EclipseCon Europe 2015

An Open Source Development Platform For Embedded Multi- and Many-Core Systems

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Agenda

APP4MC – Application Platform Project for MultiCore

- AMALTHEA - Timeline and current project(s)
- Challenges for embedded multi- and many-core systems
- The AMALTHEA Platform
- Demo / Screenshots of current release
- APP4MC - Next steps

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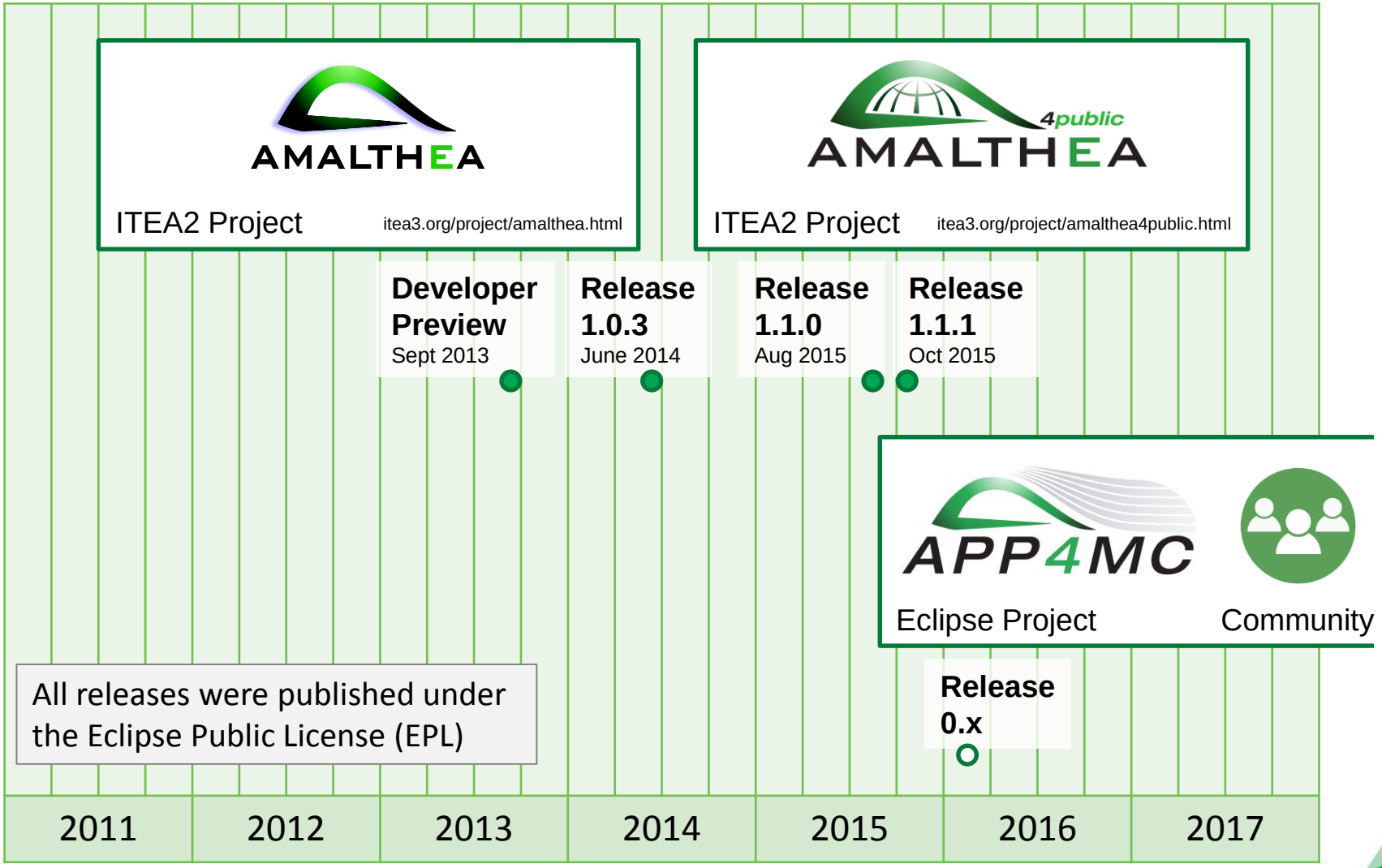
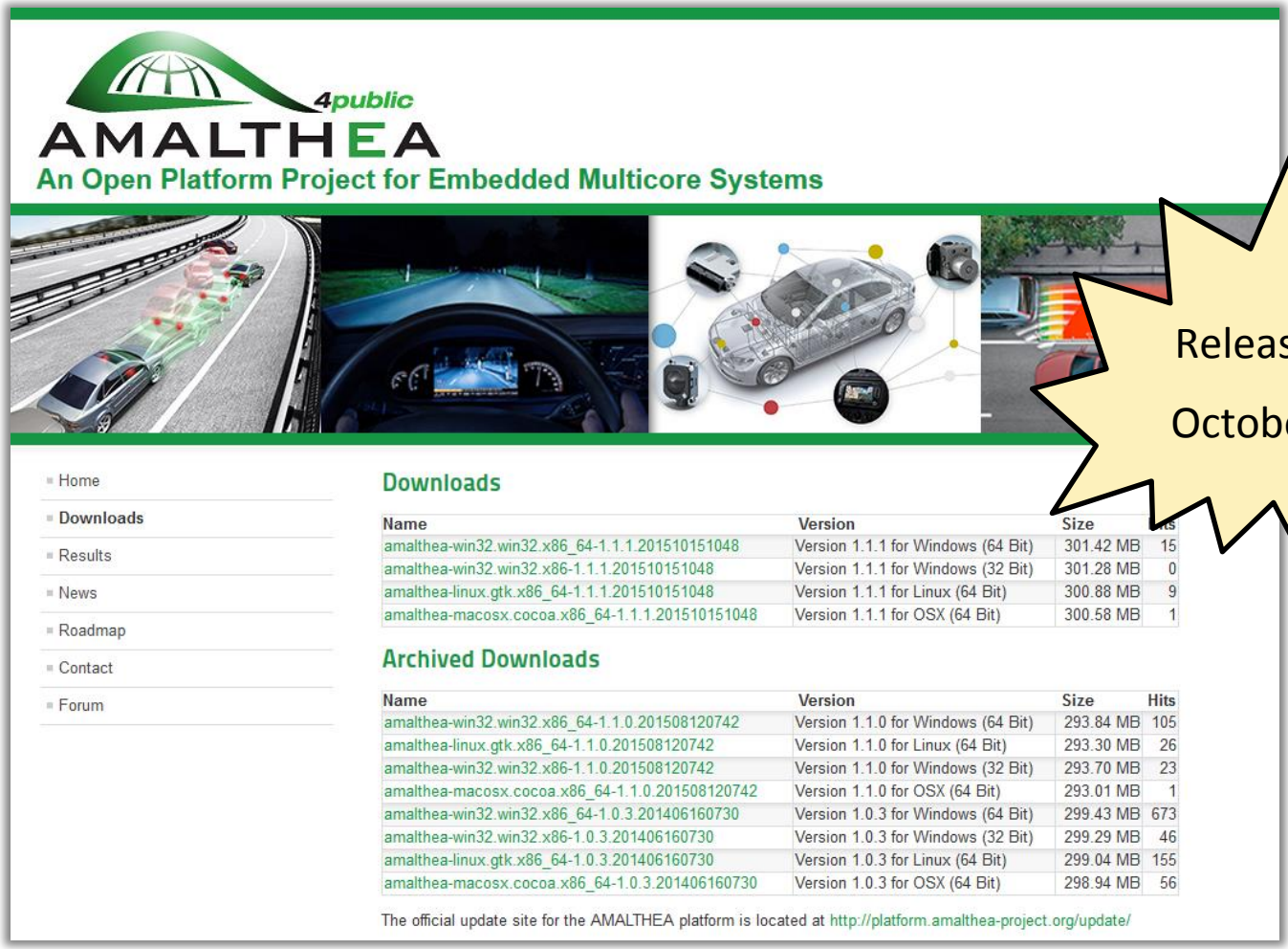
AMALTHEA
Timeline



AMALTHEA
Latest Open Source Releases



Release 1.1.1

October 2015

http://www.amalthea-project.org

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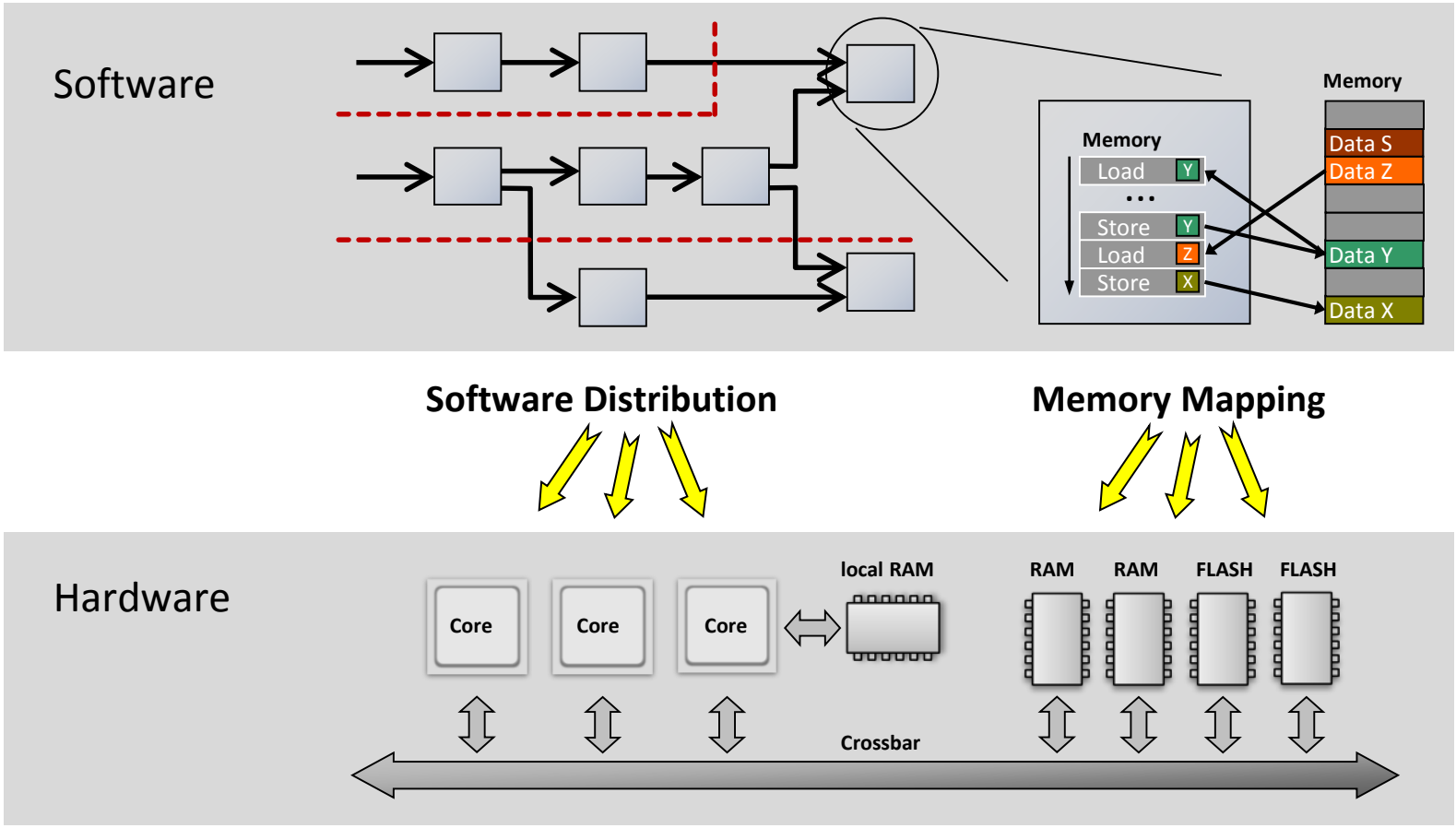
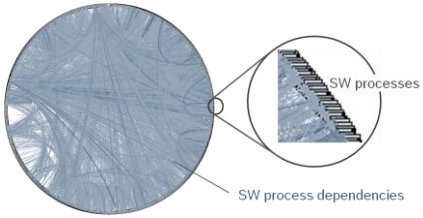
Challenges of Embedded Multi-Core

