

# Using SysML in a RTC-based Robotics Application : a case study with a demo

Kenji Hiranabe(Change Vision, Inc)  
Noriaki Ando (AIST)

- Introduction
- Background and Goals
- Problem
- Analysis and Design via Demo
- Conclusion
- Future Ideas



- Kenji Hiranabe, Change Vision, Inc.(maker of Astah)
- Astah is a UML editor popular in Japan
  - <http://astah.net/>
- Astah/SysML
  - Newly developed
  - Focused on “Usability” and “Web collaboration”
- RTC plug-in
  - Plug-in for Astah/SysML to generate RTC.xml to OpenRTM



# Project members



Noriaki Ando



Geoffrey Biggs



Isao Hara



Kenji Hiranabe



Toshiki Iwanaga



Toshihiro Okamura

Honda R&D Team



Makoto Sekiya



Toyotaka Torii

1

SysML to RTC

2

OpenRTM to Honda RTM

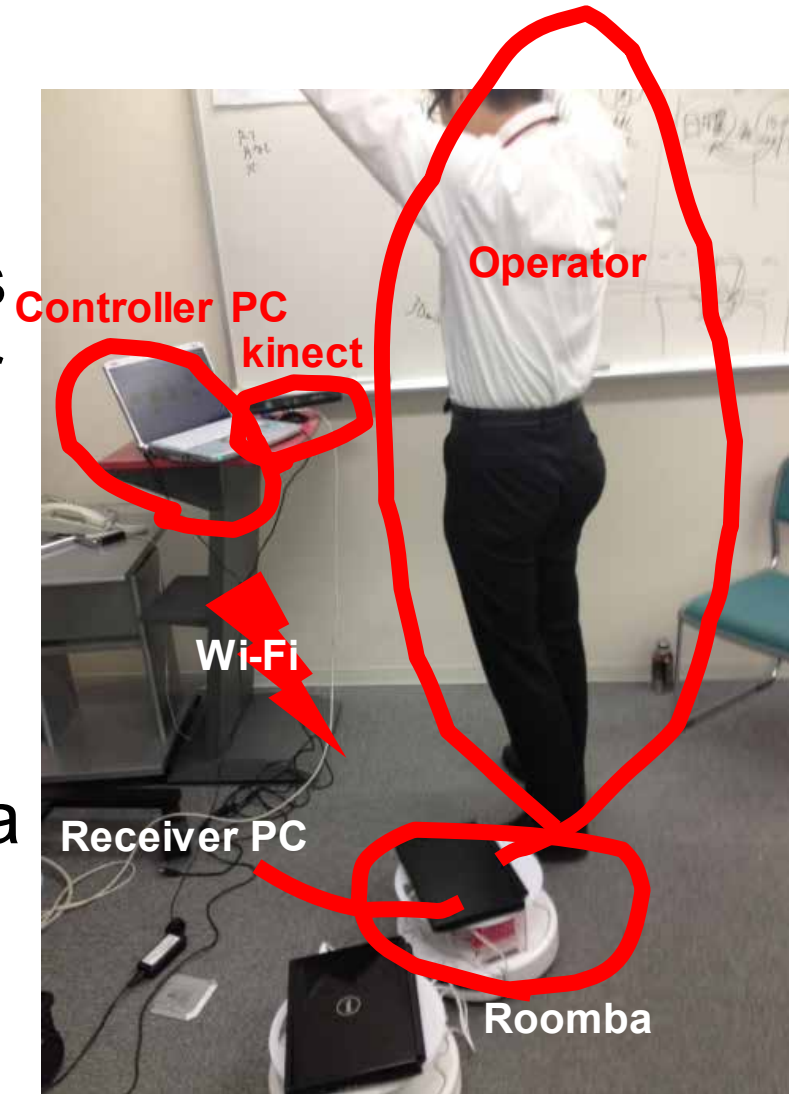
- Evaluate how SysML can help design a component(RTC)-based robotic application using a simple problem.

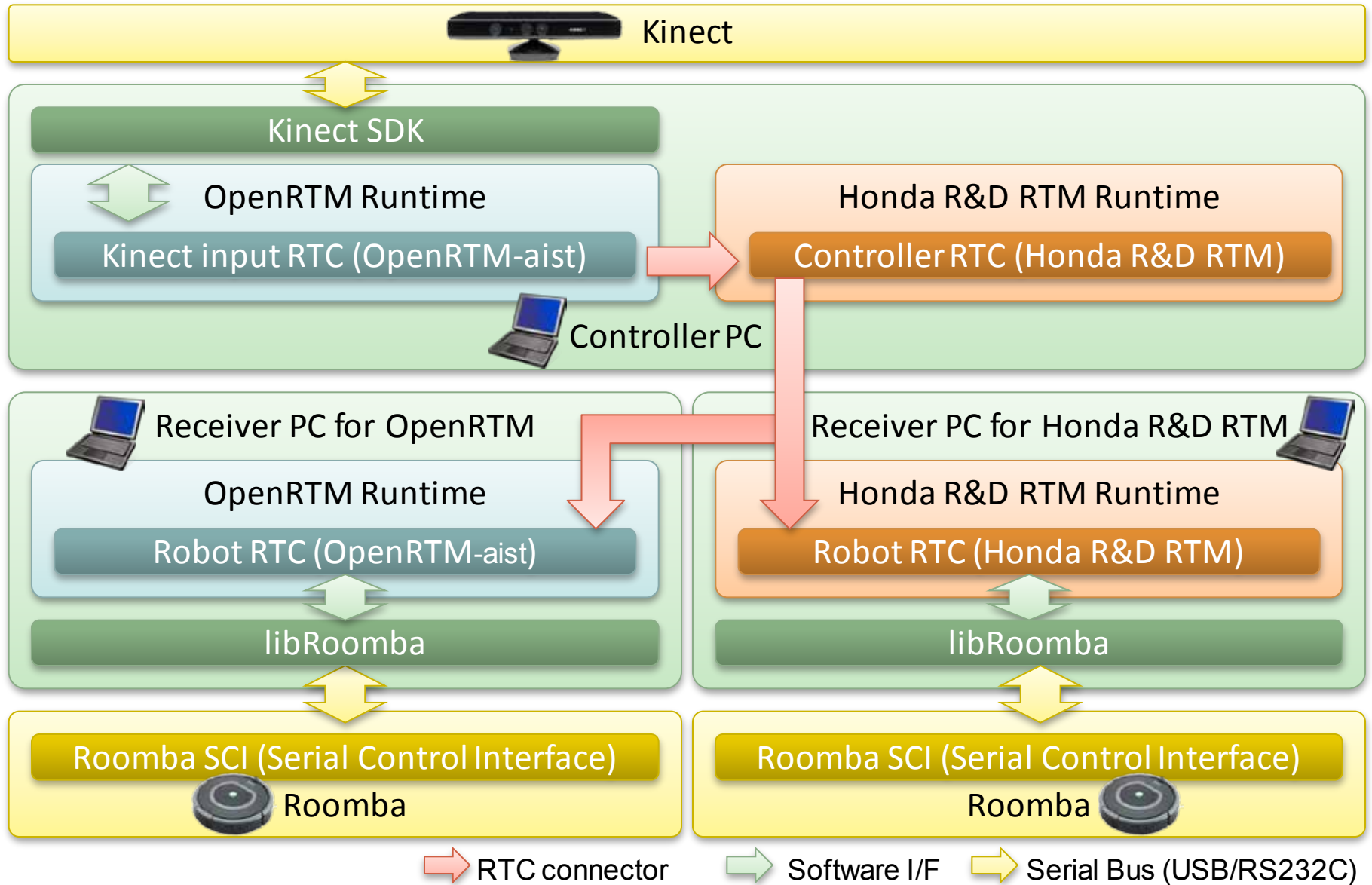
## 1 SysML to RTC

- Try a demonstration test to verify that one common model can work and interoperate on multiple RTM implementations.
  - OpenRTM-aist
  - Honda R&D RTM

