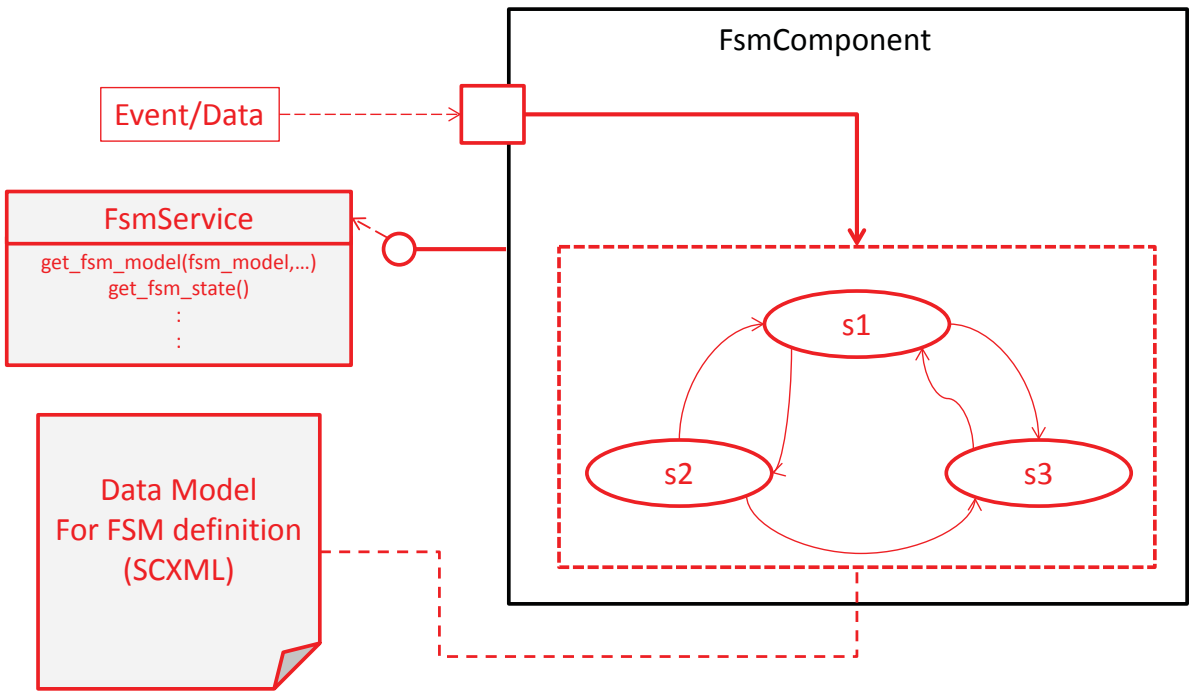
FSM4RTC specification shall provide:

- Ways to execute the logic of FSM components
- Ways to obtain the definition of the state machine in the FSM component.
- Ways to obtain the current state of the state machine from the FSM component.
- Ways to receive the notification of the state transition from the FSM component.
- Information of ports and connections, that is required for the communication between Robotic Technology Components.

For further details, please see:

robotics/2013-03-05 - Revised Finite State Machine Component for Robotics Technology Components (FSM4RTC) DRAFT RFP

Concepts



Any questions?

(Speak slowly, please)

Robotics-DTF

Date: Friday, March 22nd 2013
Reporter : Makoto Sekiya
URL: http://robotics.omg.org/
email: robotics@omg.org

➢Highlights from this Meeting:

– 1st Review of Finite State Machine Component for Robotic Technology Components (FSM4RTC) RFP
[robotics/2013-02-01] [robotics/2013-03-04,05] [mars/2013-03-23]

– Robotics Plenary: (10 participants)
  – 2 WG Report
    • Robotic Infrastructure WG [robotics/2013-03-08]
    • Robotic Functional Service WG [robotics/2013-03-09]
  – Joint Information Day 2013 in Berlin
    Component Information Day on Monday

Robotics-DTF

Date: Friday, March 22nd 2013
Reporter : Makoto Sekiya
URL: http://robotics.omg.org/
email: robotics@omg.org

➢Deliverables from this Meeting:

– Nothing Special

➢ Future deliverables (In-Process):

– Finite State Machine Component for Robotic Technology Components (FSM4RTC) RFP
– Hardware Abstraction Layer (HAL) RFI

➢ Next Meeting (in Berlin, Germany):

– 2nd Review of FSM4RTC RFP and voting
– Component Information Day
– Exhibitions related to RTC, RLS, RoIS, FSM4RTC

Minutes of the Robotics Domain Task Force Meeting – DRAFT -
December 10-14, 2013
Reston, VA, USA
(robotics/2013-03-16)