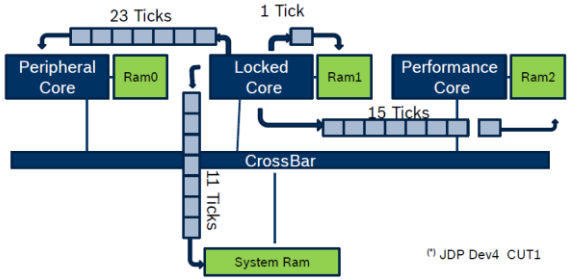


Challenges of Embedded Multi-Core

- **Typical Paradigm of Single-Core Software**
  - Blackboard Architecture: Memory access is for “free”
  - Integration challenge: scheduling of computation



- **Paradigm Change for Multi-/Many-Core**
  - Cross-Core Communication is expensive
  - Synchronization leads to high overheads
  - Memory location matters
  - Integration challenge: scheduling of computation and communication



- Sophisticated new tooling required for task distribution, memory location optimization and performance analysis

Cross-core communication is a new resource bottleneck

From Multi- to Many-Core

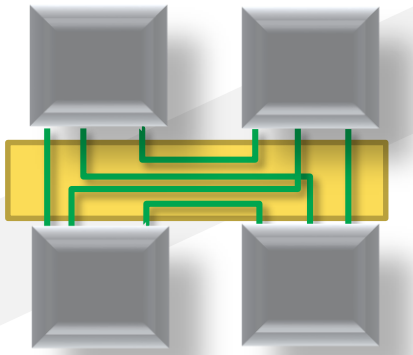
Multi-Core

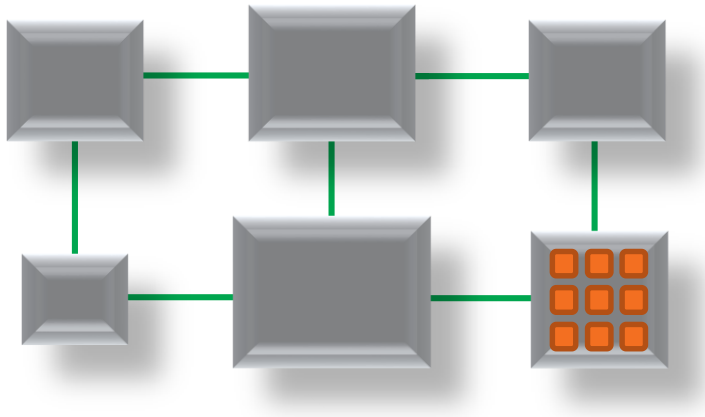
- Small number of homogenous cores with shared memory
- Mostly symmetric connectivity (e.g. crossbar)
- Limited impact on SW distribution

Many-Core

- Larger number of **heterogeneous cores** with distributed memories
- Increasingly **heterogeneous connectivity** (Non-uniform Memory Access)
- High impact on SW distribution

Increasing Computing Power





Today's automotive Multi-Cores already have Many-Core characteristics

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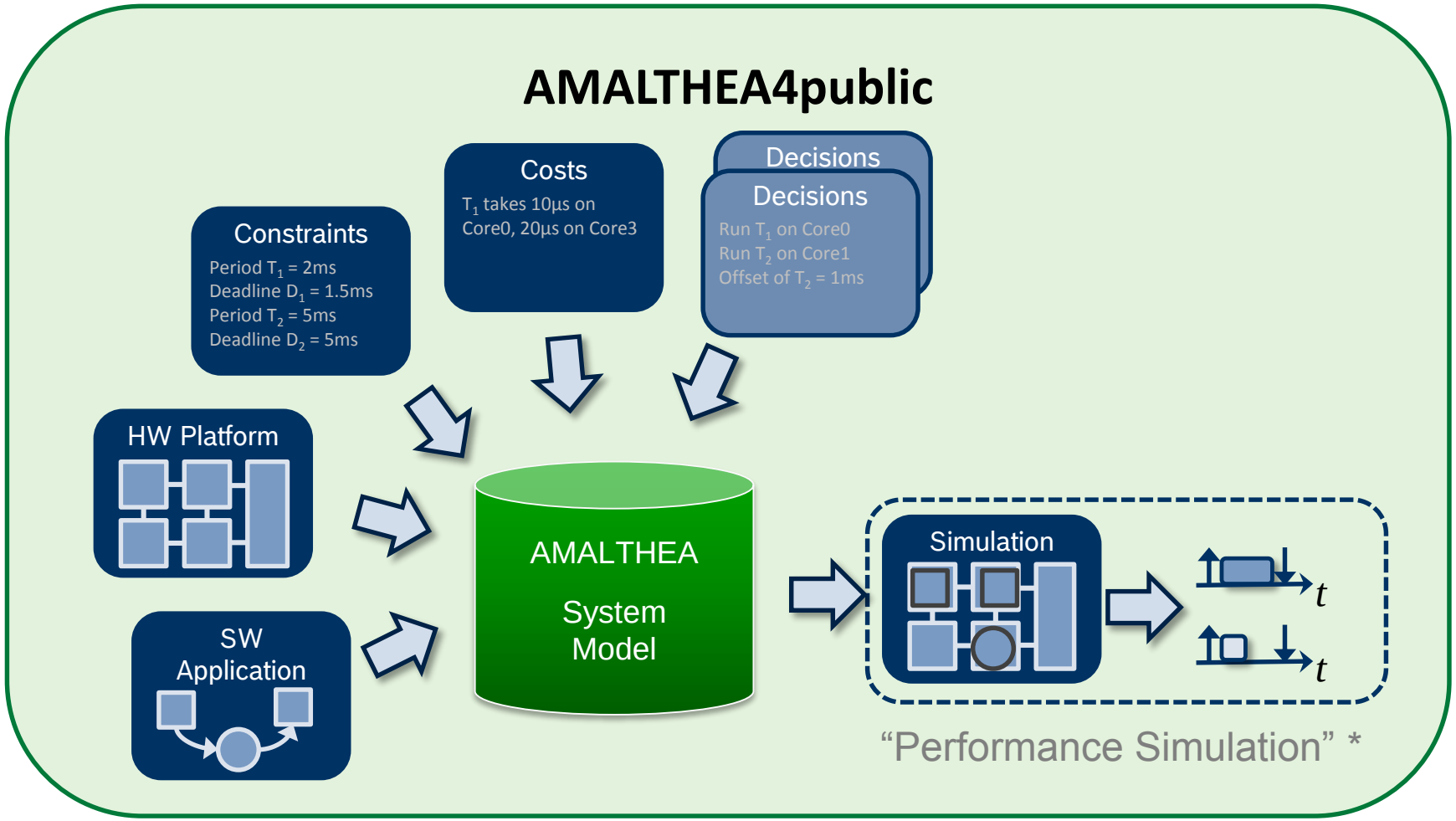
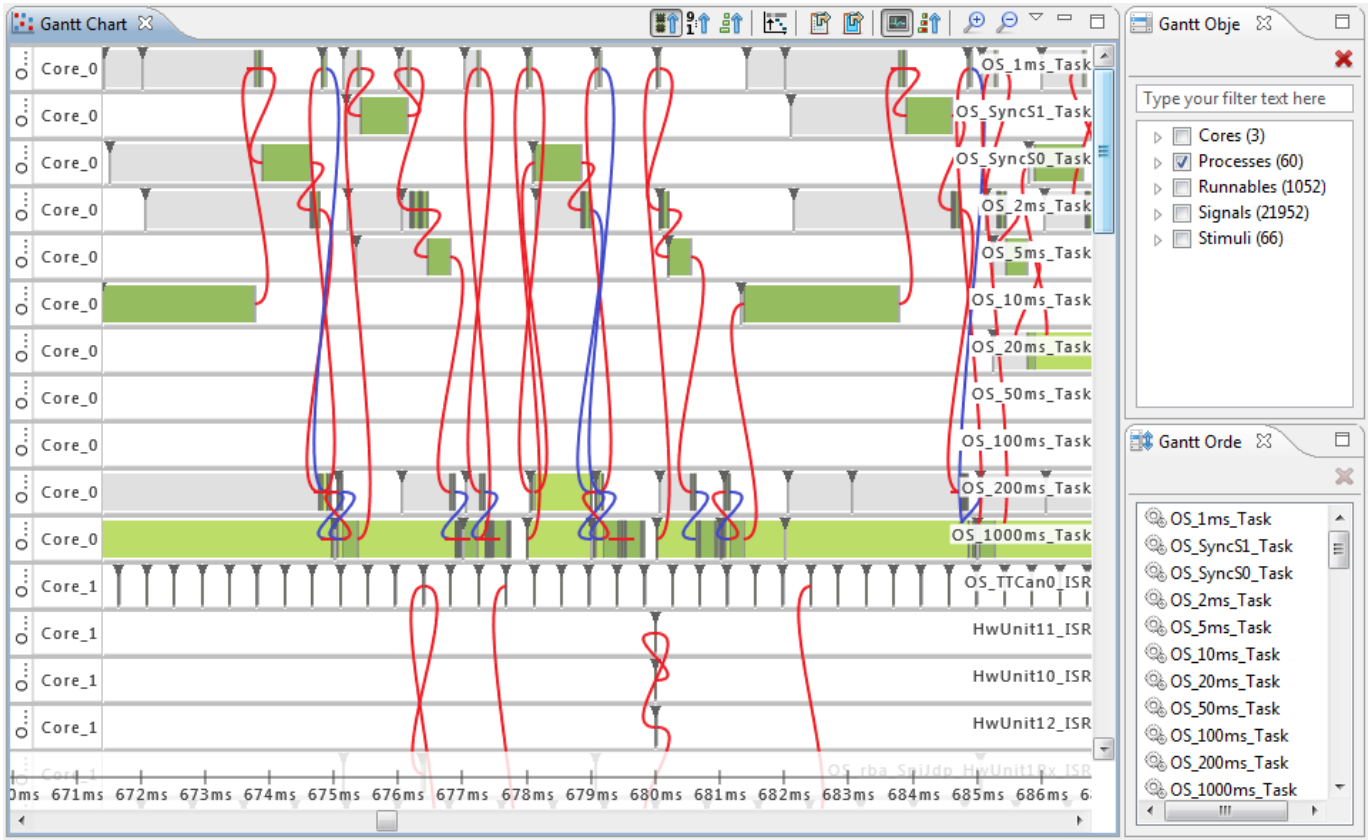
- AMALTHEA - Timeline and current project(s)
- Challenges for embedded multi- and many-core systems
- **The AMALTHEA Platform**
  - **High level description**
  - **Use cases**
  - **Connections to other Eclipse projects**
  - **Technical decisions and experiences**
- Demo / Screenshots of current release
- APP4MC - Next steps