## 2 OpenRTM to Honda RTM

- Demonstrate the movements (Spiral and Back-and-Forth) by controlling multiple autonomous robots from externally. Operator can switch between the autonomous mode and demonstration mode.
- Hardware architecture is already known, we use Roomba with PC that can control it using Wi-Fi and use Kinect to switch the mode.



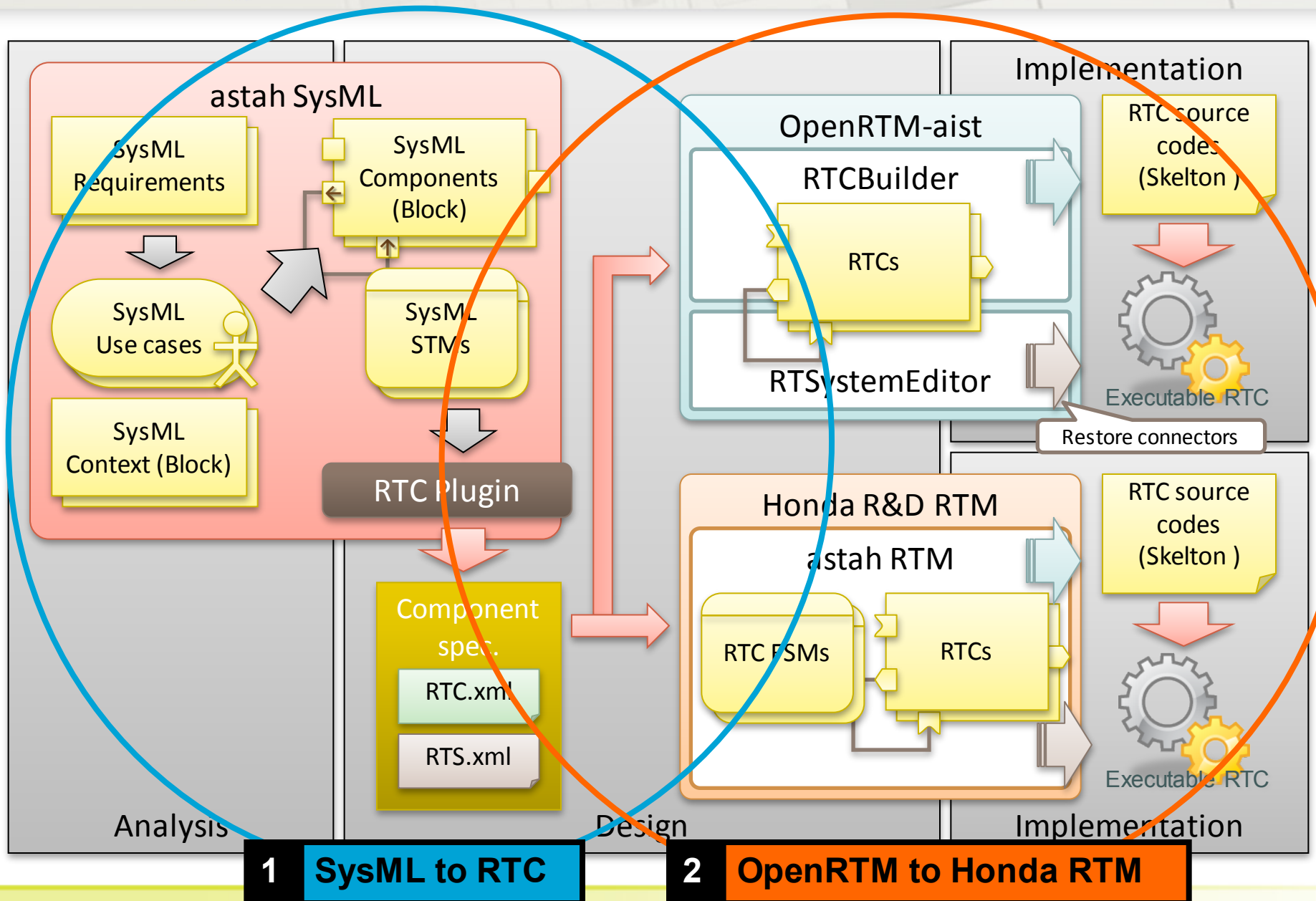


# OMG RTC Family

Name	Vendor	Feature
OpenRTM-aist	AIST	C++, Python, Java
OpenRTM.NET	SEC	.NET(C#,VB,C++/CLI, F#, etc..)
miniRTC, microRTC	SEC	RTC implementation for CAN·ZigBee based systems
Dependable RTM	SEC/AIST	Functional safety standard (IEC61508) capable RTM implementation
RTC CANOpen	SIT, CiA	Standard for RTC mapping to CANOpen by CiA (Can in automation) and implementation by SIT
PALRO	Fuji Soft	C++ PSM implementation for small humanoid robot
OPRoS	ETRI	Developed by Korean national project
GostaiRTC	GOSTAI, THALES	C++ PSM implementation on URBI
Honda R&D RTM	Honda R&D	C++, Python. FSM Component.

