The eTrice Eclipse Project Proposal

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Agenda

- Motivation
- Scope of eTrice
- ROOM Language
- Codegenerators
- Middleware
- Realization
- Project Plan
- Conclusion
Motivation: Why?

- Increasing size and complexity of software in embedded systems
- Increasing requirements for quality (steer by wire)
- Modeling can help by
  - raising the level of abstraction
  - raising the degree of automation
- Open Source Modeling Tool for event driven embedded systems with complete codegenerator and middleware is missing

➡️ The ROOM based Tool eTrice could fill in
Motivation: Why ROOM and not UML2?

UML2 Meta Model

ROOM Meta Model
Motivation: Why not UML2?

- UML2 is too complex for some/most projects
- UML2 tools are very costly to build and maintain
- UML2 was not designed for embedded systems
- UML2 is not very specific about semantics
Scope of eTrice

- provide an implementation of the modeling language Real Time Object Oriented Modeling (ROOM)
- build ready to use editors for ROOM models (textual and graphical)
- create code generators and portable target runtime libraries for Java and C++, later also for ANSI-C
- provide built-in support for modeling level debugging of the running target software: state machine animation, data inspection and manipulation and message injection
- provide built-in possibilities for sequence diagram creation from the running software
- support heterogenous distributed systems out of the box

⇒ eTrice is a Modeling Toolset for event driven, distributed embedded systems
Hierarchical Components called **Actors** define the Structure of a System

**Ports** are the only Interfaces of an actor and define a specific role in its environment. They also make Actors always deployable by decoupling them.
Protocols define the Syntax and Semantics of incoming and outgoing messages between Ports.

Model checking can proof the correct implementation of semantics.
hierarchical **Statemachines** define the dynamical behaviour of Actors

Incoming messages from the Ports trigger transitions
Layering enables the explicit modeling of layered architectures

Layering is a powerful element in ROOM to master complexity
a set of actors can be deployed to a physical node

one or several actors can be assigned to an execution thread
Codegenerators

- the high degree of formalization enables the complete generation of structure and event driven behavior of the model in high level languages

- manual code can be added at various points in the model to add more detailed behaviour

- codegenerators for Java, C++ and C will be implemented

- codegenerators for other languages can easily be implemented
the generated code needs a runtime library (middleware) to close the abstraction gap

- platform abstraction / portability
- communication (asynchronous messaging)
- debugging / tracing on model level
- invariant part of modeling elements
- framework for generated statemachines
- deployment / lifecycle
- error handling
Realization

Modeling

- ROOM metamodel with EMF
- initial editors with XText
- graphical editors (Statemachines, Actor hierarchies, …) with GMF or Graphiti

Codegenerators:

- Xpand/Xtend

Target Middleware:

- Java (JDT), C++, C (CDT)
Project Plan: Current Status

Organizational:
- pre-proposal phase
- gathering of community

Technical:
- current tool Trice since 1998
  - new implementation with Eclipse
- first proof of concept running
- 50% of ROOM meta model
- XText editors
- simple codegenerator and middleware for Java
Project Plan: Next Steps

Organizational:

- proposal phase
- gathering community

Technical:

- prototype with textual syntax until November
- first industry pilot project until July 2011
- maturity 12/2011
Project Plan: Pilot Project

Pilot Customer PARItect

1. smaller production system for inhalers

2. bigger production system for compressors
Committers / Interested Parties

Initial Committers:

- Thomas Schütz, project lead (Protos)
- Henrik Rentz-Reichert, committer (Protos)

Interested Parties:

- Tieto
- Harman Automotive
- Infineon
- PARItec
The eTrice project will create:

- A ROOM metamodel
- Textual and graphical editors for ROOM models
- Code generators for Java, C++, C, …
- portable target middleware
- Model level debugging

The eTrice project will create a development tool for event-driven embedded and real time systems
Thank you for your attention

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