Meeting Highlights

- **1st Review of Finite State Machine Component for Robotic Technology Components (FSM4RTC) RFP.**
- **Hardware Abstraction Layer WG was established. Kenichi Nakamura (JASA) was elected as the WG chair.**
- **We will join to the Component Information Day 2013 in Berlin collaborated with MARS-PTF.**

List of Generated Documents

robotics/2013-03-01 Final Agenda (Tetsuo Kotoku)
robotics/2013-03-02 Burlingame Meeting Minutes [approved] (Takashi Suehiro and Seung-woog Jung)
robotics/2013-03-03 Opening Presentation (Tetsuo Kotoku)
robotics/2013-03-04 1st Draft of Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP (Makoto Sekiya)
robotics/2013-03-05 Updated Draft of Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP (Makoto Sekiya)
robotics/2013-03-06 Proposal for establishment of "Hardware Abstraction Layer WG" (Kenichi Nakamura)
robotics/2013-03-07 Experience with Component Based Development at Honda (Antonello Ceravola)
robotics/2013-03-08 Infrastructure WG Progress Report (Reston meeting) (Makoto Sekiya)
robotics/2013-03-09 Robotic Functional Service WG Report (Toshio Hori)
robotics/2013-03-10 Contact report: ISO/TC184/SC2 (Tetsuo Kotoku)
robotics/2013-03-11 Wrap-up Presentation (Tetsuo Kotoku)
robotics/2013-03-12 Roadmap for Robotics Activities (Tetsuo Kotoku)
robotics/2013-03-13 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)
robotics/2013-03-14 MARS Presentation of Finite State Machine Component for Robotics Technology Components (FSM4RTC) RFP [mars/2013-03-23] (Makoto Sekiya)
robotics/2013-03-15 DTC Report Presentation (Tetsuo Kotoku)
robotics/2013-03-16 Reston Meeting Minutes - DRAFT (Toshio Hori)

Minutes

Tuesday, March 19, 2013, 15:00-18:00, Suite 1146, 11th FL

1. **Approval of the Burlingame minutes**
   Approved: AIST(motion), Honda(second), IPA(white ballot)

2. **1st review of the FSM4RTC RFP draft by Dr. Makoto Sekiya (Honda)**
   - Introduction of the FSM4RTC RFP draft
   - Who will be the submitter of this RFP? and From which TF will the RFP should be submitted, Robotics (DTF) or MARS (PTF)?
     => Robotics-DTF

3. **Special Talk by Mr. Nakamura (JASA)**
   - Title: Proposal for establishment of Hardware Abstraction Layer WG

- Challenge and solution to solve the problems in robots control.
  - OpenEL (Open Embedded Library) developed at JASA
- Introduction of OpenEL Ver.0.x
- Proposal of establishment of a new WG

Approved: AIST(motion), Honda(2nd), IPA(white ballot)

4. Special Talk by Mr. Ceravola (Honda RI)

- Title: Experience with Component Based Development at Honda
- Bottom-up approach based on Middleware
- Moved from Module based development to Component Model

5. WG Report

- Infrastructure WG by Dr. Makoto Sekiya(Honda)
  - Reviewed the FSM4RTC RFP draft.
  - Planning to submit the RFP in May
- Service WG by Dr. Toshio Hori(JARA/AISt)
  - RoIS Ver.1.0 was published in February
  - RoIS RTF may be chartered in next meeting

6. Contact Report by Dr. Kotoku

- ISO/TC184/SC2 Activity
  - WG8/SG Modularity (Mon, Jan. 28, 2013)
  - Planning to setup new WGs (proposed by China)
    3 areas: Software Interface, Electrical Interface, Mechanical Interface
- IEC/SMB/AHG47
  - Household and similar robot technologies
- ISO/TC184/SC2 Schedule
  - 2013 May Karlsruhe, Germany ISO Workshop during ICRA
  - 2013 June Bristol, UK WG Meeting
  - 2013 Oct Beijing, CN, WG Meeting and SC2 Plenary
  - 2014 Jan/Feb Spain WG Meeting

7. Wrap-up

Next meeting schedule

Adjourned plenary meeting at 18:00

Plenary meeting attendee (10 attendees):

- Alexander Chelombitko (Infostroy)
- Alexander Lipanov (Infostroy)
- Antonello Ceravola (Honda-RI-EU)
- Geoffrey Biggs (AIST)
- Isashi Uchida (IPA)
- Kenichi Nakamura (JASA)
- Makoto Sekiya (Honda)
- Noriaki Ando (AIST)
- Tetsuo Kotoku (AIST)
- Toshio Hori (JARA/AIST)

Prepared and submitted by Toshio Hori (JARA/AIST).