

AMALTHEA

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Robert Bosch GmbH

Model Based Open Source
Development Environment Platform
for Embedded Multi-Core Systems



ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

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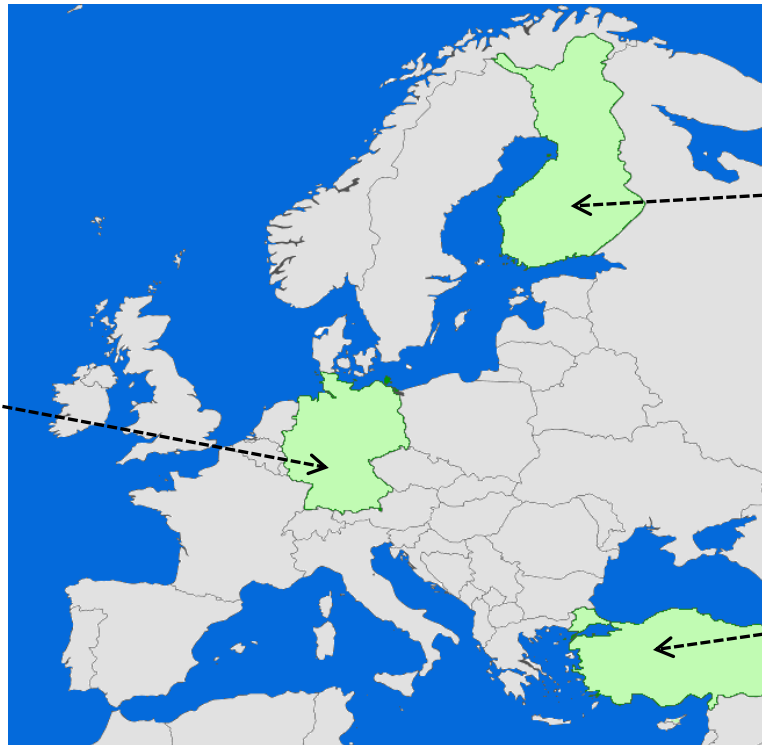
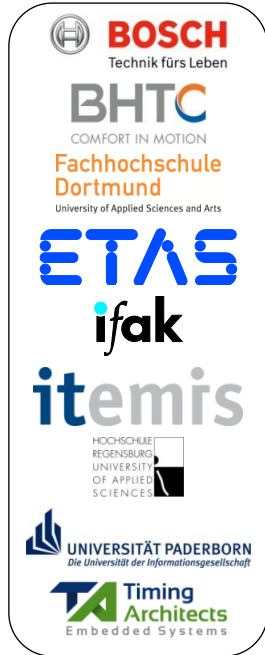
Federal Ministry
of Education
and Research



TEKES



The Project

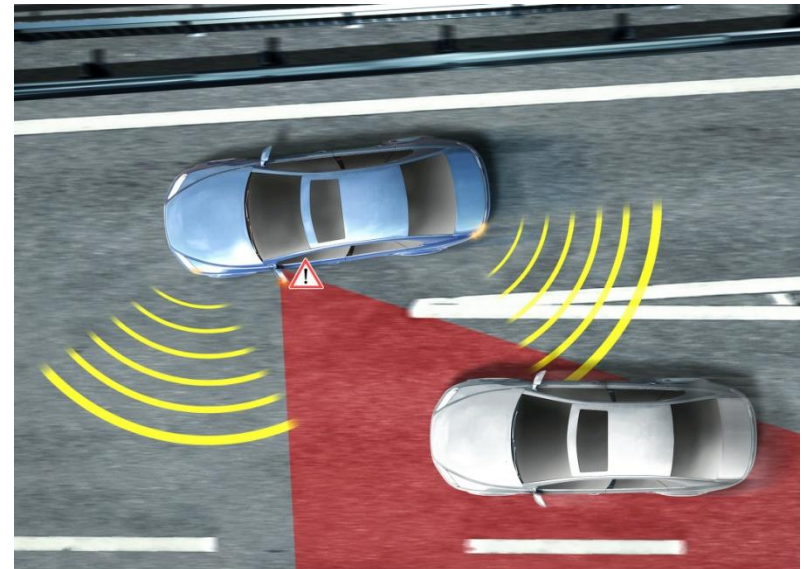
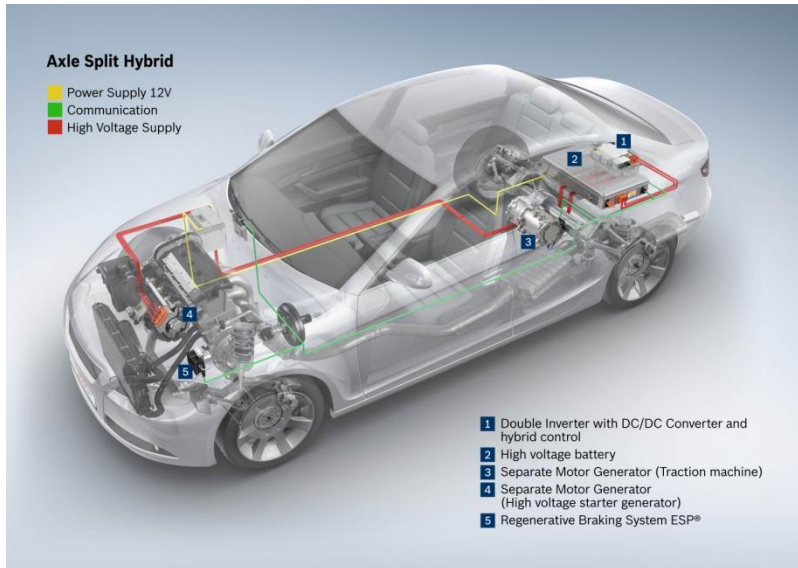


