

# Process recommendations for timing- analysis in AUTOSAR-based projects

Torino  
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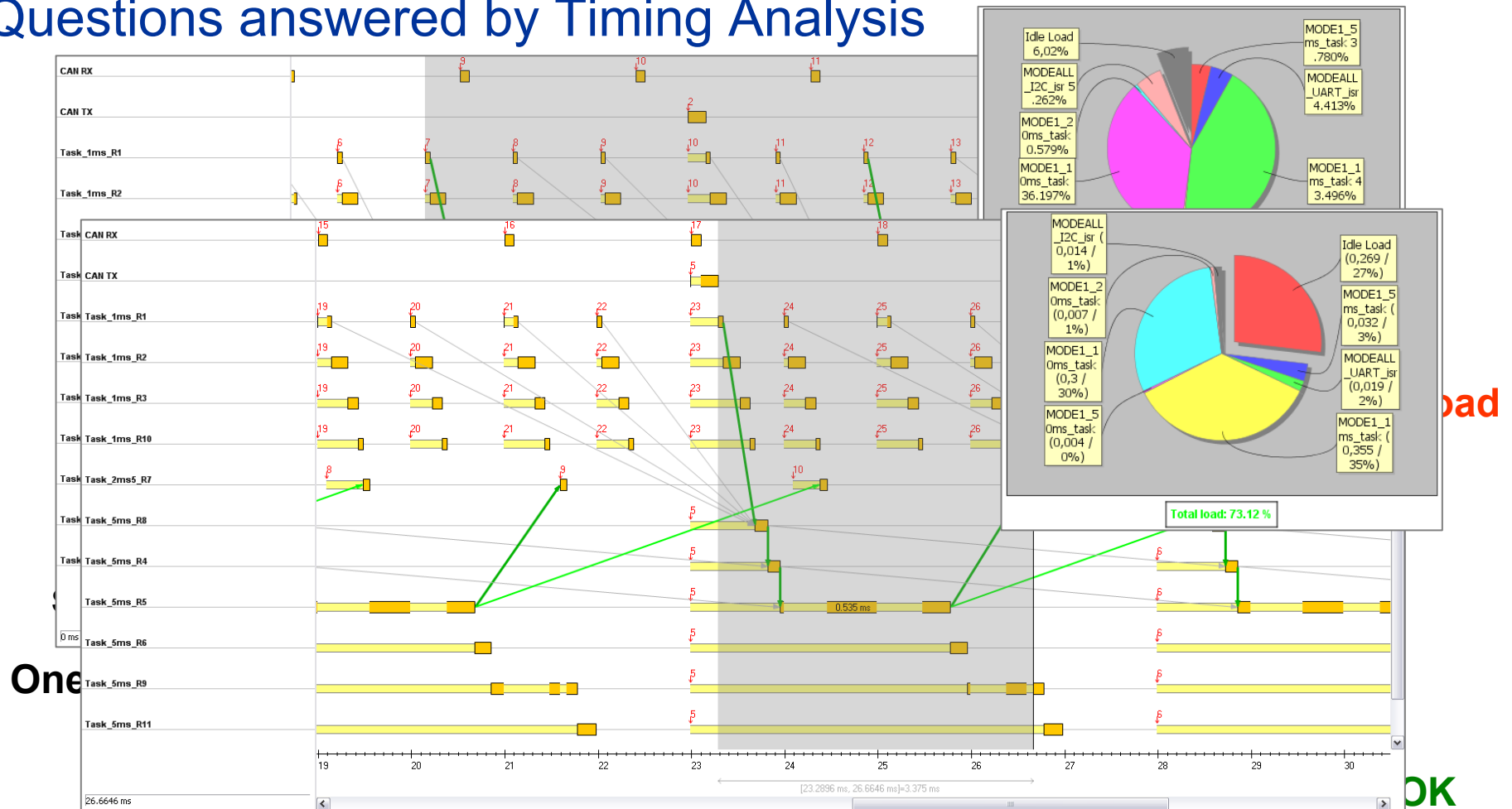