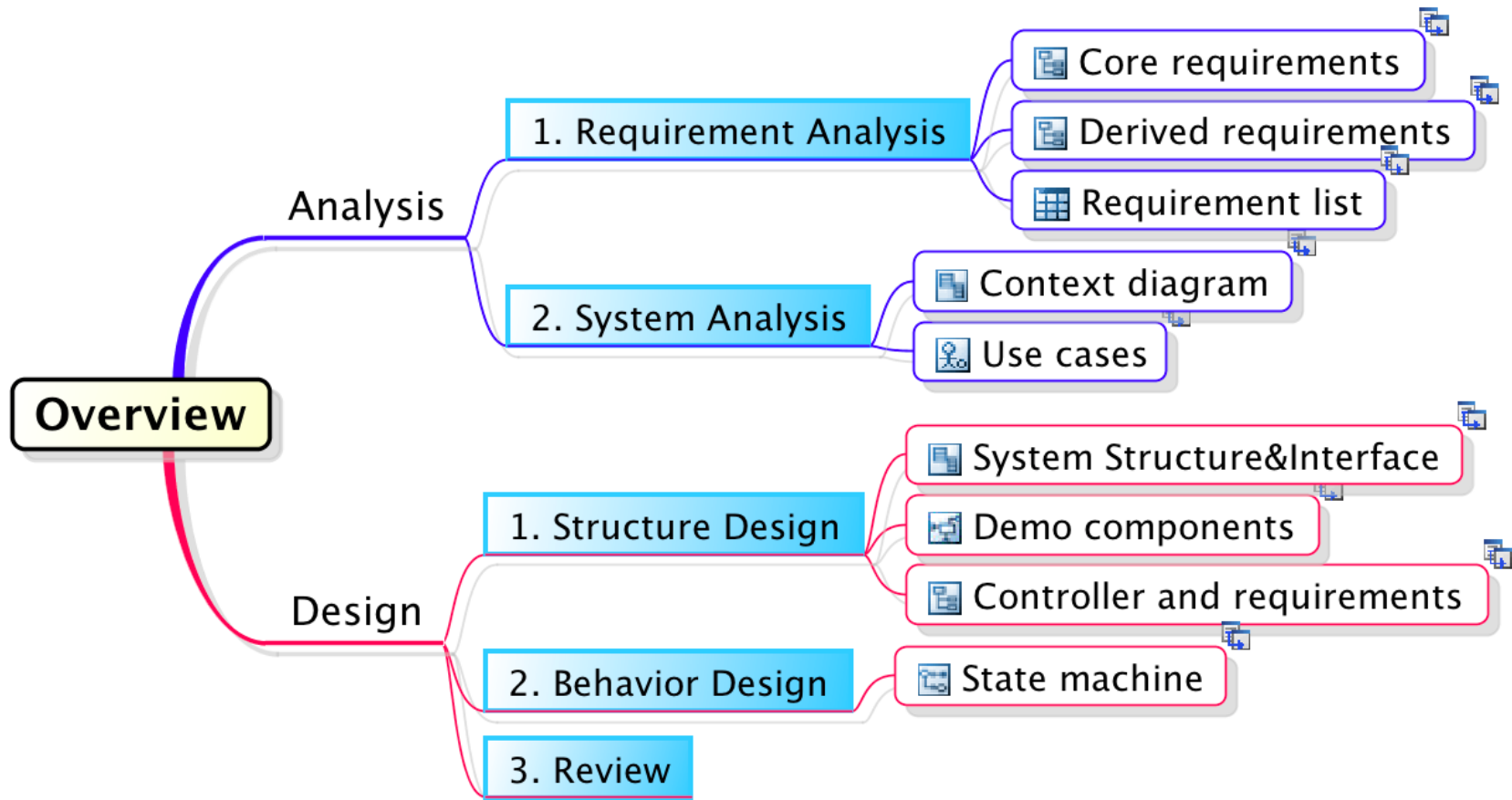




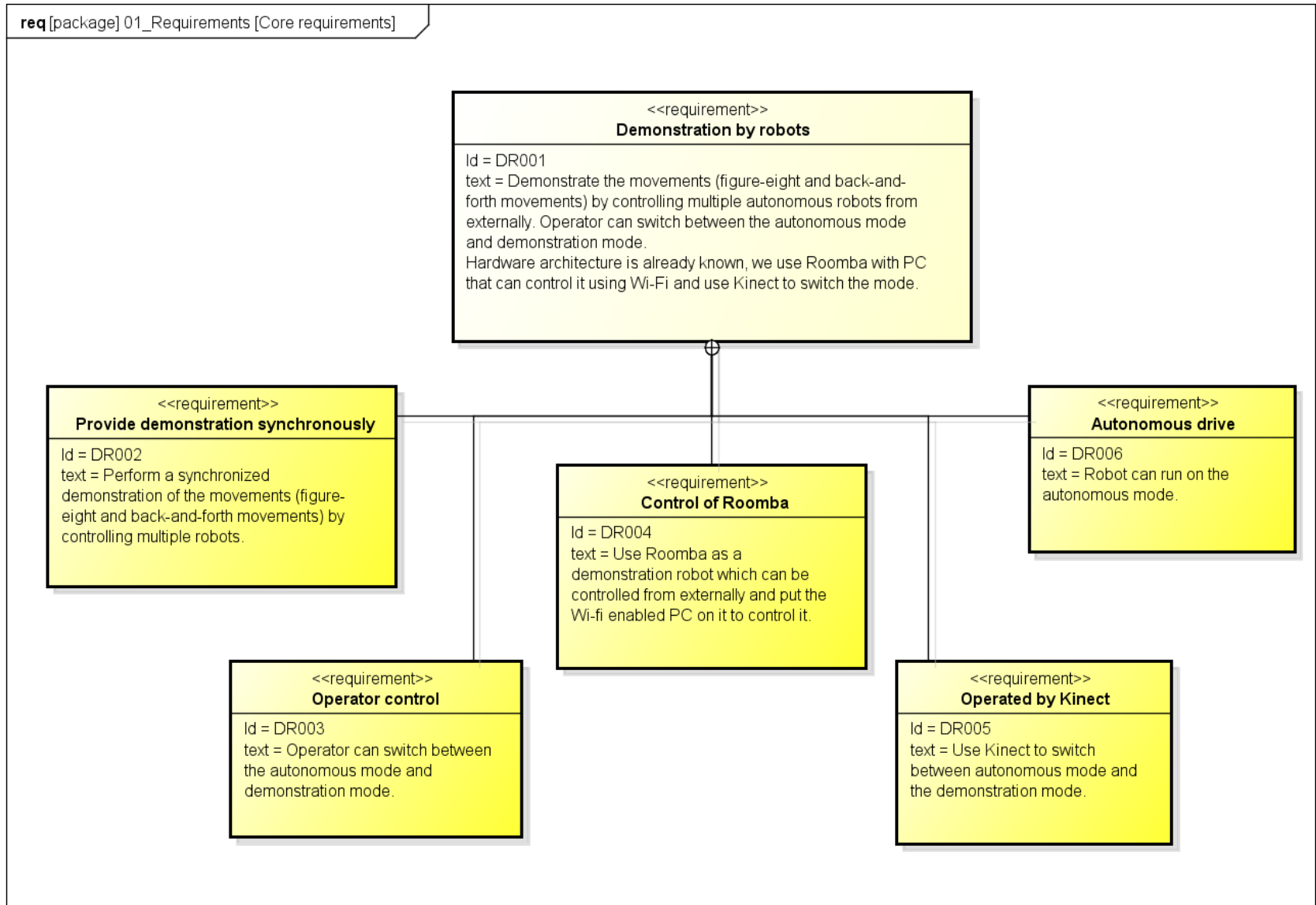