Start 1.7.2011
End 30.4.2014



Total effort: 60 PY

Embedded Software Systems



Source: BOSCH

Boost of
functionality



Need for

- processing power
- standardized architecture
- better tool support

Embedded Software Systems

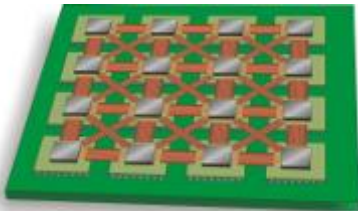


The Limits

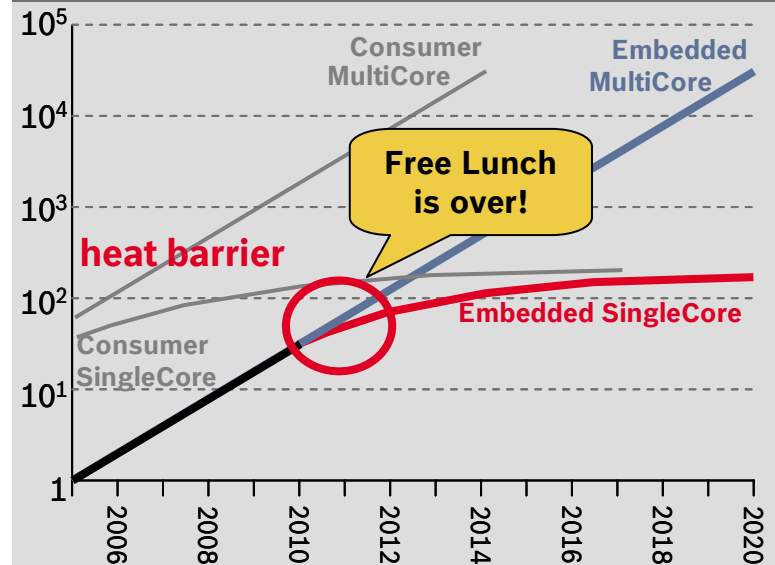
- Technological limits of serial computing
 - » Power wall
 - » Memory bandwidth wall

The Solution

- Parallelism
 - » Embedded MultiCore

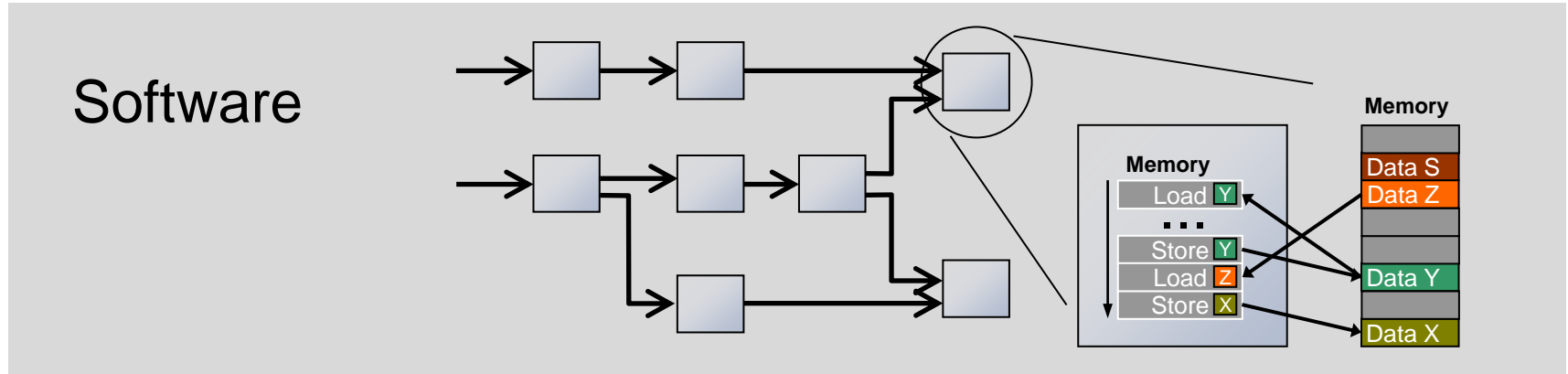


Computational performance, normalized to automotive embedded performance 2005



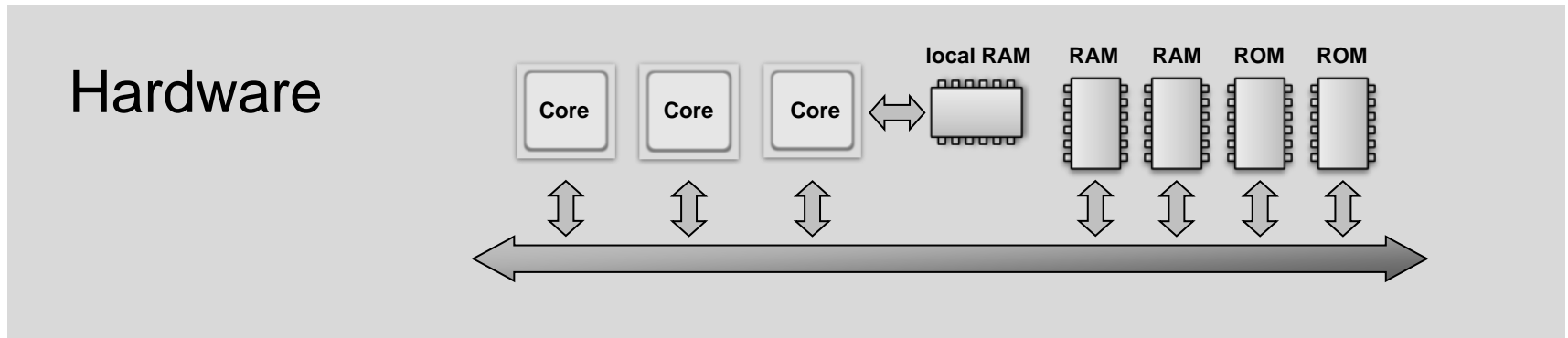
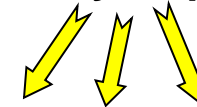
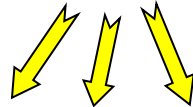
- MultiCore performance, embedded automotive
- SingleCore performance, embedded automotive
- Computational performance, consumer applications

