LET'S PLAY: LEGO MEETS PAPYRUS UML

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INTRODUCTION

Papyrus in a Nutshell

Why using Legos?

First steps with Legos

Advanced usage
PAPYRUS IN A NUTSHELL
A graphical editing tool for **UML 2** as defined by **OMG**
Key features:

- Support table, graphical & form-based editing
- 100% conformant to standards: UML, SysML and others
- Fully extensible:
  - Language as extensions of UML: SysML 1.4, UML-RT, etc.
  - Views, with customization of existing ones or new ones
- Integration with many eclipse components
  - Model compare
  - Model transformation
  - Report generation
  - Code edition & generation
Eclipse Foundation Launches Papyrus Industry Consortium Focused on Modeling Tools for Embedded Development

Embedded World, Germany — February 23, 2016 — The Eclipse

WHY USING LEGOS?
Easy to access
- Cheap
- Widespread
- Already available in many places

Representative
- Many actuators / sensors already existing
- Allows complex systems with several implementation languages:
  - EV3Basic as an extension of Microsoft smallBasic,
  - Java with Lejos
  - C++
AN EXPERIMENTATION PLATFORM: THE LEGO FACTORY

Source: http://robotics.benedettelli.com/lego-car-factory/
FIRST STEPS WITH LEGOS IN PAPYRUS
Application model in Papyrus…

- Structural definition of the application
  - Composite structure diagrams to describe the application and the various elements known by the program

- Definition also of the behavior:
  - State machine and few lines of hand written code

But also the platform and deployment of code on the platform

- Only a simple one for the demo, with only one brick for code execution
**Context**
- EV3 Brick running on linux (ev3dev)
- Papyrus installed with MARTE and Designer extensions
  - MARTE: Modeling and Analysis of Real-time Embedded Systems
  - Designer: Component based design methodology
  - Plugin with ev3dev libraries C++ reversed code as a UML library and few customizations

**Scenario**
- Build the application model, with help of the reversed library
- Deploy it on a simple platform model
- Generate code
- Compile code for the ev3 brick target
- Deploy the code on the brick and run it

Source: http://www.ev3dev.org/
LIVE DEMONSTRATION: CODE GENERATION & EXECUTION
ADVANCED USAGE OF LEGOS AND PAPYRUS
Model Execution and Simulation with MOKA

- Based on standard FUML (OMG)
  FUML \(\rightarrow\) Semantics Of A Foundational Subset For Executable UML Models

- Open source component, part of the Papyrus project

Animated execution

Textual notation
Use case: driving the Lego factory from UML Model

Context

- Lego car factory, with an EV3 brick having Lejos installed
- Papyrus
  - MOKA installed
  - Model of the application, behavior described with an activity diagram
  - Papyrus and Moka are connected to the Brick via bluetooth

Scenario

- User wants to drive the factory and debug / test the production process
- Moka will drive the Lego brick, with Lejos java methods to control motors / sensors
- Breakpoint to allow a user action – *adding the roof of the car*
DEMONSTRATION #2: PAPYRUS MOKA + LEGOS
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Use case: optimizing the Lego factory process from UML Model

Context:
- Description of the process of car production in Papyrus with BPMN
- Simulation of the process using Moka
- Propose enhancement on the platform

Next steps:
- Reconfigure the platform and rerun the execution
DEMONSTRATION #3: PAPYRUS BPMN & MOKA + LEGOS
QUESTIONS?
THANKS TO THE PAPYRUS LEGO TEAM!

**First example:**
- Vincent Lorenzo (CEA LIST)

**Videos:**
- Kunal Suri and Juan Cadavid (CEA LIST)
Papyrus website
http://www.eclipse.org/papyrus

Papyrus youtube channel:
https://www.youtube.com/channel/UCxyPoBlZc_rKLS7_K2dtwYA

Papyrus wiki:
http://wiki.eclipse.org/Papyrus
Evaluate the Sessions

Sign in and vote at eclipsecon.org

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