robotics/2012-12-11

## A New Robotic Technology Middleware and Robotic Technology Component Interoperability Demonstration

Makoto Sekiya Honda R&D Co., Ltd.



#### We are pleased to announce

#### a NEW

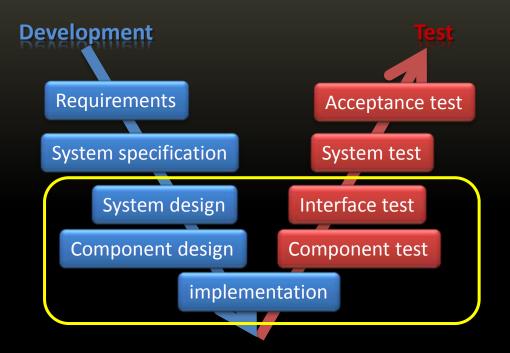
#### **Robotic Technology Middleware**

# Agenda

- Concept
- Architecture
- Main features
- Demonstration

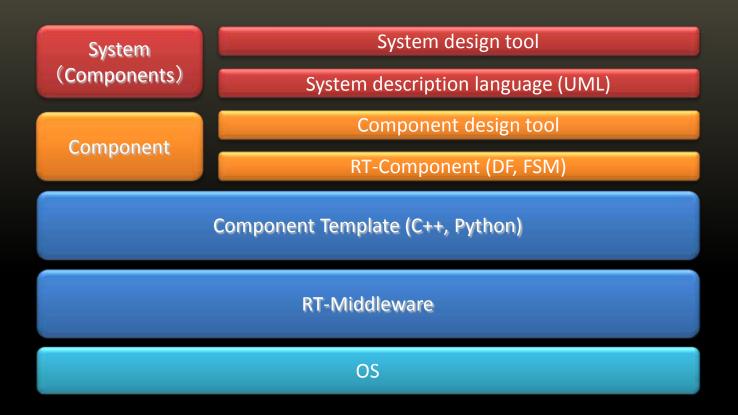


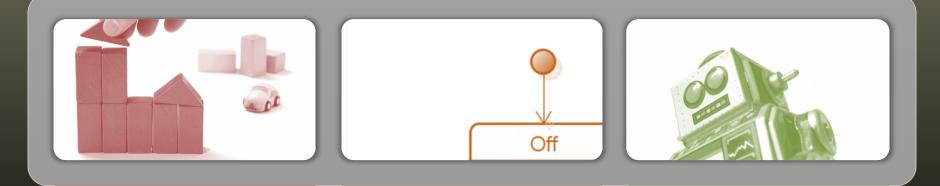
# Bring power of MBD and V-model to real-time robotic software development



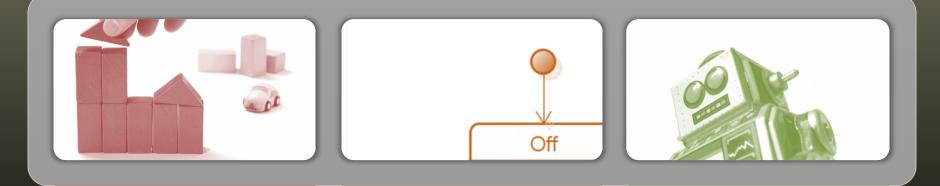
#### Architecture

#### System is modeled as UML diagram



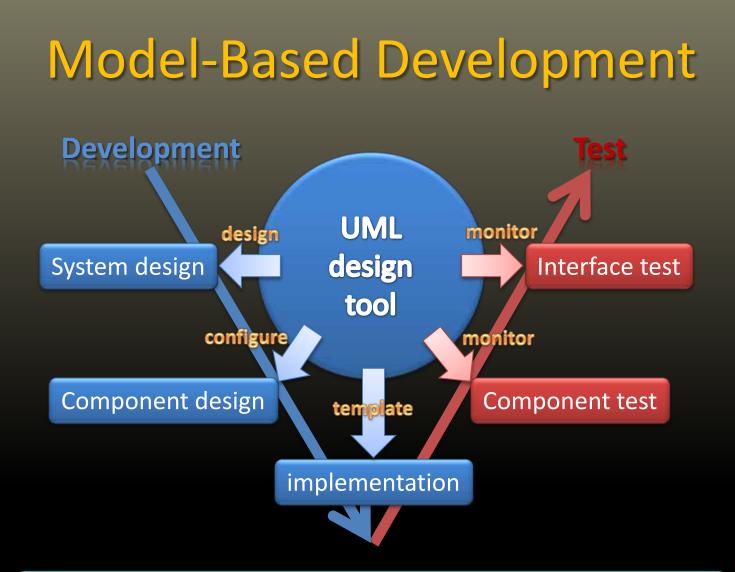


Model-Based Development State Machine Component



Model-Based Development State Machine Component

- Users can do with UML editor:
  - Design a system
  - Configure components in the system
  - Generate RT-Component template
  - Monitor components