Tool platform AMALTHEA
Processing, Simulation and Analysis



* Focus on Timing, Scheduling

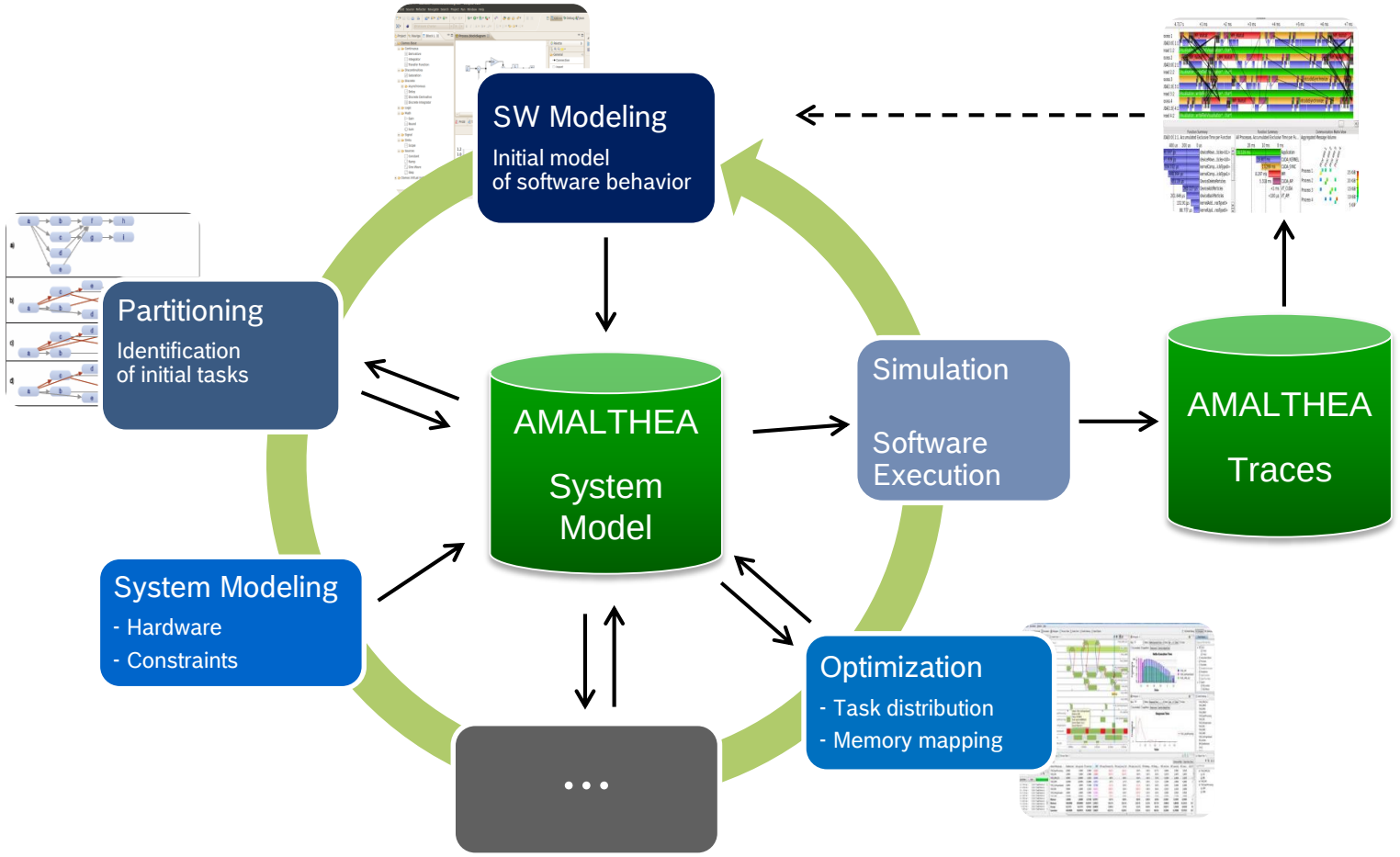
Performance Simulation



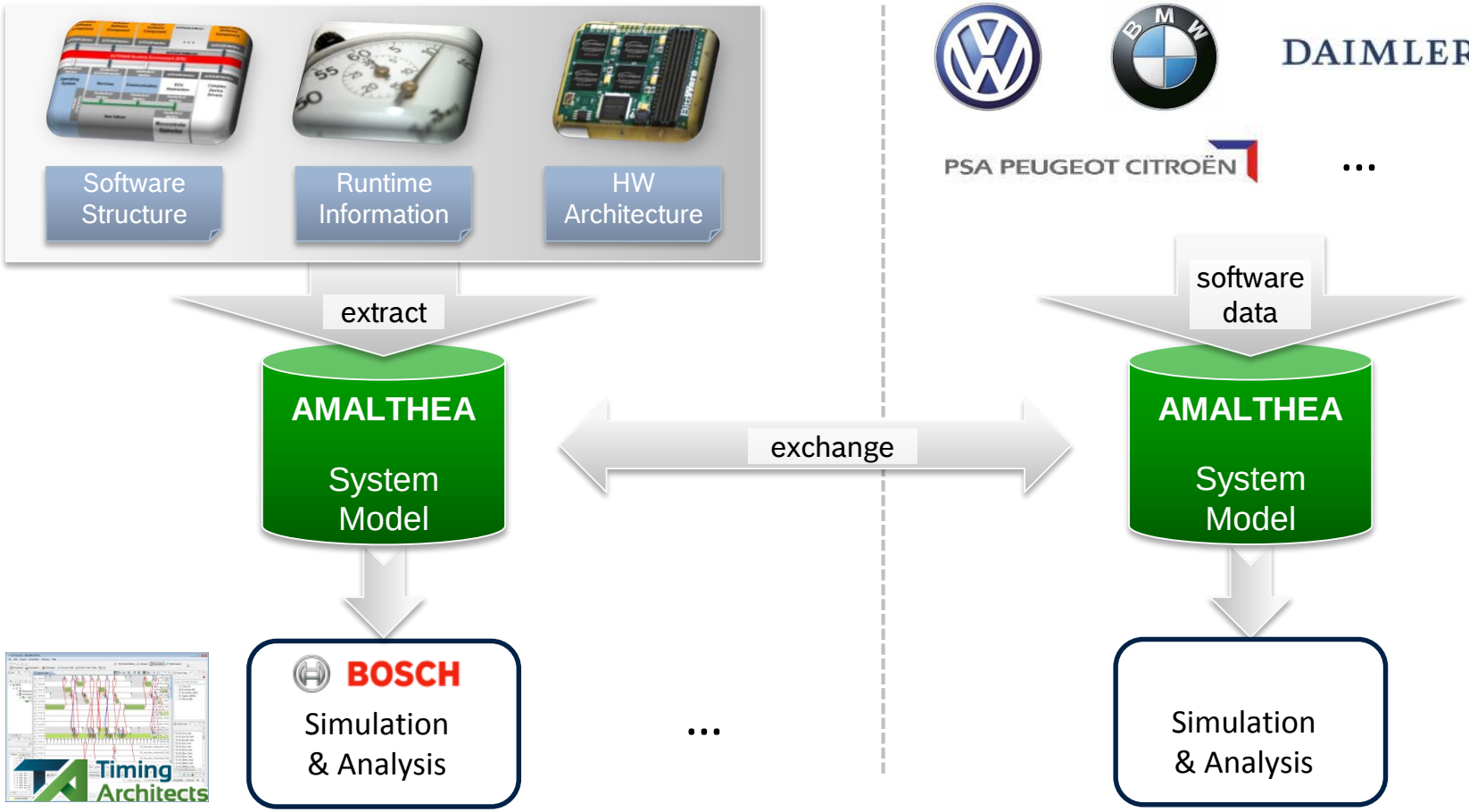
Example of a timing / scheduling simulation*

*Commercial tool – not part of the open source project

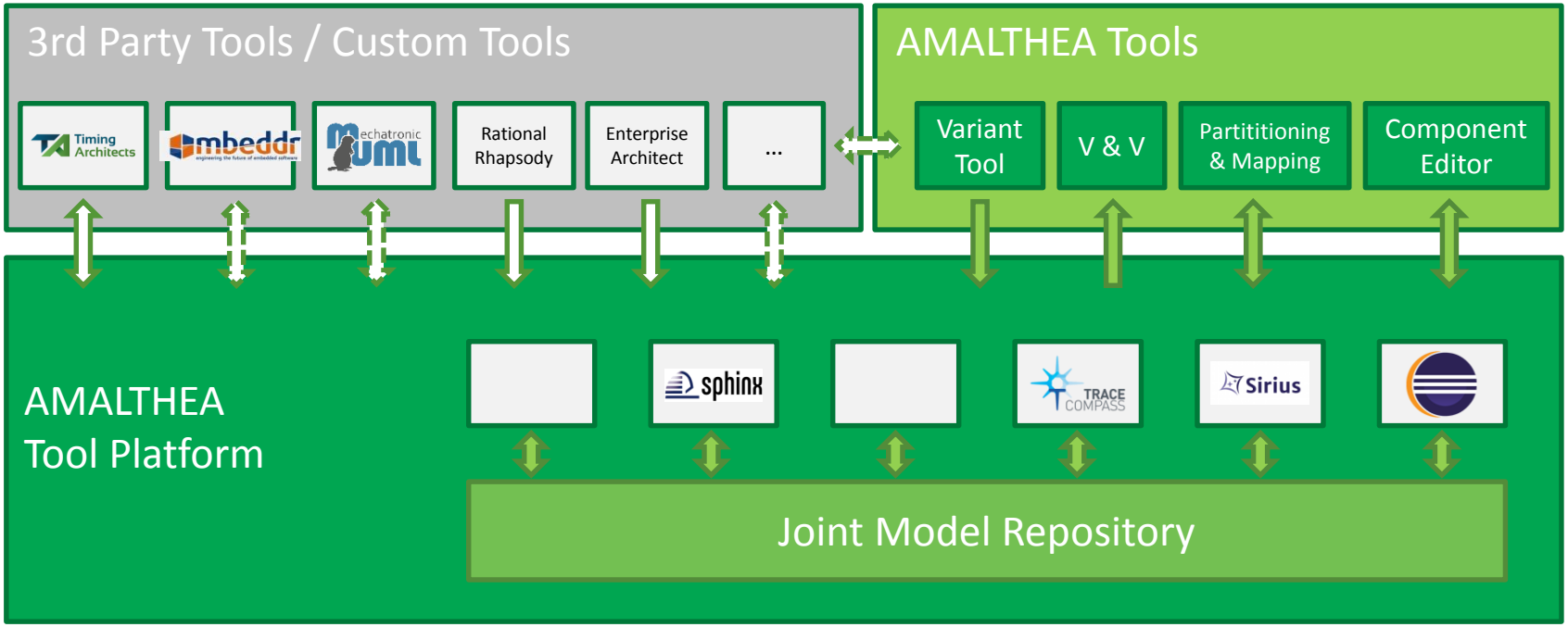
Tool platform AMALTHEA
Processing, Simulation and Analysis