Solutions for Complex  
Real-Time Systems

# Outline

- Motivation
- Timing Verification Techniques and the V-Model
- AUTOSAR Timing Model
- AUTOSAR Flow & Tools
- AUTOSAR Timing Methodology

# Questions answered by Timing Analysis



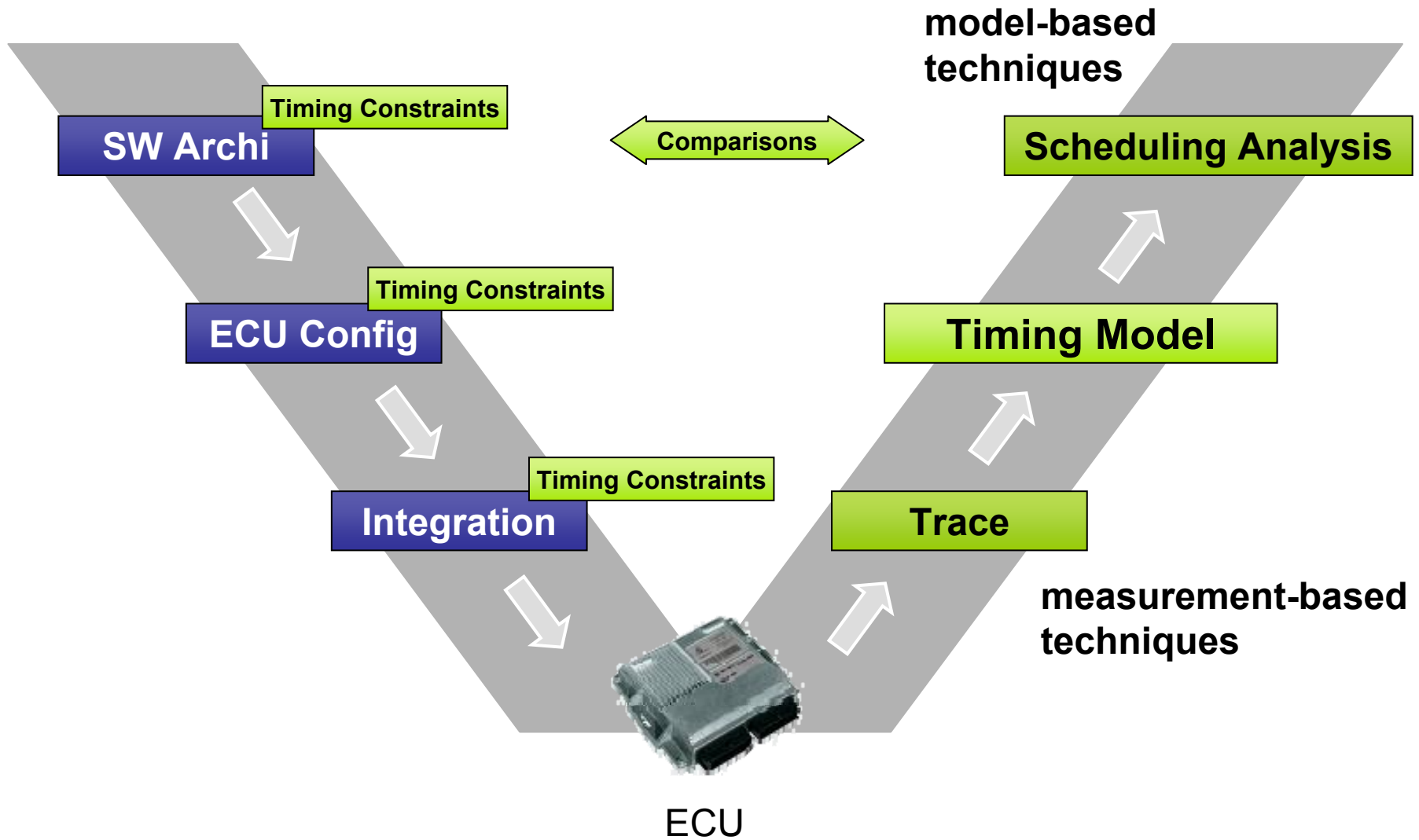
One