The Challenge of Parallelism



Software Distribution

Memory Mapping



The Challenge of Parallelism



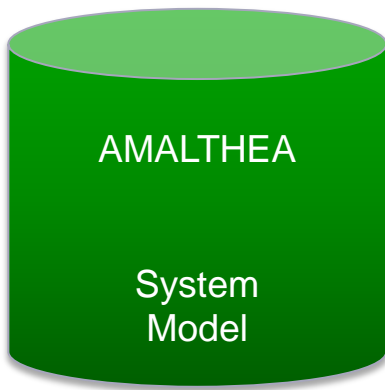
1.000.000 Lines of code
20.000 Signal-Definitions
500 Functions
50.000 Dependencies

Goals

- Efficient multi-core development
 - Methodological framework
 - High quality parallel processing
- AUTOSAR compatibility
- Support for product line engineering
- Continuous tool chain platform
 - Open source
 - Eclipse based
 - Open for third party products

Model Based

Model Based Open Source Development Environment Platform



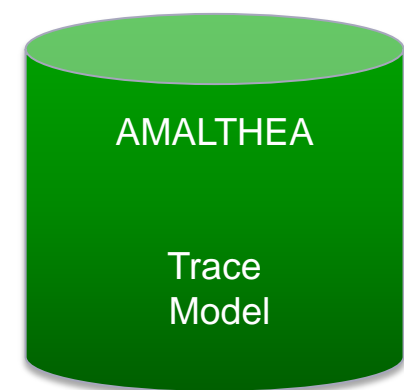
Pre-Processing

SW-Distribution,
Target Mapping,
...



Software Simulation / Execution

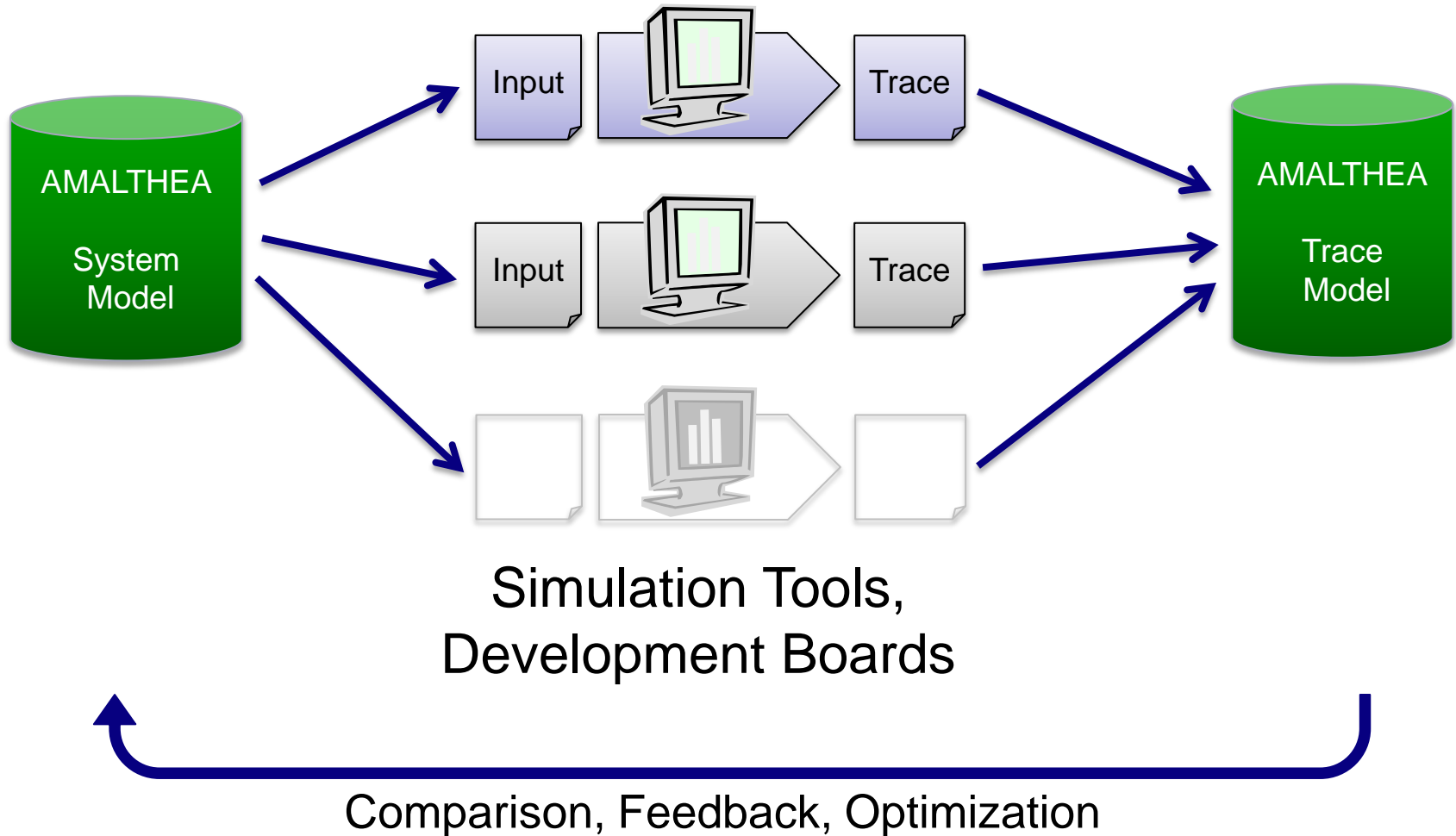
Scheduling, Timing, ...