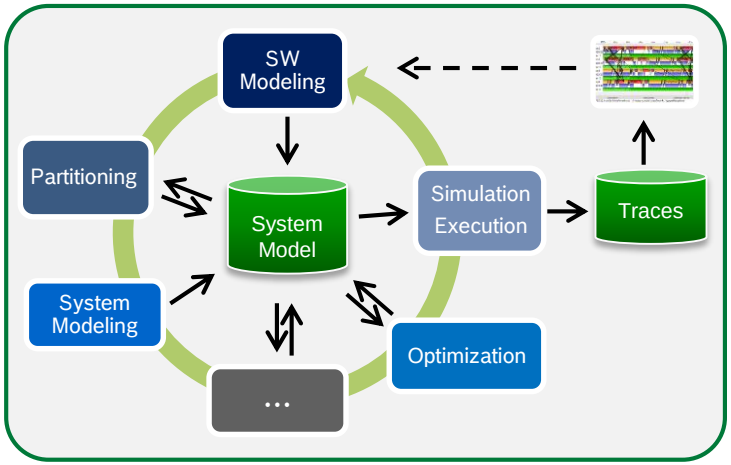
Tool platform AMALTHEA
Use cases @ BOSCH



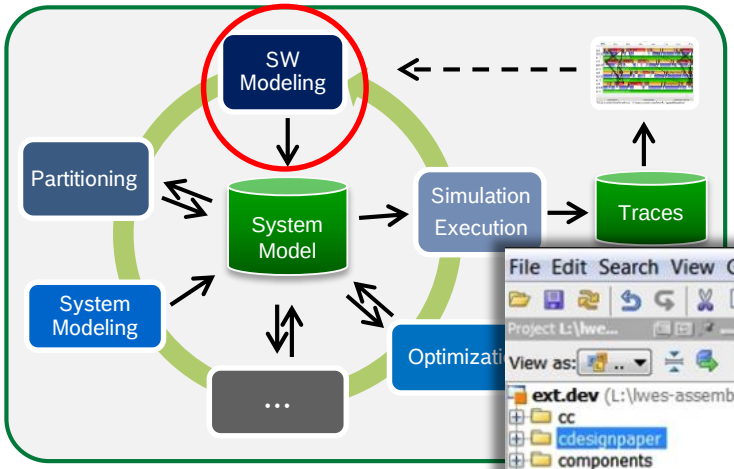
Tool platform AMALTHEA
Platform Architecture

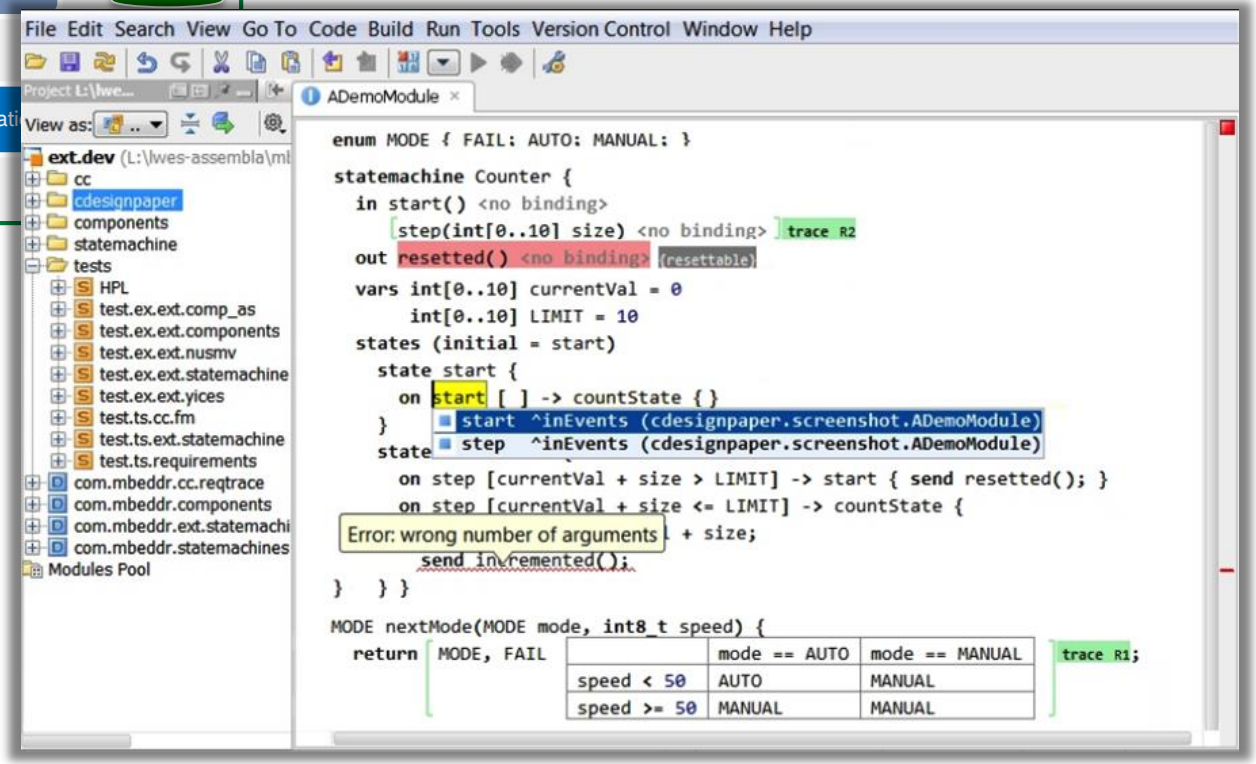


Tool platform AMALTHEA
Connection to other Eclipse Projects



Tool platform AMALTHEA
Connection to other Eclipse Projects



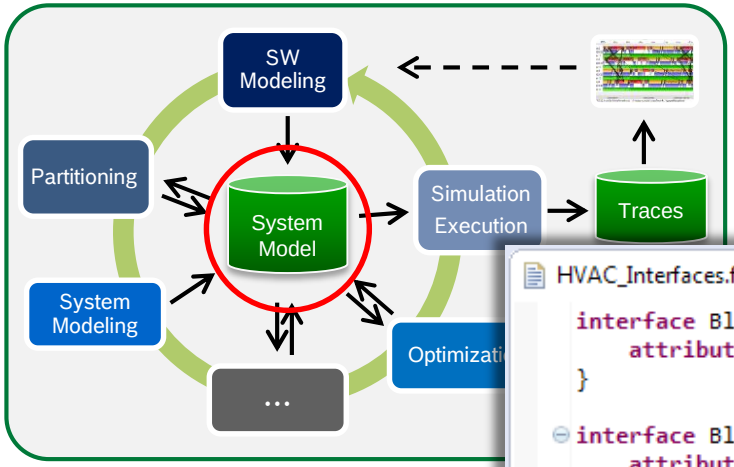


engineering the future of embedded software

planned extension

- Timing Annotations

Tool platform AMALTHEA
Connection to other Eclipse Projects



HVAC_Interfaces.fidl

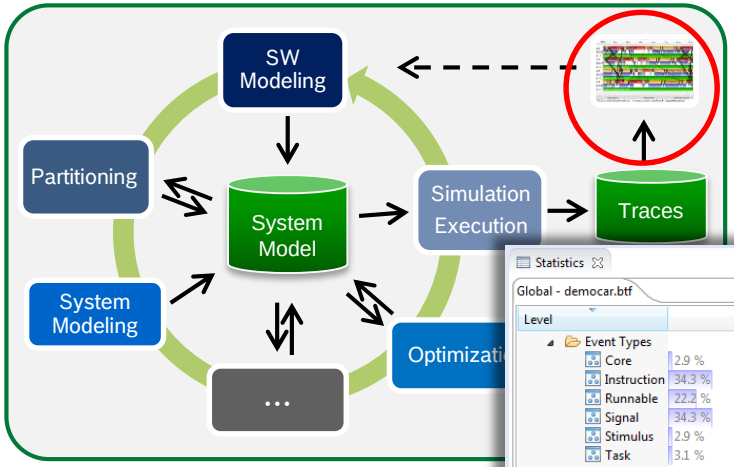
```
interface BlowerCtrl_power {
    attribute UInt16 blwOutValue readonly noSubscriptions
}

interface BlowerCtrl_ctrl {
    attribute UInt16 passThroughValue
    broadcast autoMode {}
    broadcast passThroughMode {}
}

interface Temperature {
    attribute UInt16 temp readonly noSubscriptions
}

interface TemperatureAdapter_Signals {
    broadcast turnOn {}
    broadcast turnOff {}
}

interface TemperatureAdapter_Ticks extends HMI_commToggle {
    attribute UInt8 plusTicks readonly noSubscriptions
    attribute UInt8 minusTicks readonly noSubscriptions
}
```