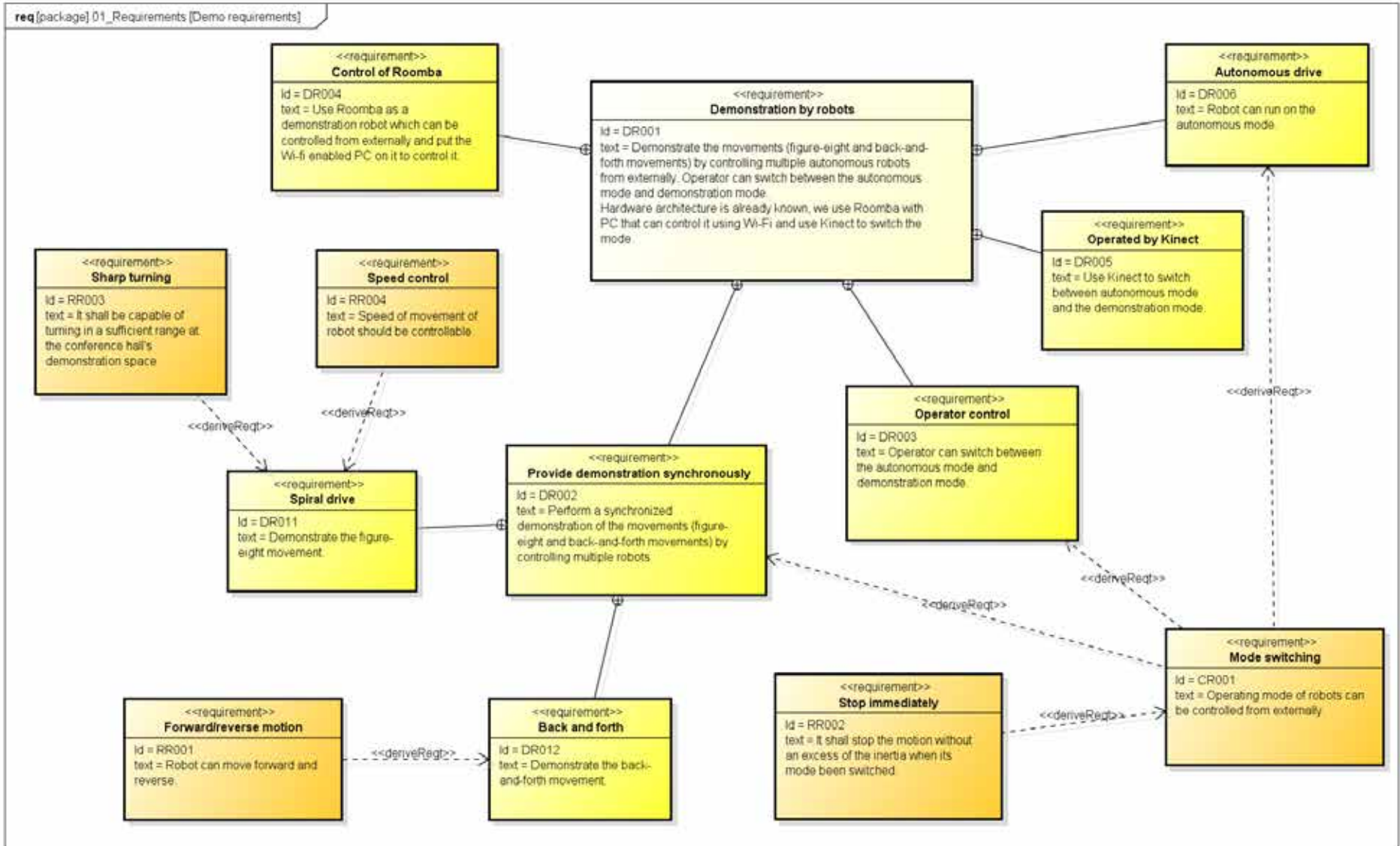


# Analysis and Design Diagrams in Astah / SysML