Analysis

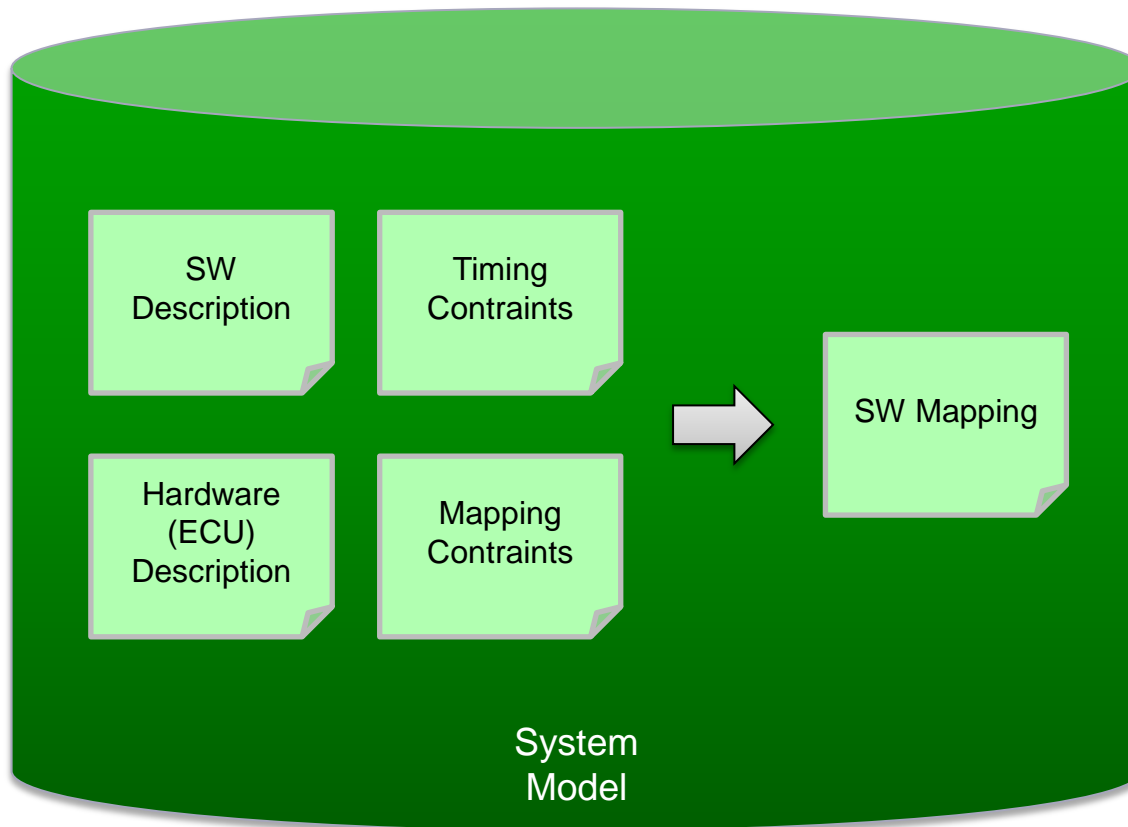
Deadline Miss,
Utilization,
...