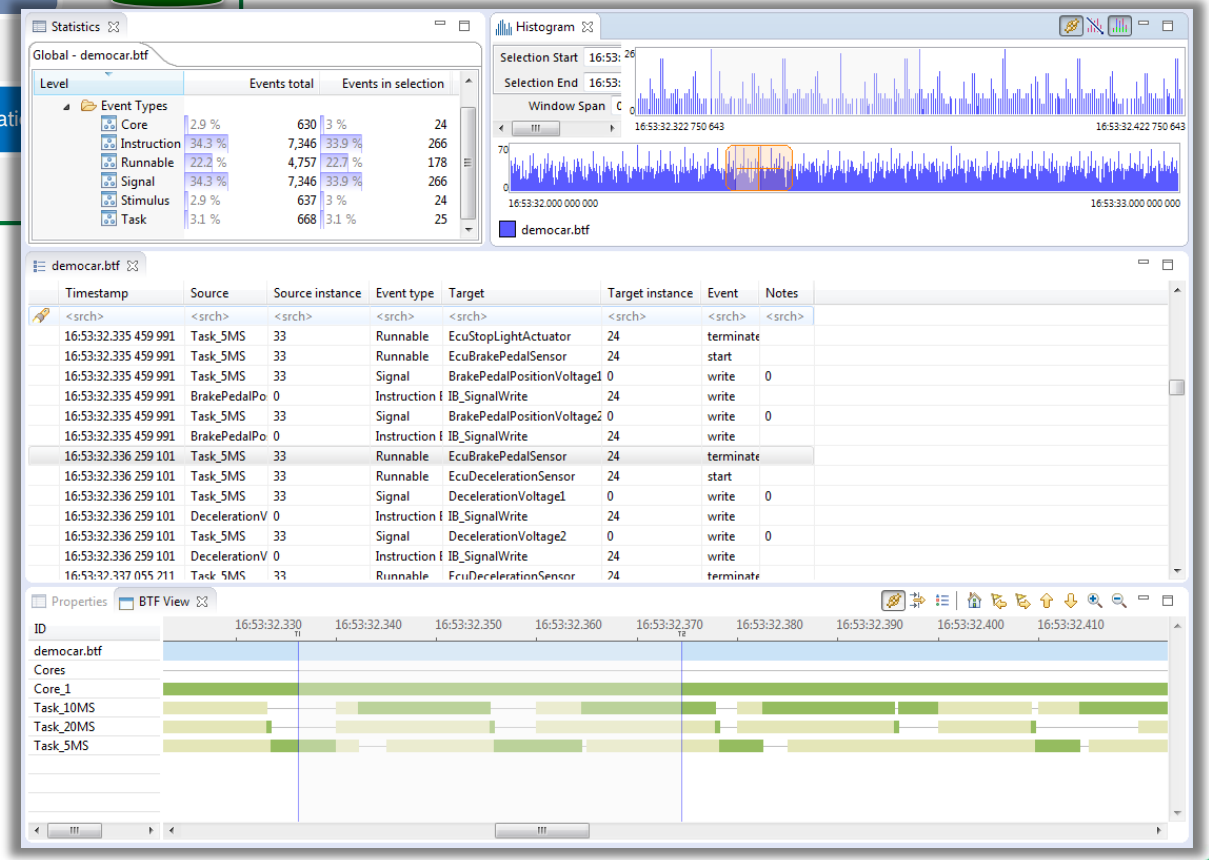
Franca

to describe

- Interfaces

Tool platform AMALTHEA
Connection to other Eclipse Projects





TRACE COMPASS

implemented

- BTF Import
- BTF View

Tool platform AMALTHEA
Eclipse Technology

- **Eclipse IDE for Automotive Software Developers**
- **Xcore**

-> Definition of the AMALTHEA Ecore model

- **Sphinx**

-> Workspace Handling, Validation, Tree Editor

- **Xtend2**

-> Code generation, model transformation

Tool platform AMALTHEA
Eclipse Technology

- **Lyo**

  -> OSLC *(separate Java libraries, no bundles, not included in orbit)*

- **Ecore Tools**

  EcoreTools

  -> Class diagrams *(only limited connection to Xcore models)*

- **Sirius**

  Sirius

  -> Graphical editors (first prototype)

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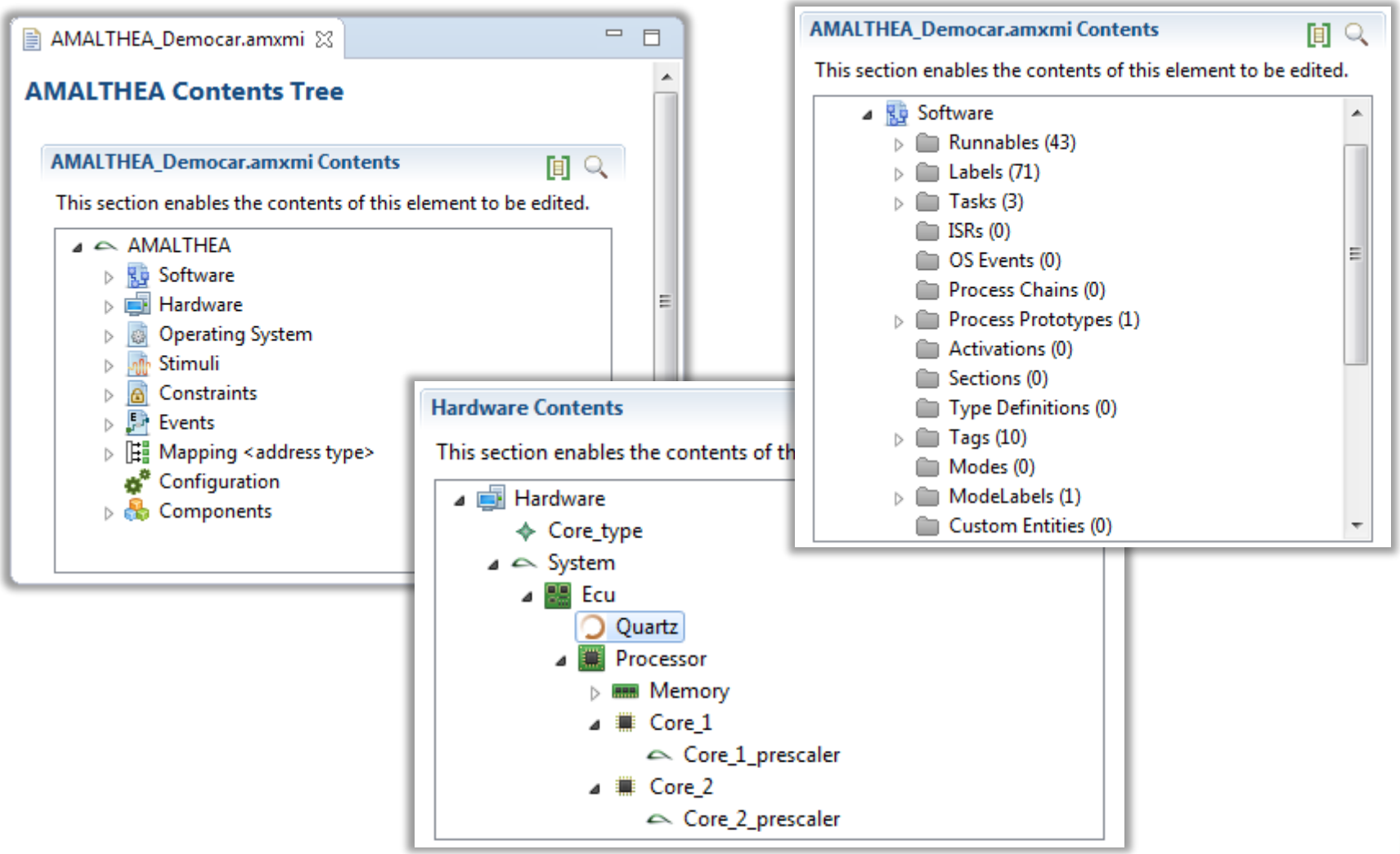
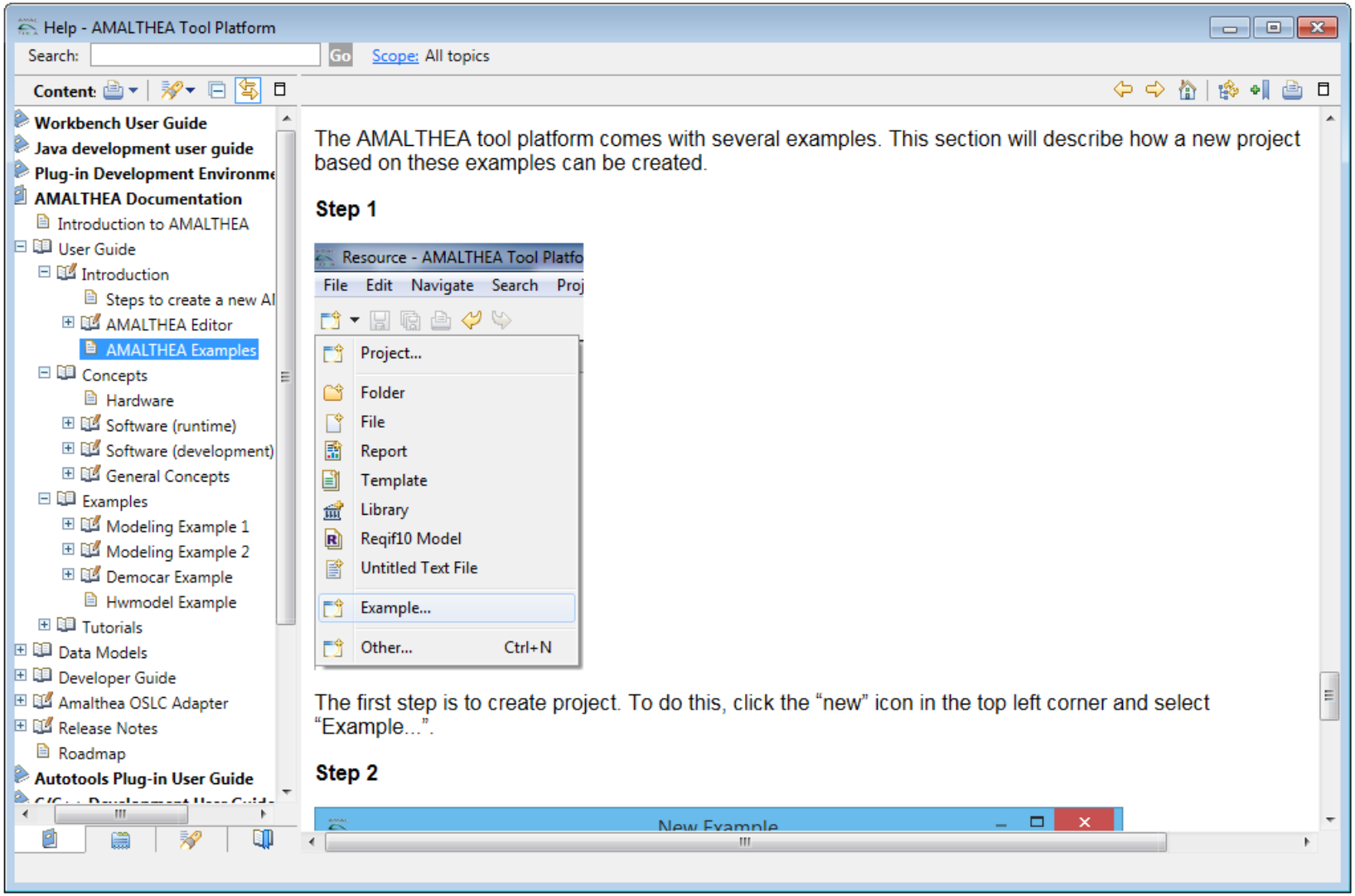
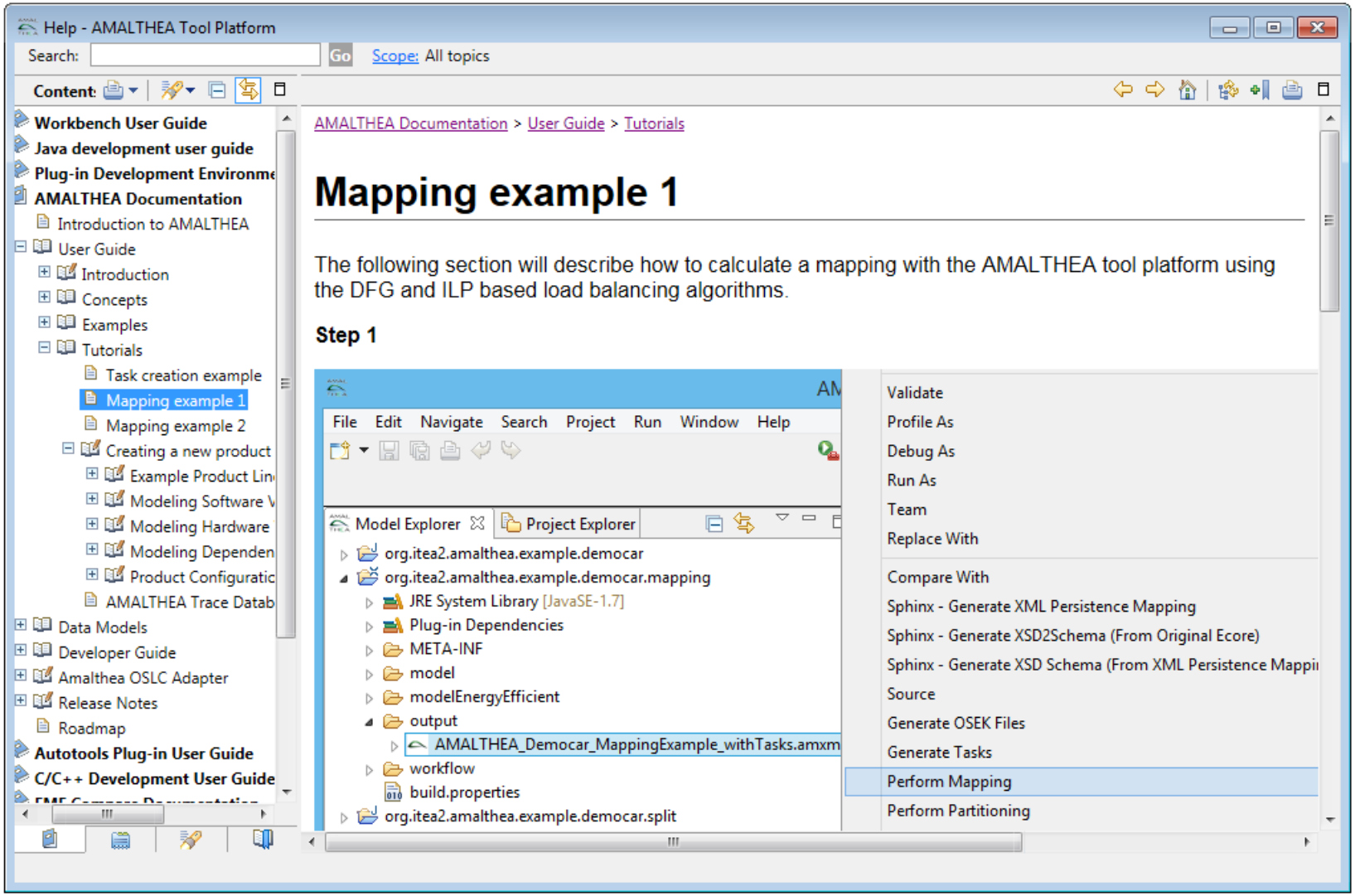
Platform Demo
AMALTHEA Model Editor