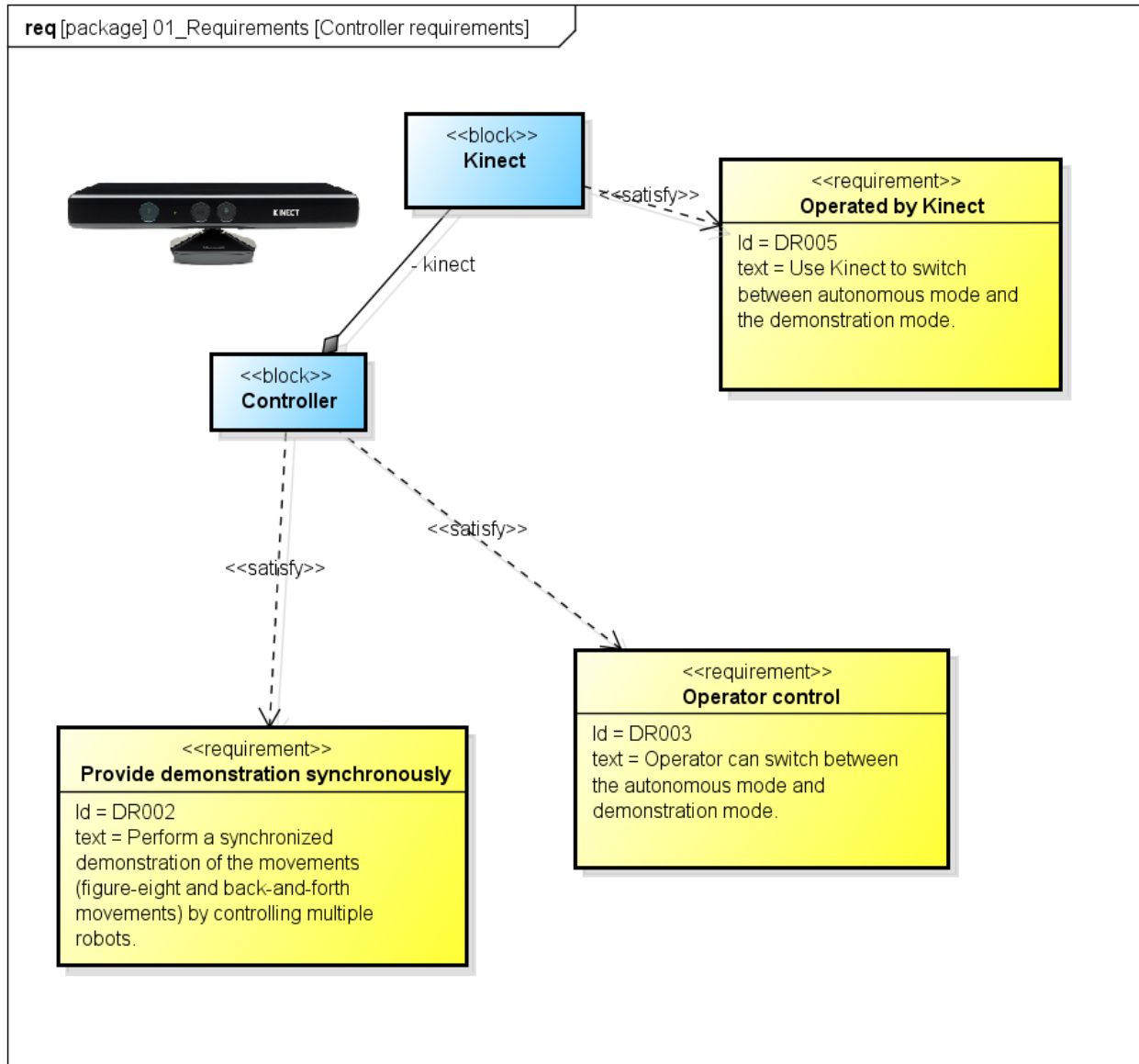


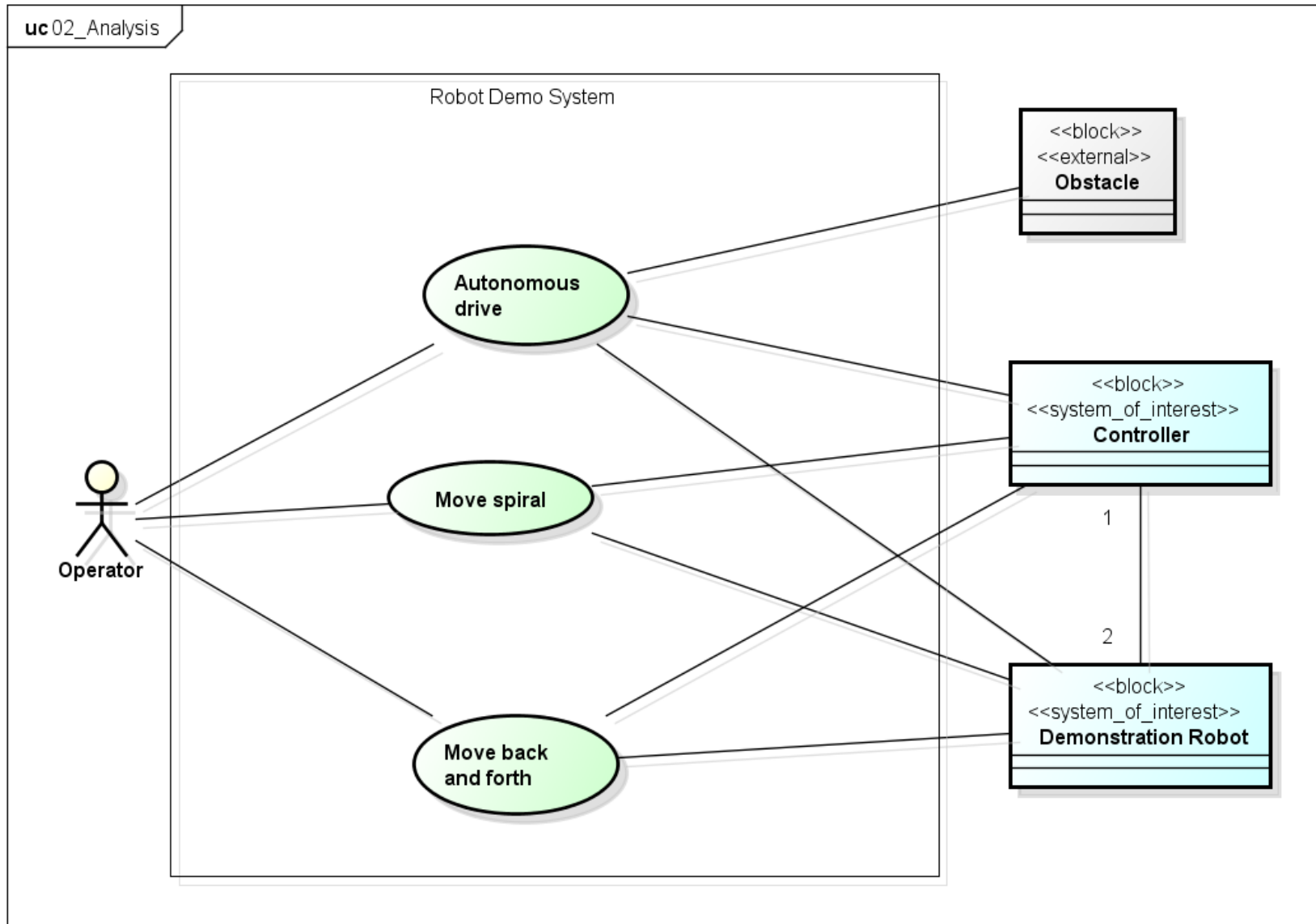
# req [Core requirements]