Tool Integration / Interoperability



Model Based

Model Based Open Source Development Environment Platform



Open Common Model

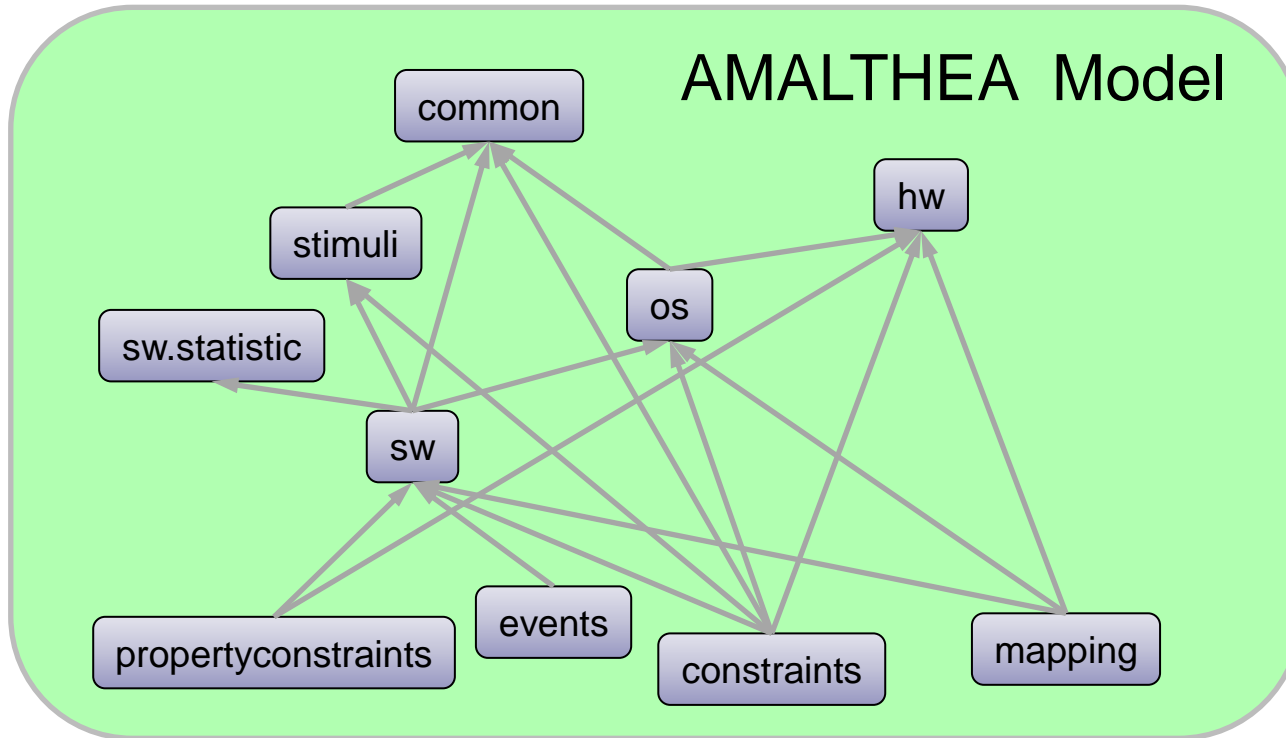
allows

Prototyping

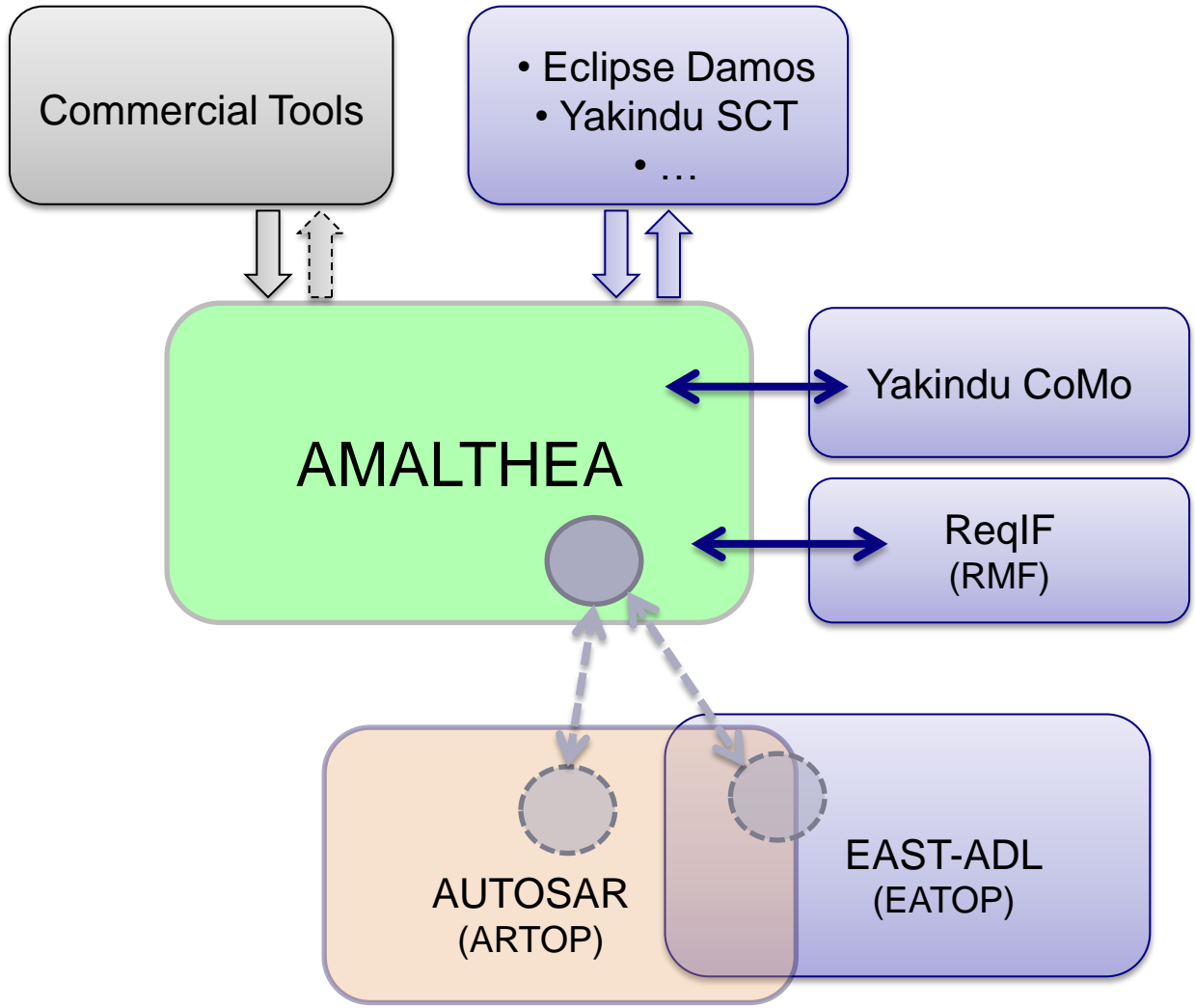
Custom Tooling

Model Exchange

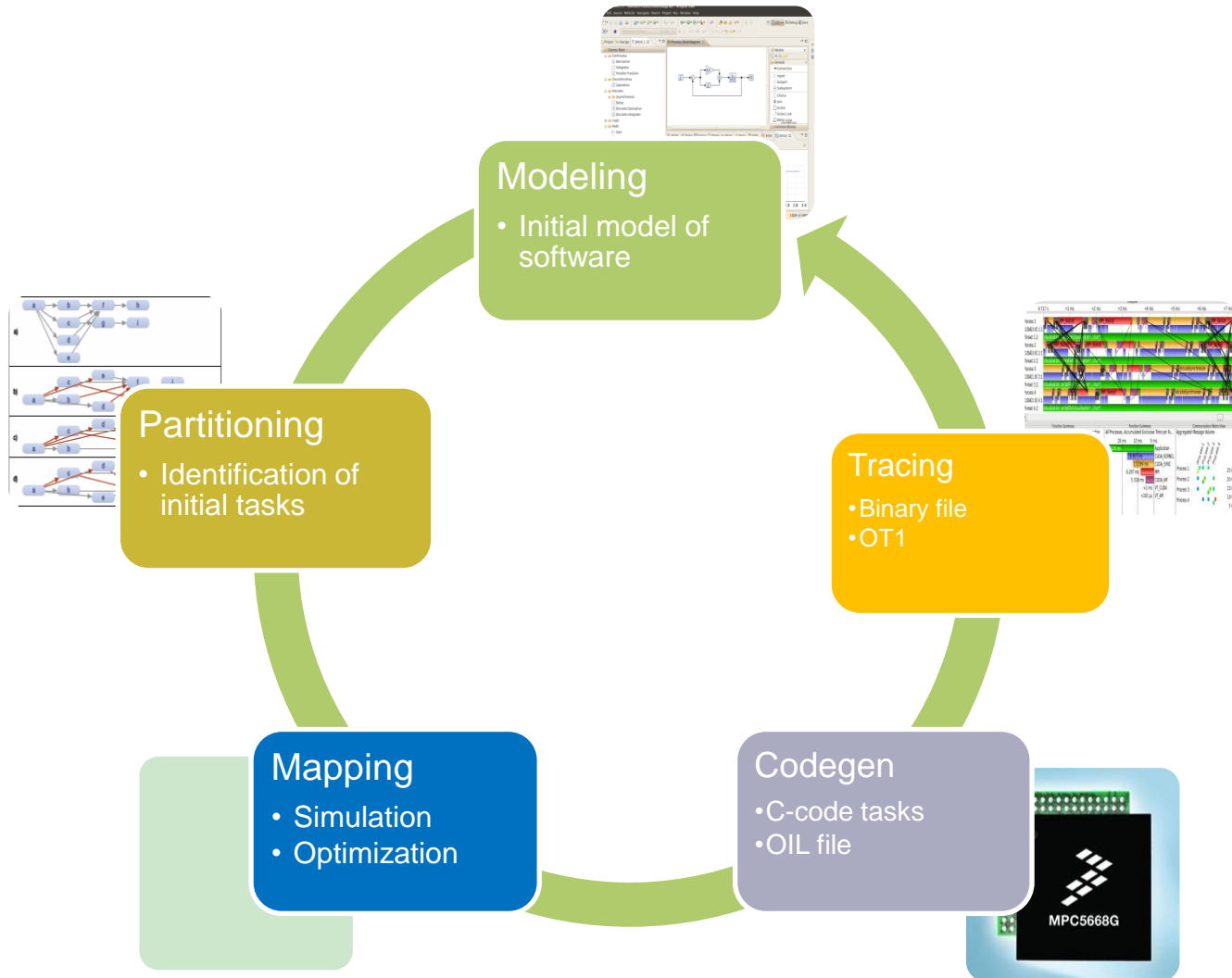
Based on Eclipse Modeling Technology



Relation to other (Eclipse) Projects

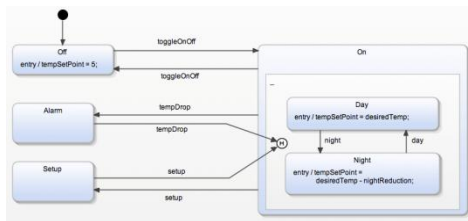
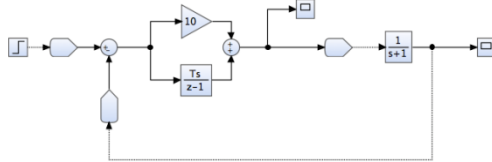


Tools (Eclipse plugins)

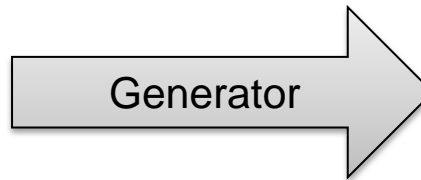


Tools

Eclipse Damos Integration



Damos Models



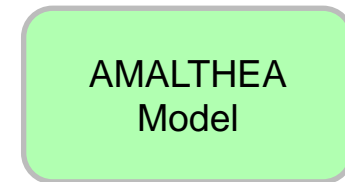
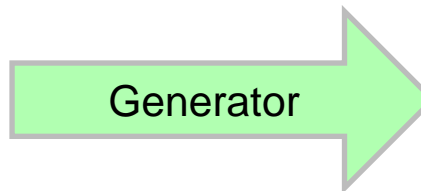
```
class System {
public:
    Scheduler* scheduler;

    InductionLoopComponent* byRoadInduction;
    TrafficLightComponent* byRoadLight;
    TrafficLightComponent* mainRoadLight;
    CrossingControllerComponent* controller;
    TrafficLightControllerComponent* byRoadLightController;
    TrafficLightControllerComponent* mainRoadLightController;

    System(Scheduler& scheduler);
    virtual ~System();

    void connect();
    void raiseTimerEvent(void* handle);
};
```