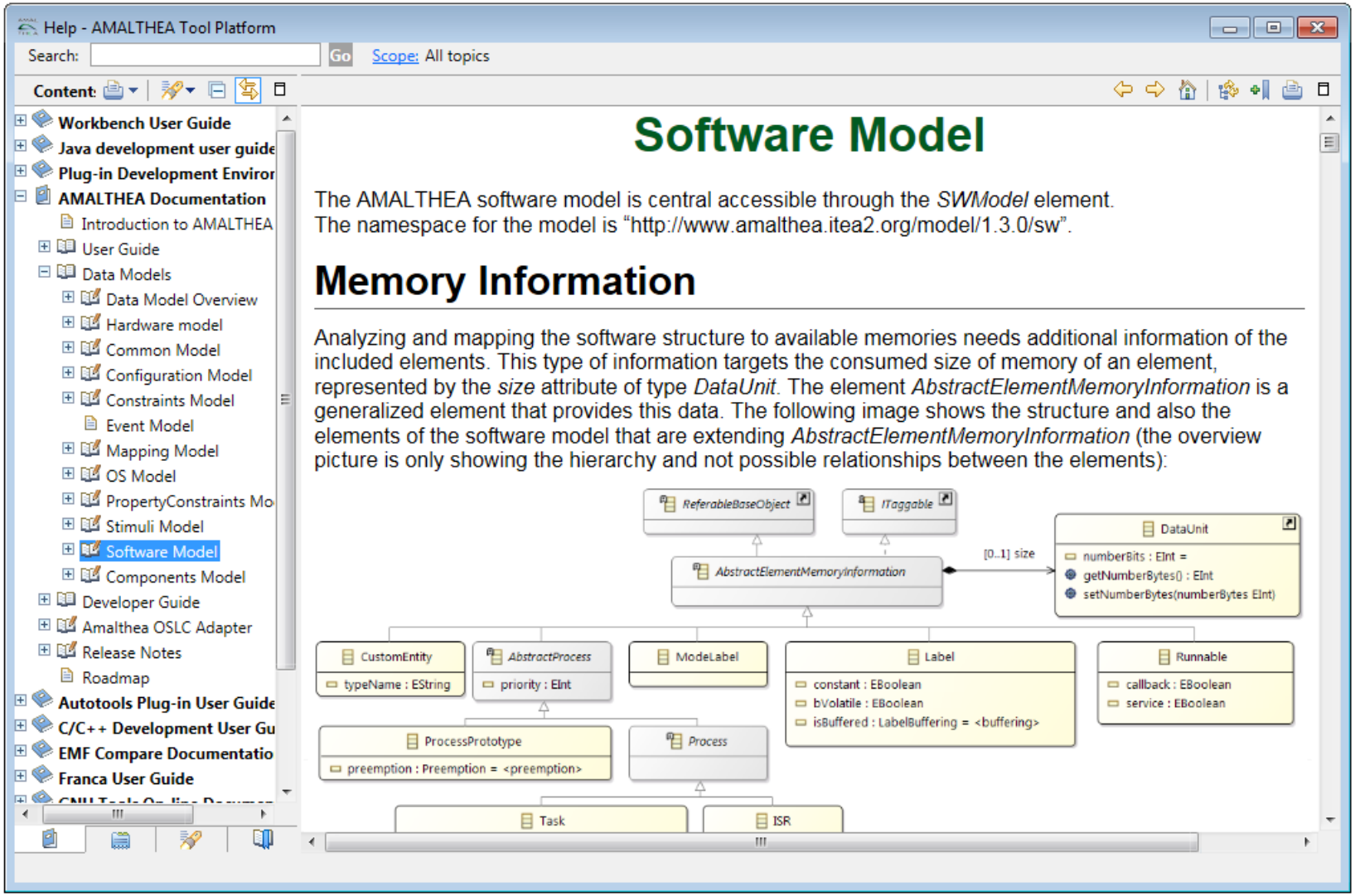
Platform Demo
Eclipse Help – Examples



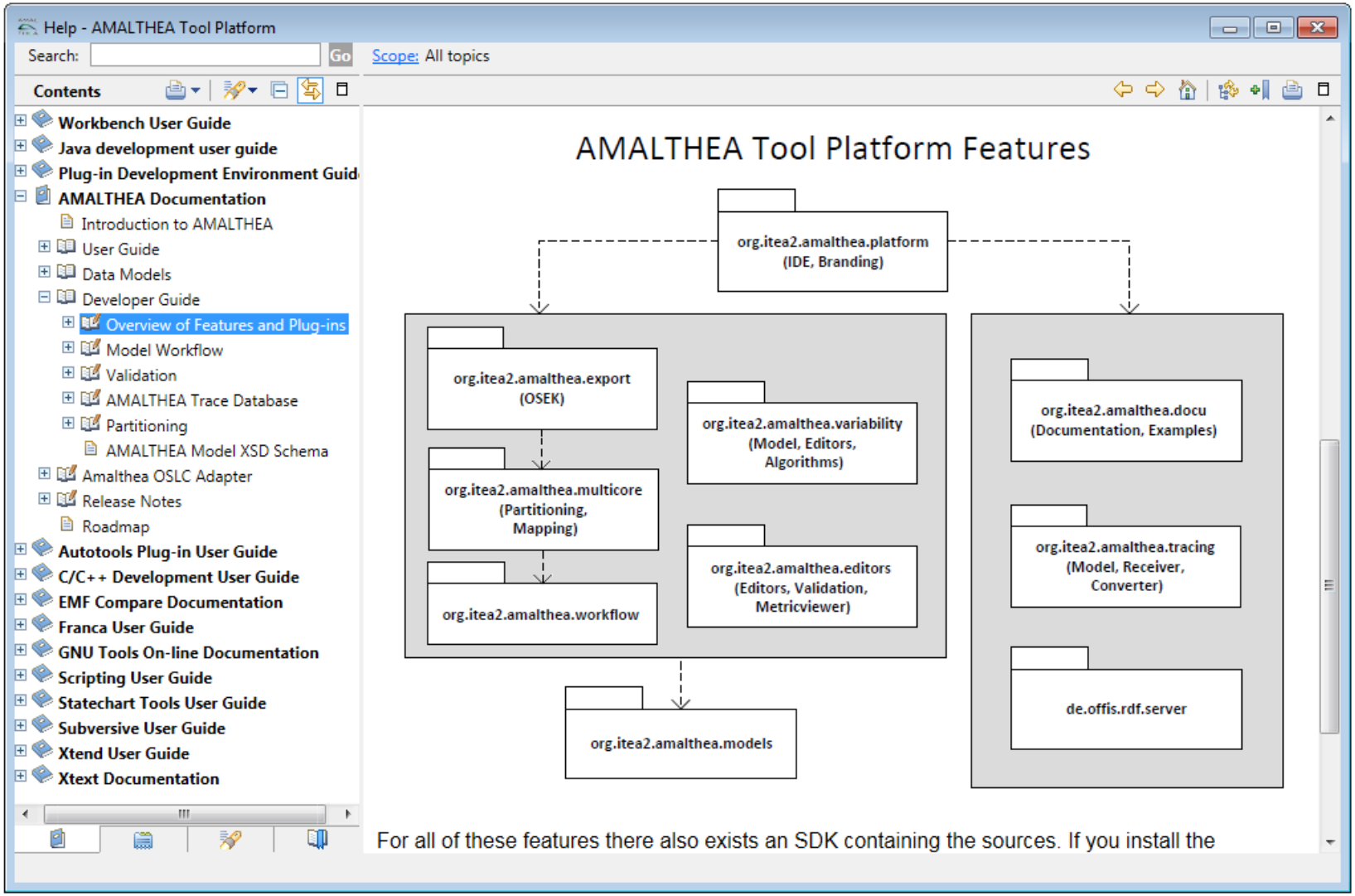
Platform Demo
Eclipse Help – Tutorials



Platform Demo
Eclipse Help – Data Models



Platform Demo
Eclipse Help – Developer Guide