UML design tool is the center place of development process

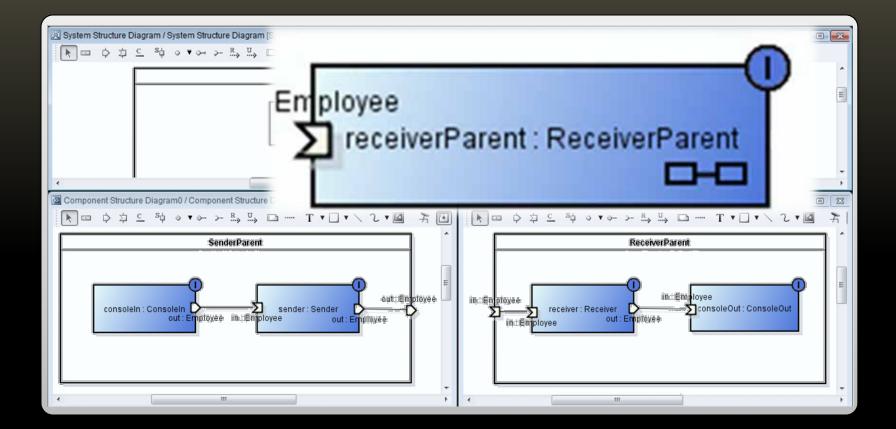
Design a system with UML

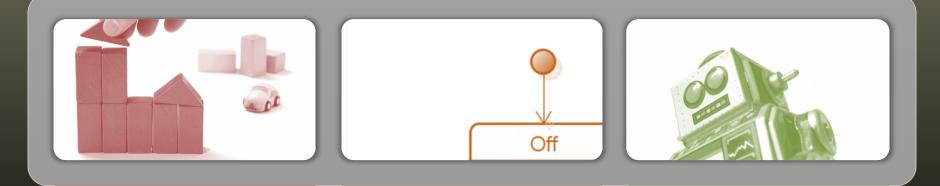
	Syst	em		
IeftArmJointAngle	leftArmJointCmd	leftArmJointCmd	robot : Robot	imageOut
IeftLegJointAngle	leftLegJointCmd	leftLegJointCmd		leftArmJointAngle
rightArmJointAngle	rightArmJointCmd	rightArmJointCmd		leftLegJointAngle
rightLegJointAngle	rightLegJointCmd	rightLegJointCmd		rightArmJointAngle

Configure components in the system

	System				
Base Activity Configuration Data Port Service Port User Definition Hyperlink					
Namespace					
Component	Robot				
Part Name	robot				
Component Type	<ul> <li>C DFC</li> <li>C FSM</li> <li>Statemachine Diagram         Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram          Statemachine Diagram           Statemachine Diagram           Statemachine Diagram          Statemachine Diagram           Statemachine Diagram</li></ul>				
Rate [Hz]	10				
Version					
Vendor					
Category	tegory composite.PeriodicECShared				
Composite Type	omposite Type PeriodicECShared				

Monitor components in the system



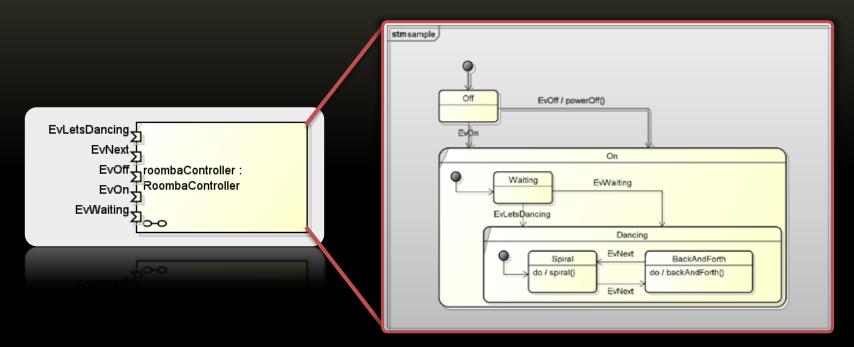


Model-Based Development State Machine Component

#### State Machine Component

- Embedded FSM in Data Flow Component

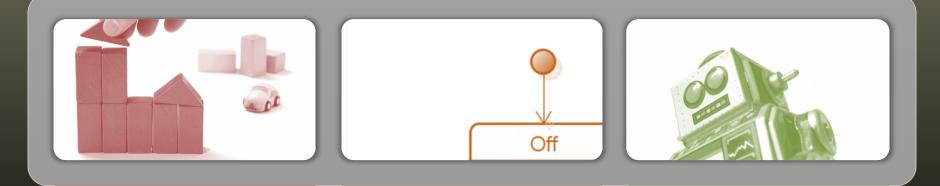
   Events are input from data ports
- FSM is modeled with UML Statechart



## Why not Statechart?

- Lots of robotic software includes state machines in its code
- Coding state machine by hand makes things bad
  - Only you can understand it
    - For a few months...

Leave your efforts in the reusable way



Model-Based Development State Machine Component

## **Real-time Middleware**

- Enhancements for RTOS
  - Runtime configuration
    - Fast data port types
    - Bus communication protocols

#### Full functionality is available

#### Demonstration

2 Roombas are synchronously changed their action by gestures

- To show interoperability of Honda RTM and OpenRTM-aist
  - Honda RTM provides:
    - Action state component (mode changer)
    - Roomba component (controller)
  - OpenRTM-aist provides:
    - Kinect component (UI)
    - Roomba component (controller)

Enjoy it!