Code



SW Description

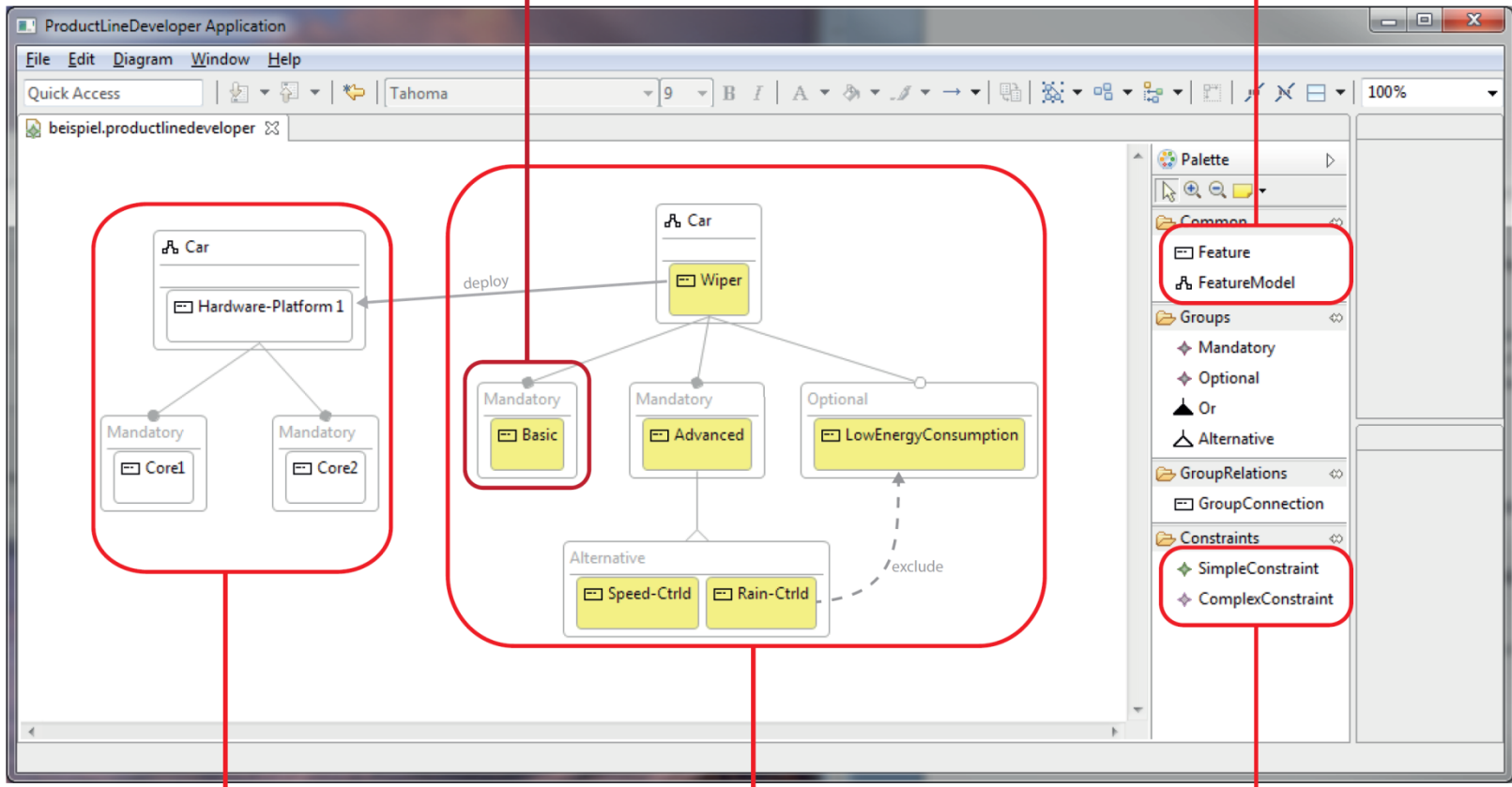
Tools

Product Line Developer



variation point

variant models



target platforms

software variants

constraints

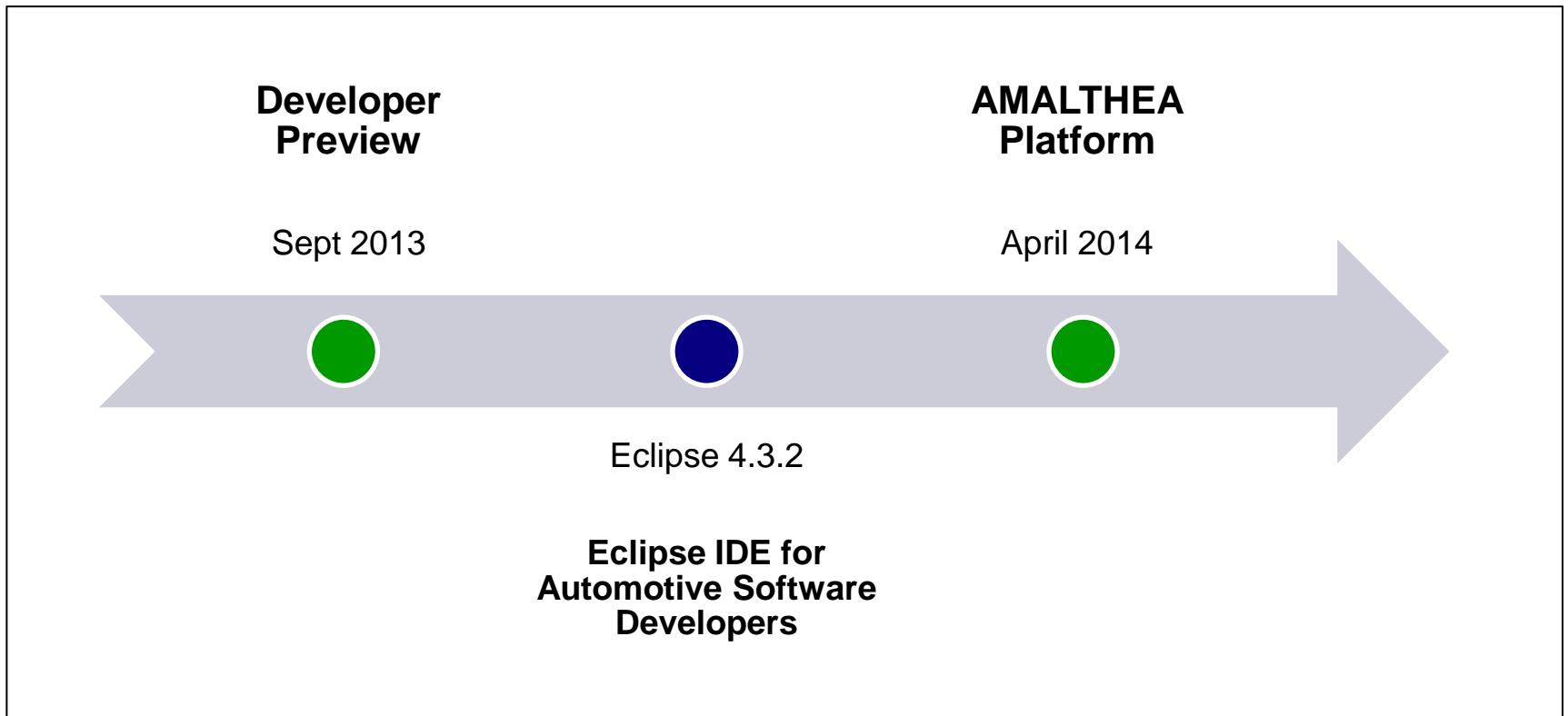
Benefits of an Open Platform

- Shared effort for common tool platform
- De-facto standards for
 - system description (SW, HW, Constraints)
 - analysis
- Combination of different tools is simplified

Roadmap



Public Releases