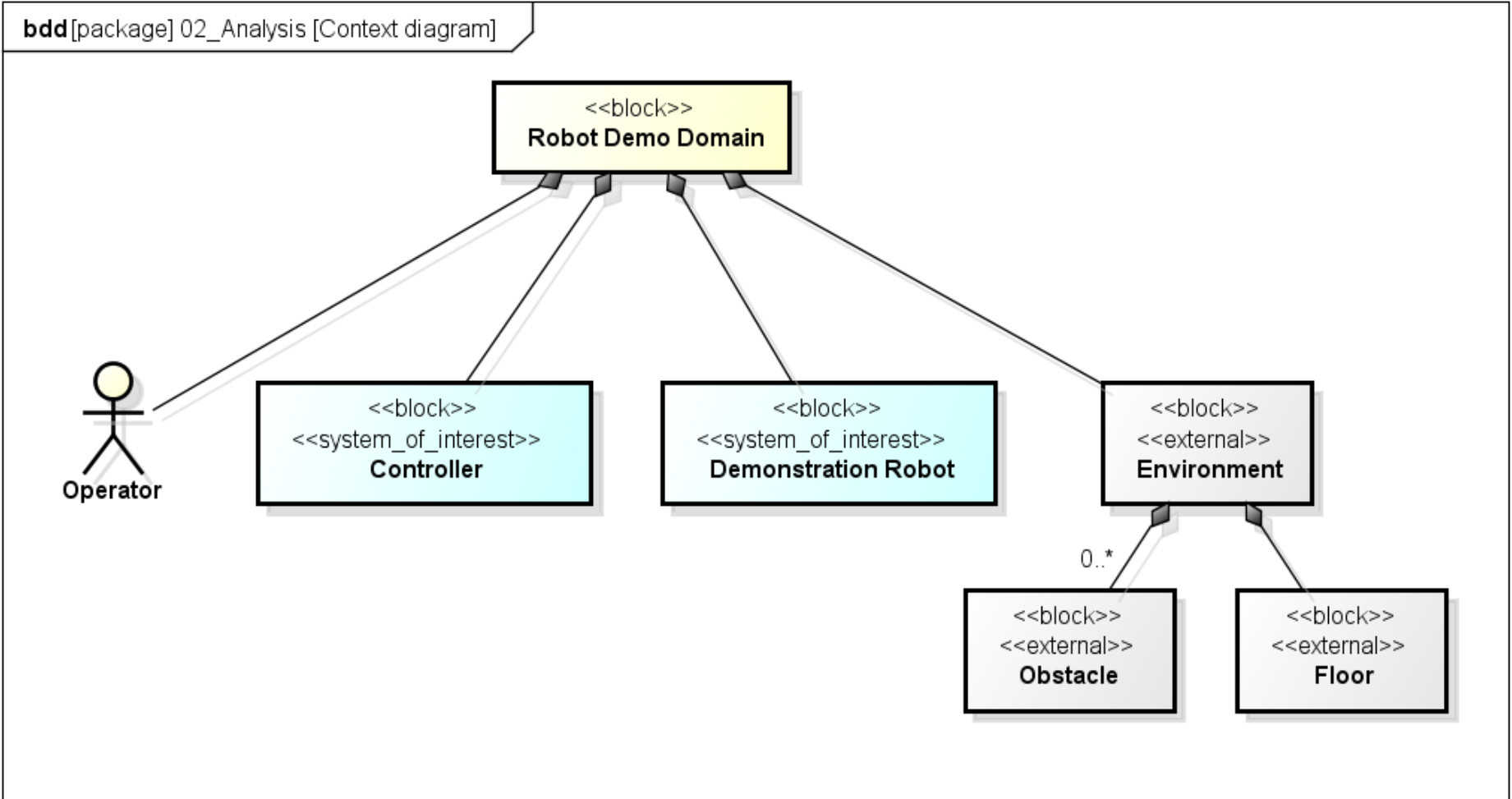




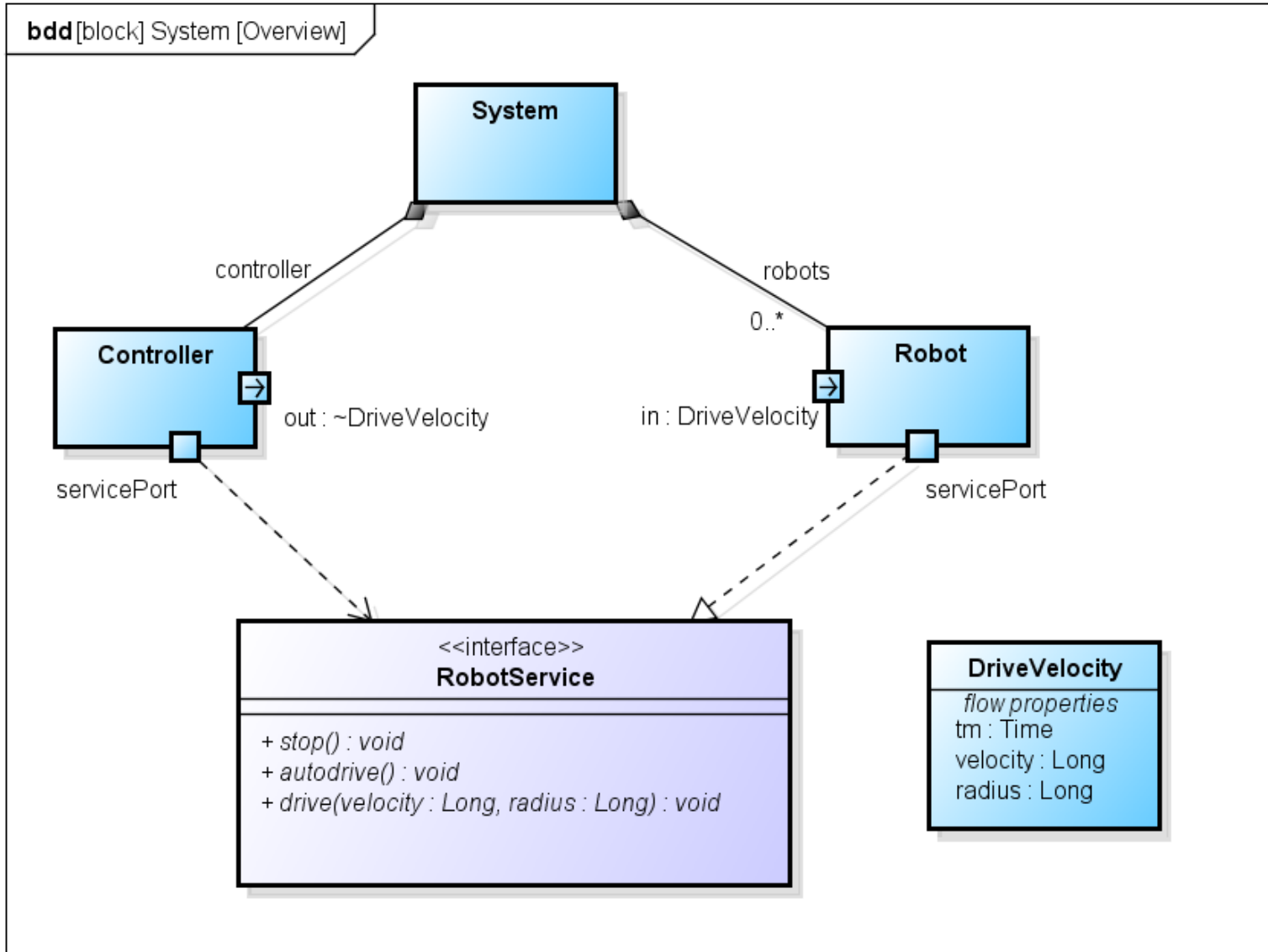