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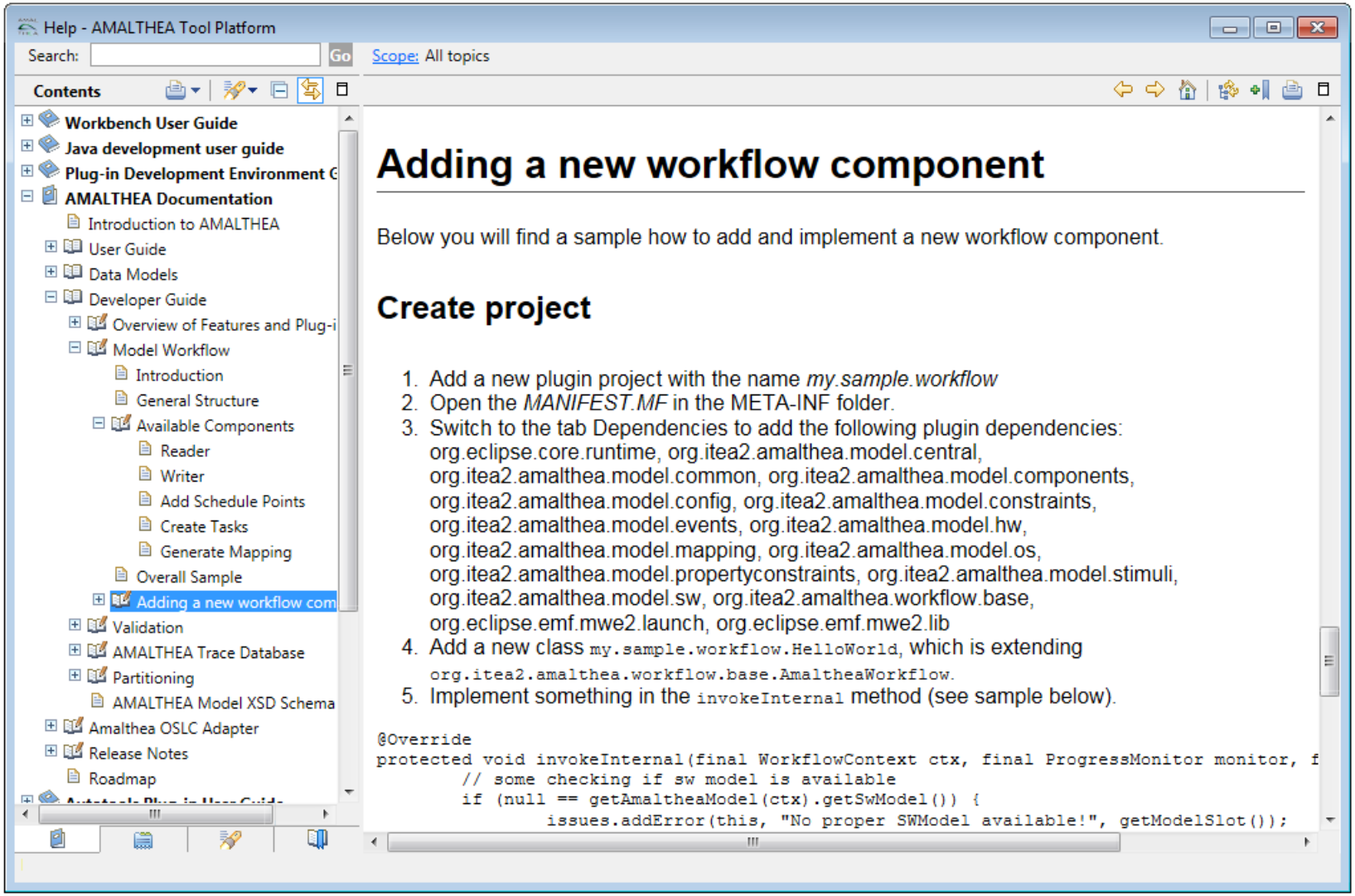

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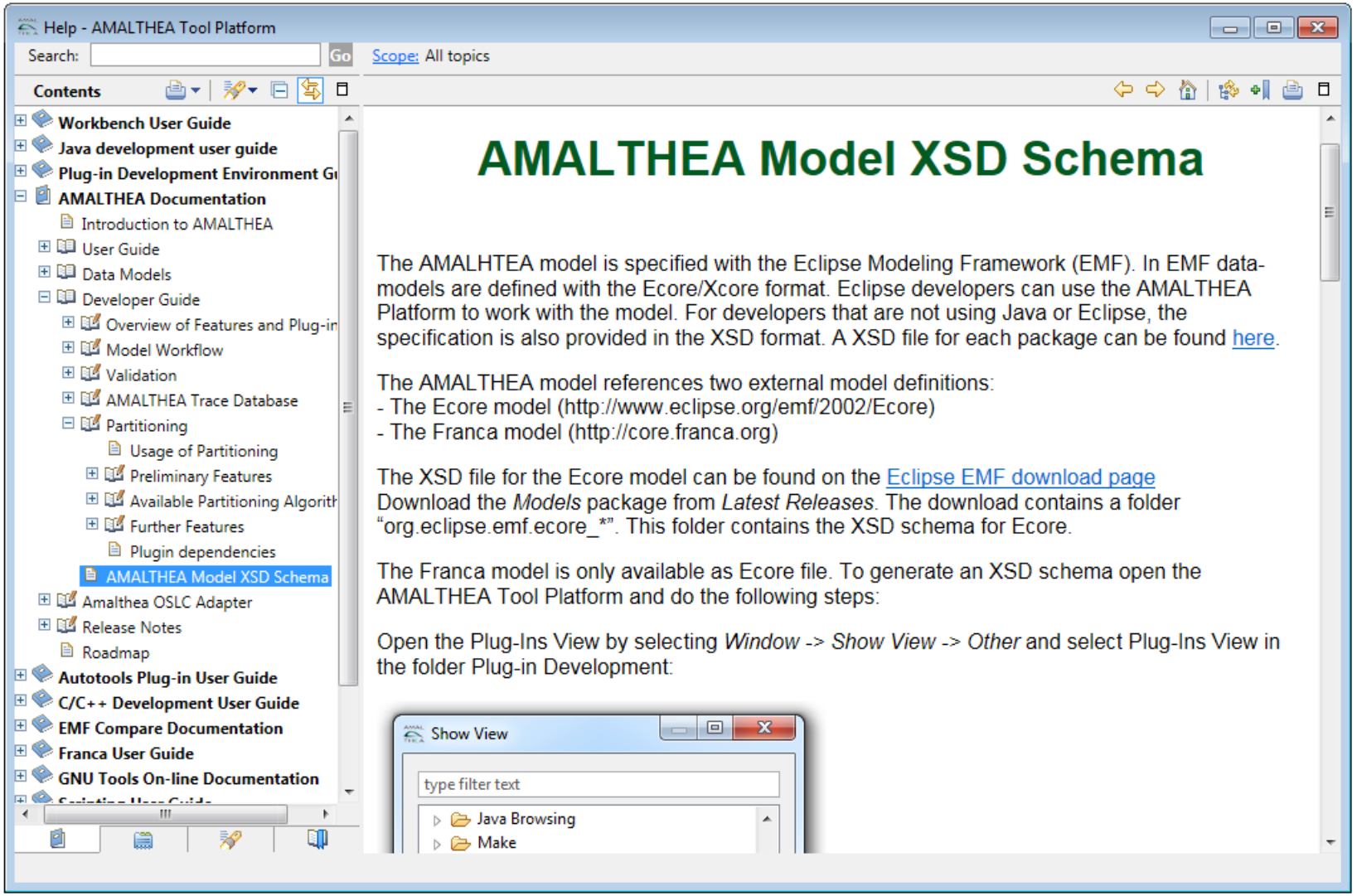

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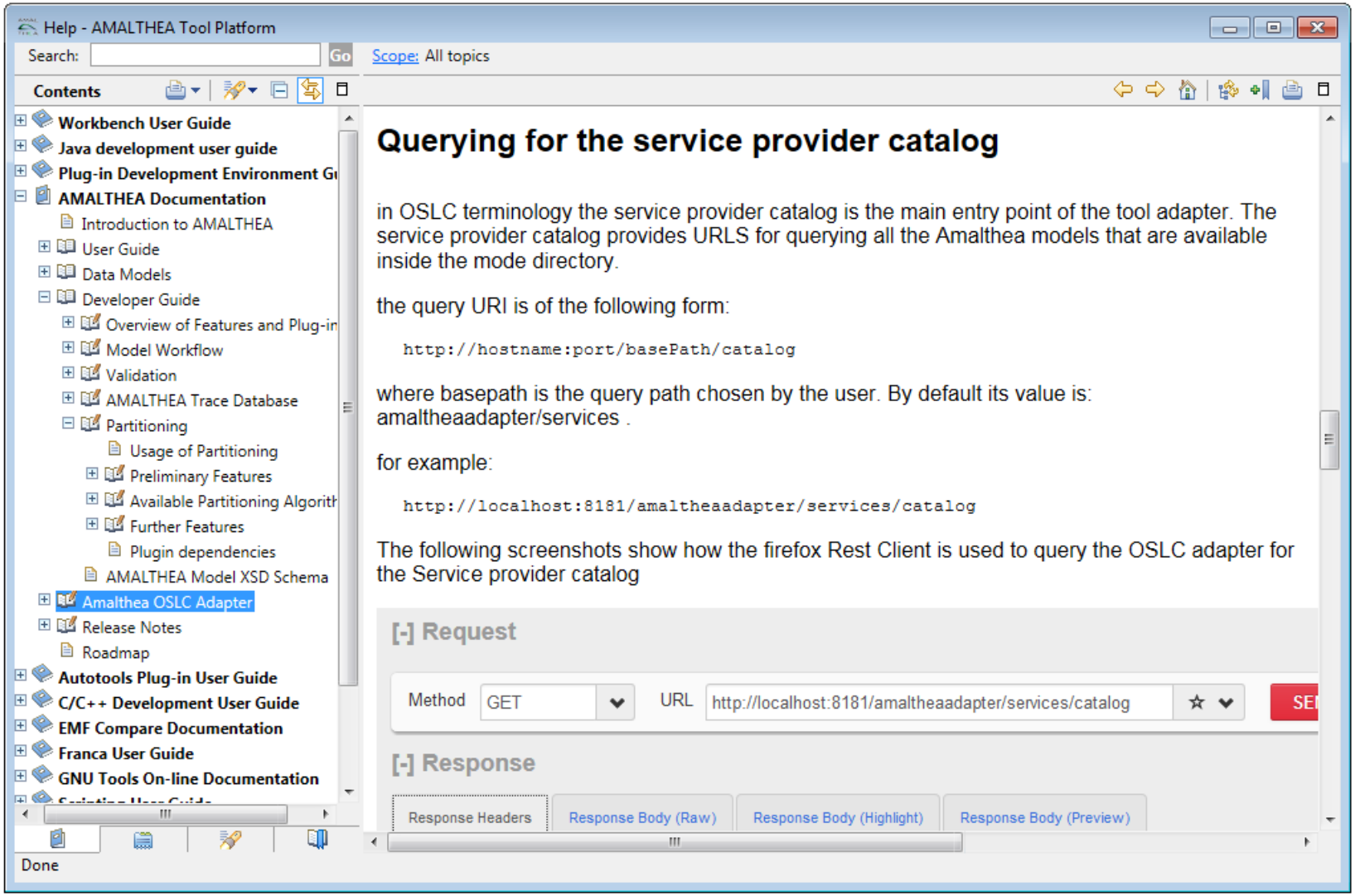