Open Source



Eclipse Public License



Hosted on Eclipse Labs



Most project partners are Eclipse Members



Cooperation with the Eclipse Automotive Industry Working Group

Follow up Activities

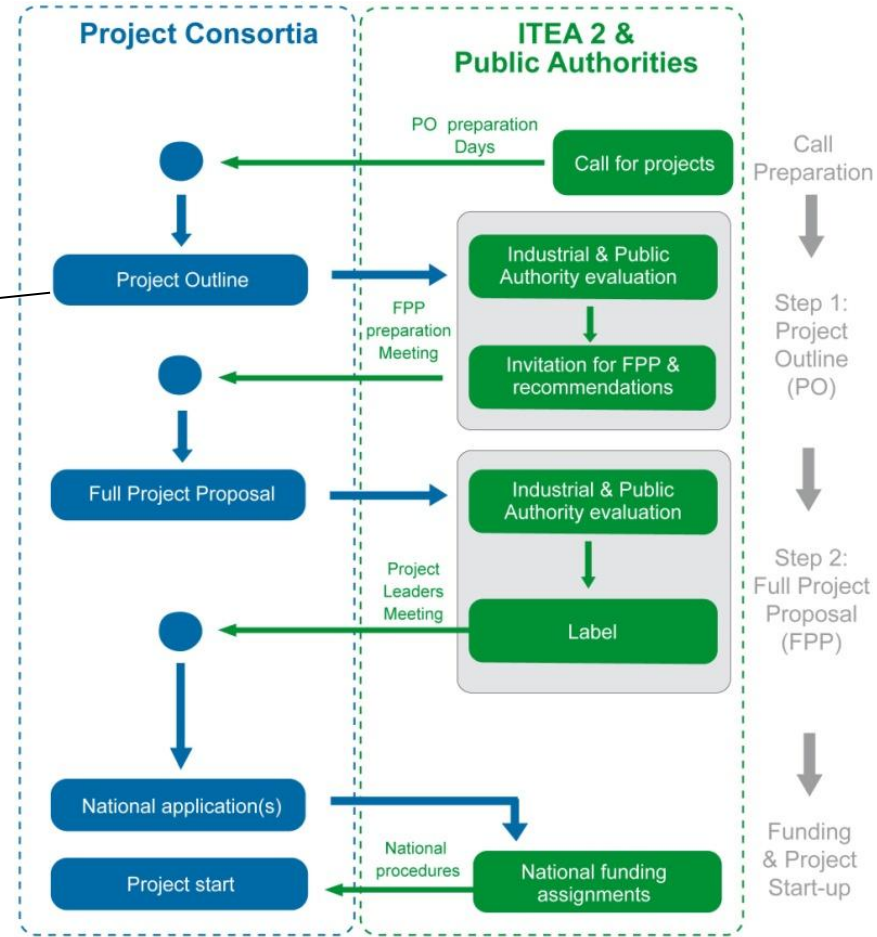
AMALTHEA 4 public

ITEA 2 Call 8

Project Outline submitted

Topics

- Collect and enhance results from AMALTHEA and others
- Transfer into Application
- Building a Community



Thank you for your attention