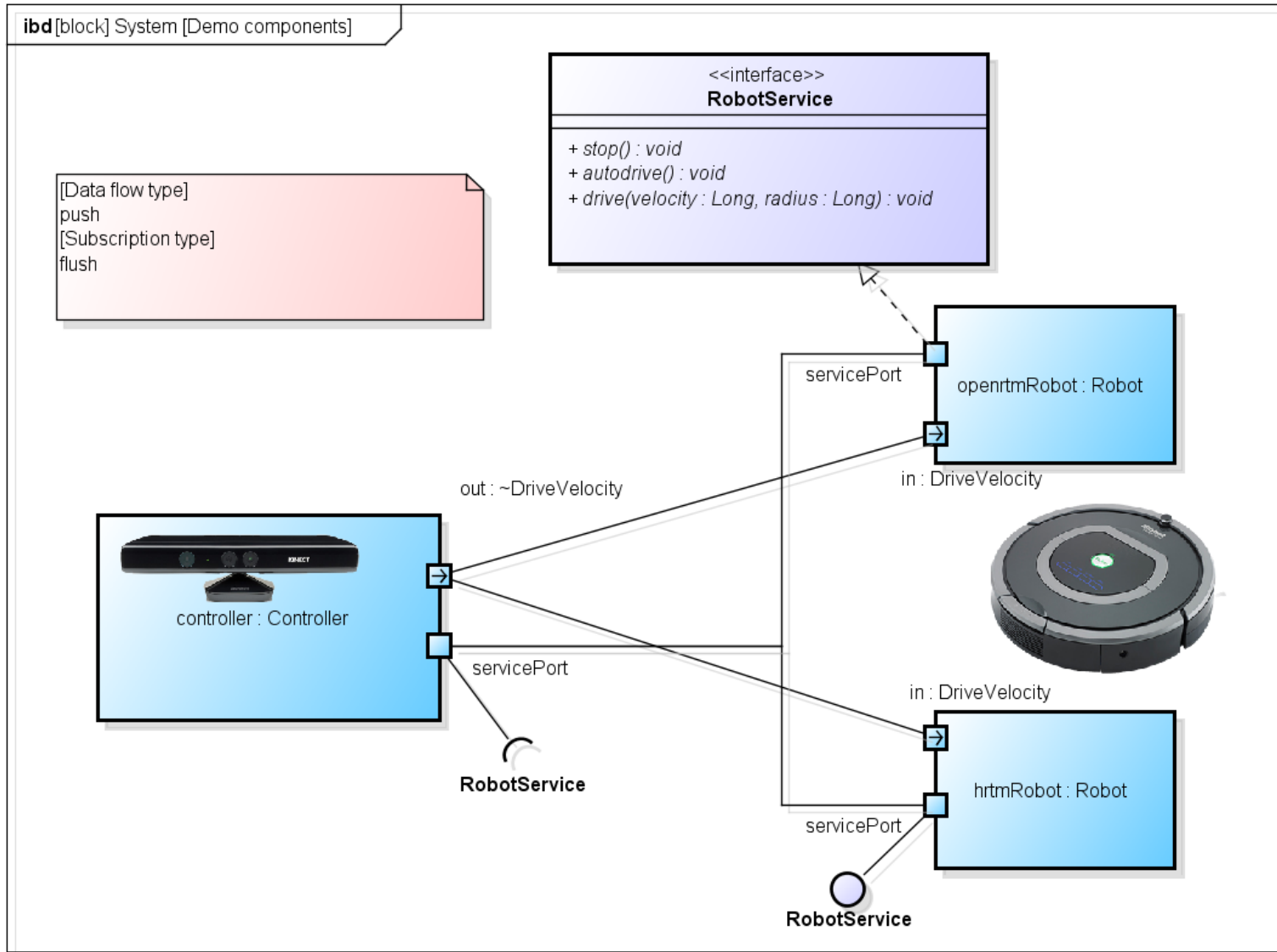


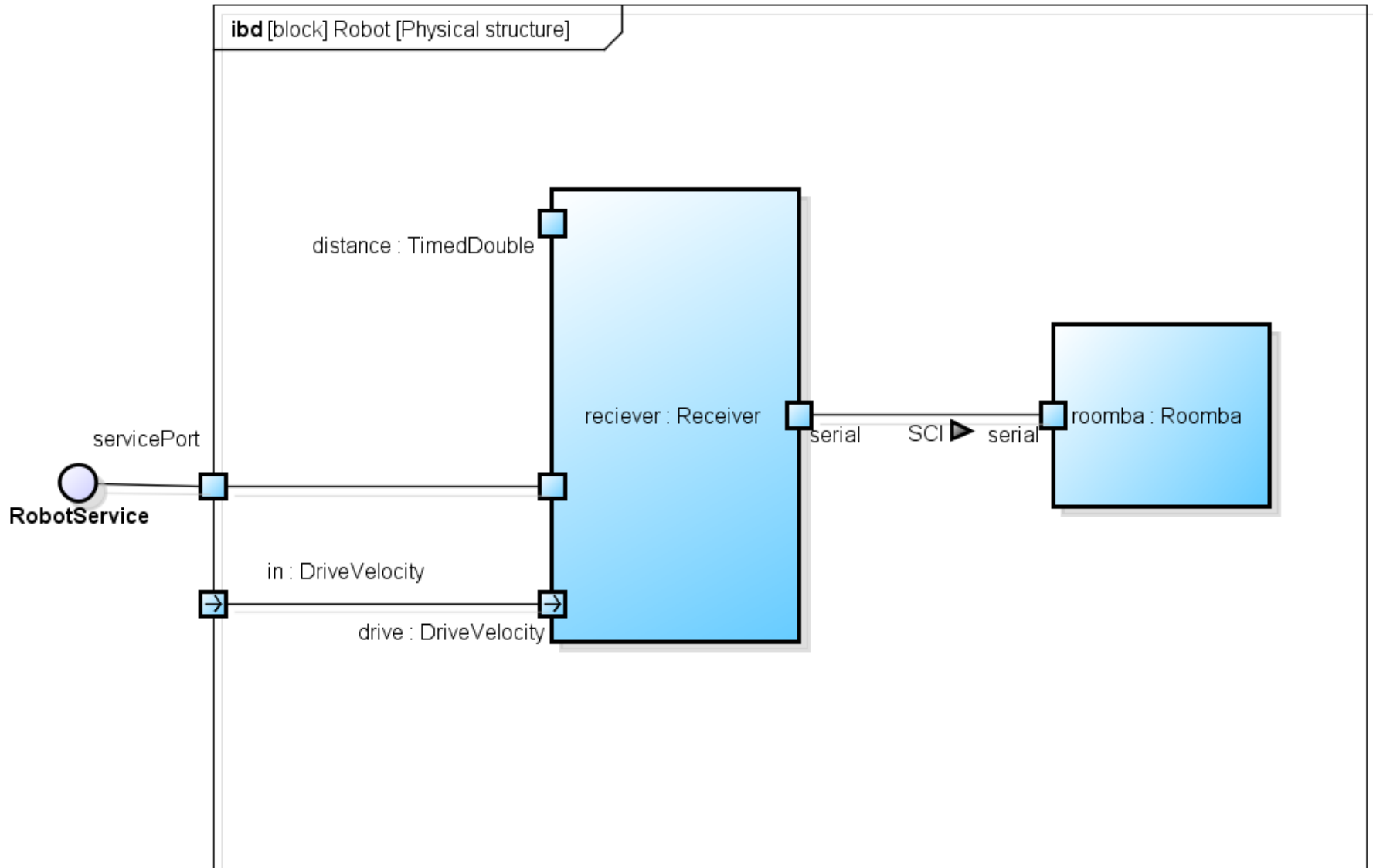
# bdd [Context diagram]