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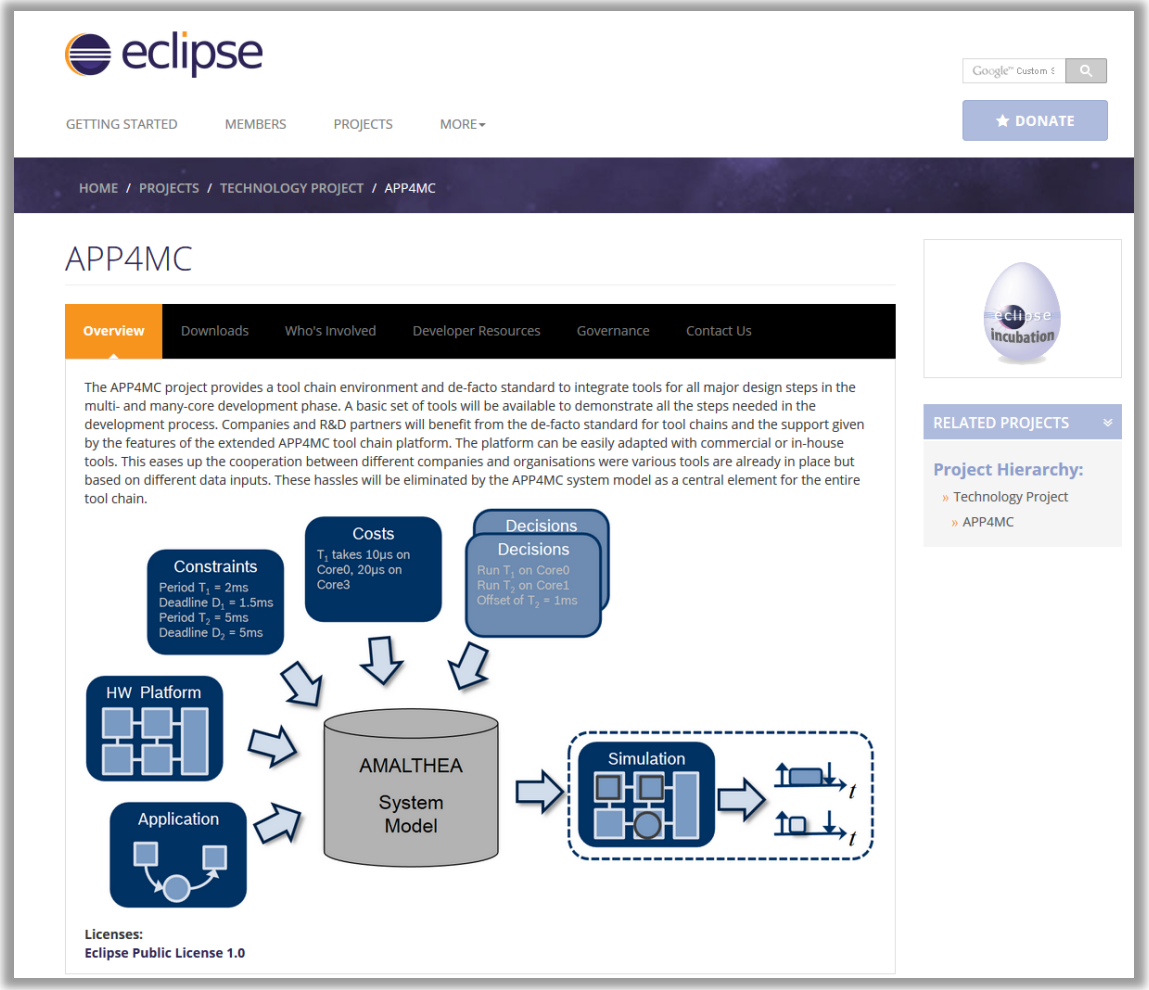
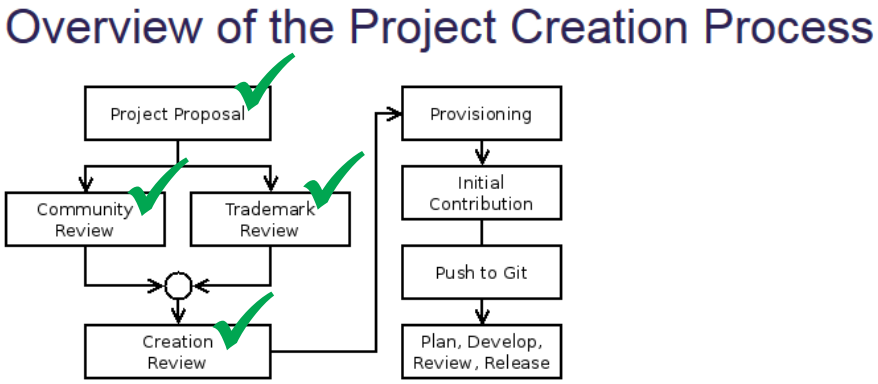
Project Activities
Eclipse Project APP4MC



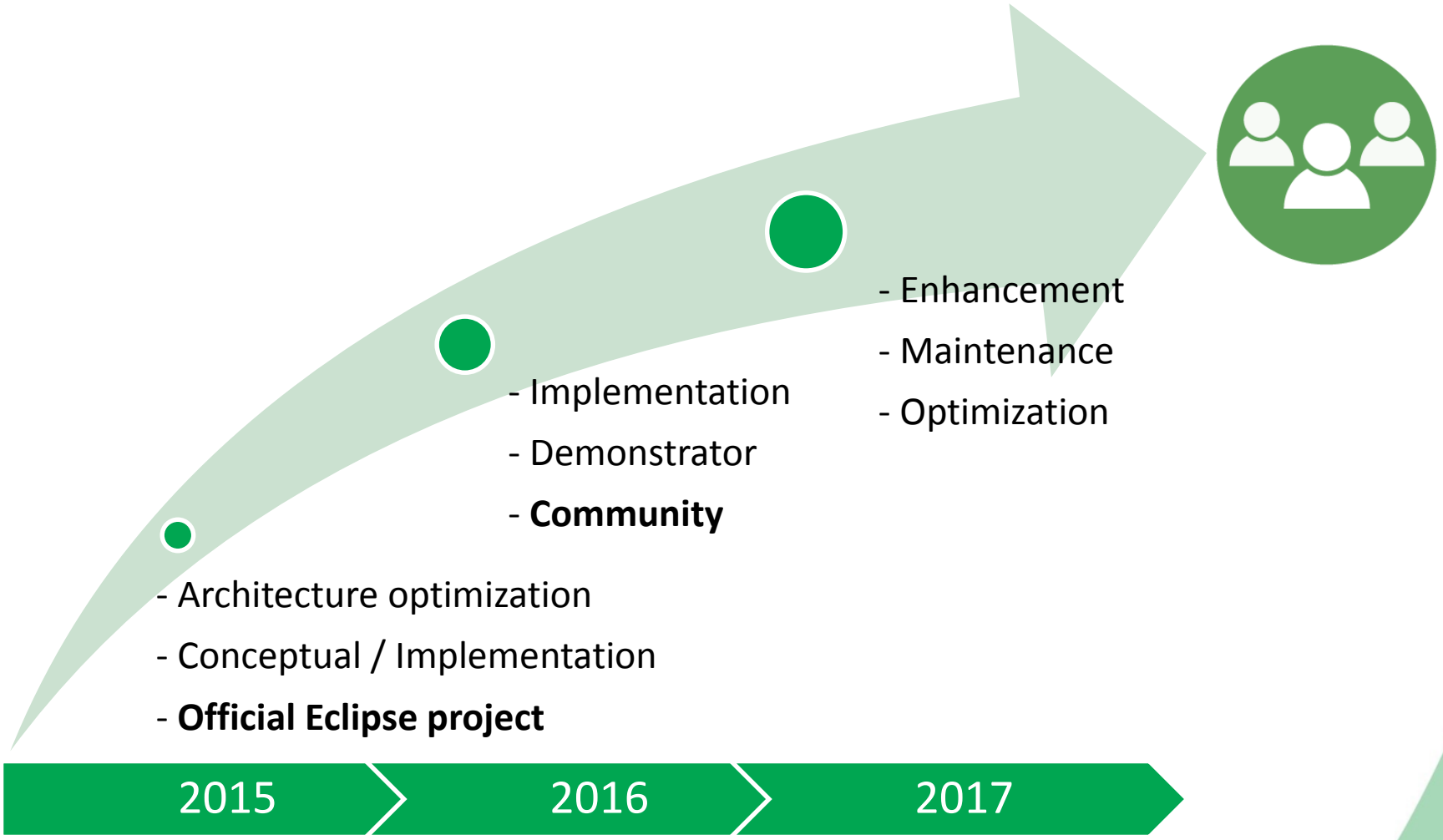
http://projects.eclipse.org/projects/technology.app4mc

Project Activities
Eclipse Project APP4MC

- Open Source **Eclipse project** is created
- Current work: Committer Agreements, Code refactoring, IP clearance, …



Project Activities
Timeline & future activities



Evaluate the session