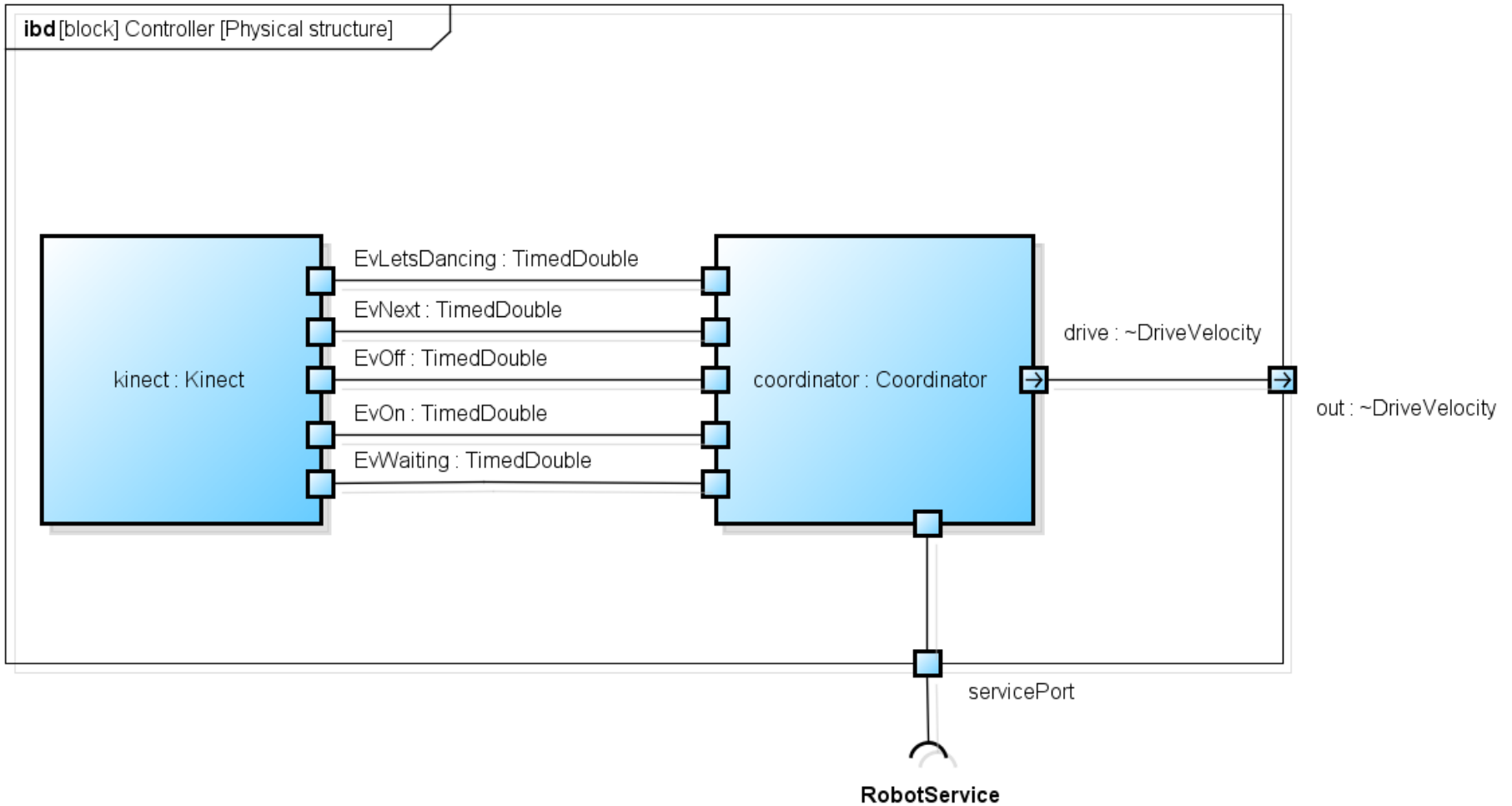


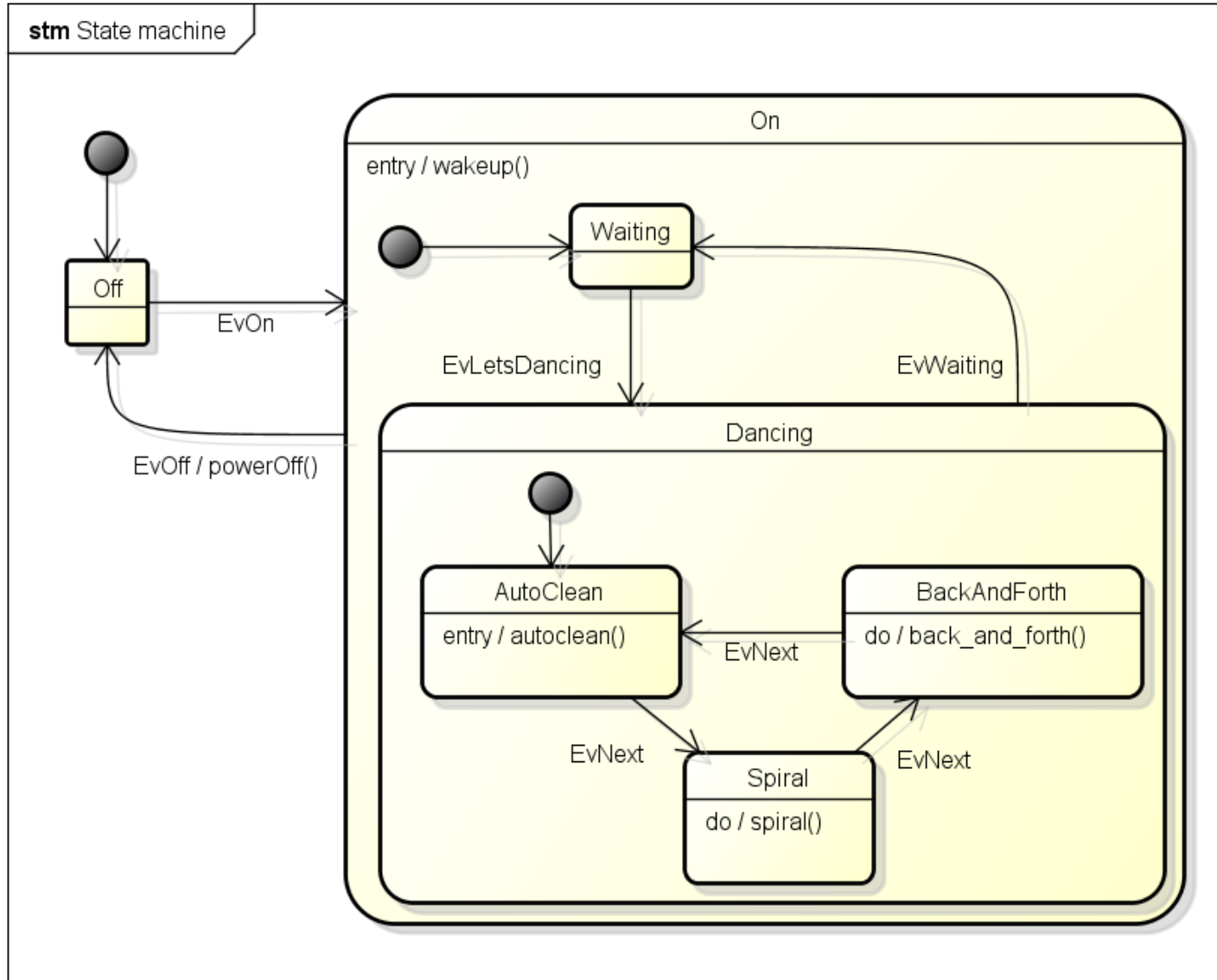
# bdd [System overview]











- SysML “Block”s map to “RTC”s nicely.
- <<Satisfy>> relationships between “Requirements” and “Components” can be visualized to show the intentions of components reasonably.
- An Easy-to-use tool(Astah/SysML) boosted effectiveness of modeling.
- Communication between teams worked well using web-based model sharing feature of the tool.

- Real-time aspects into the model
- Relate Safety Case models(Software Assurance Case Model/Safe ML) with SysML models
- SysML Profile for RTC.
- Traceability and impact analysis from/to requirements to components via the tool.





# Thank You !

We are exhibiting the demo, and tools. Please visit us.



Noriaki Ando



Geoffrey Biggs



Isao Hara



Kenji Hiranabe



Toshiki Iwanaga



Toshihiro Okamura

Honda R&D Team



Makoto Sekiya



Toyotaka Torii