+ Performance Reserves + Safety Proof

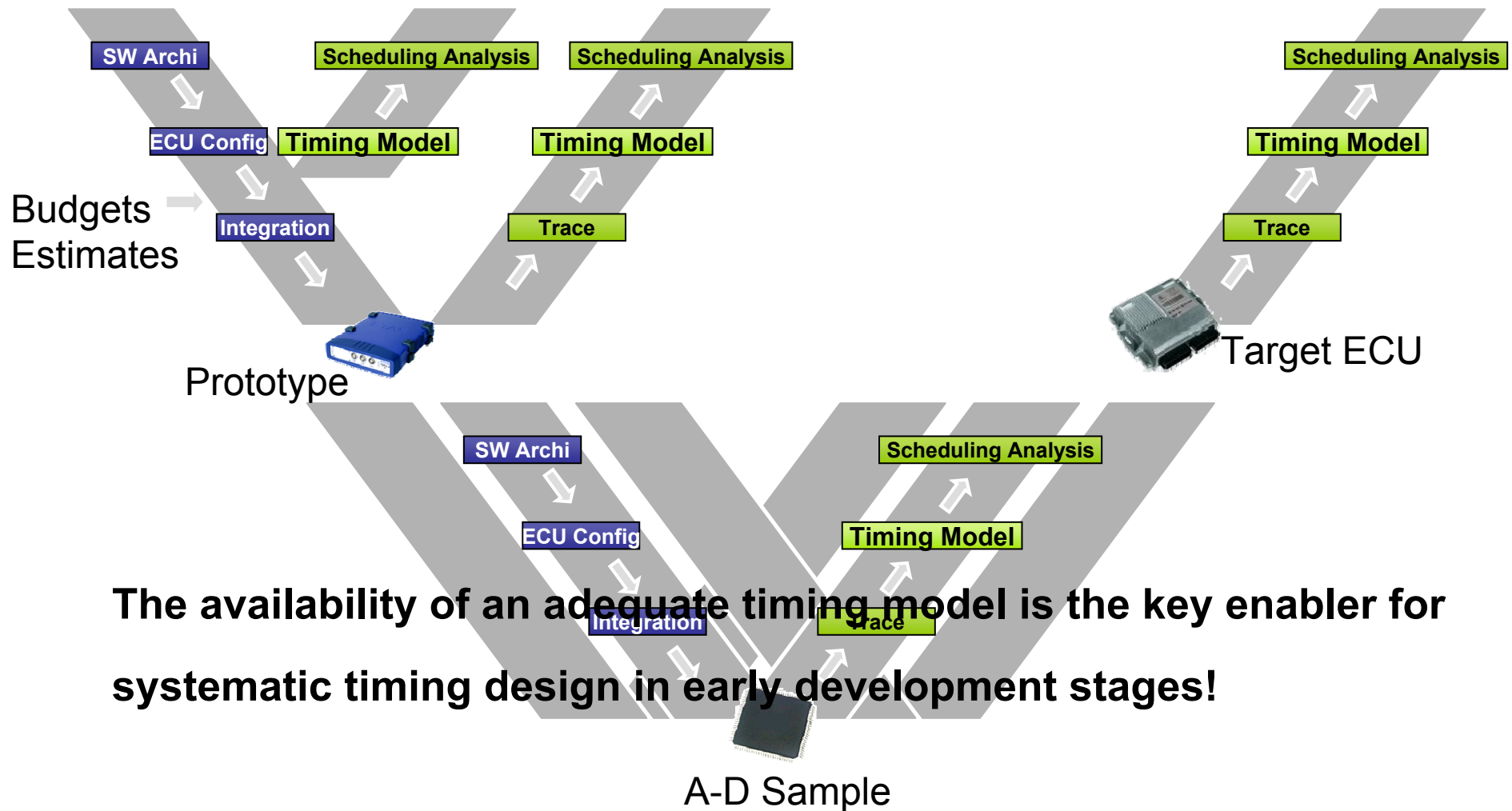
**AUTOSAR lets you specify SW architecture & ECU configuration !**

**Timing Analysis lets you distinguish good from bad designs !**

# Timing Verification Techniques and Flows



# Timing Verification Early and Late

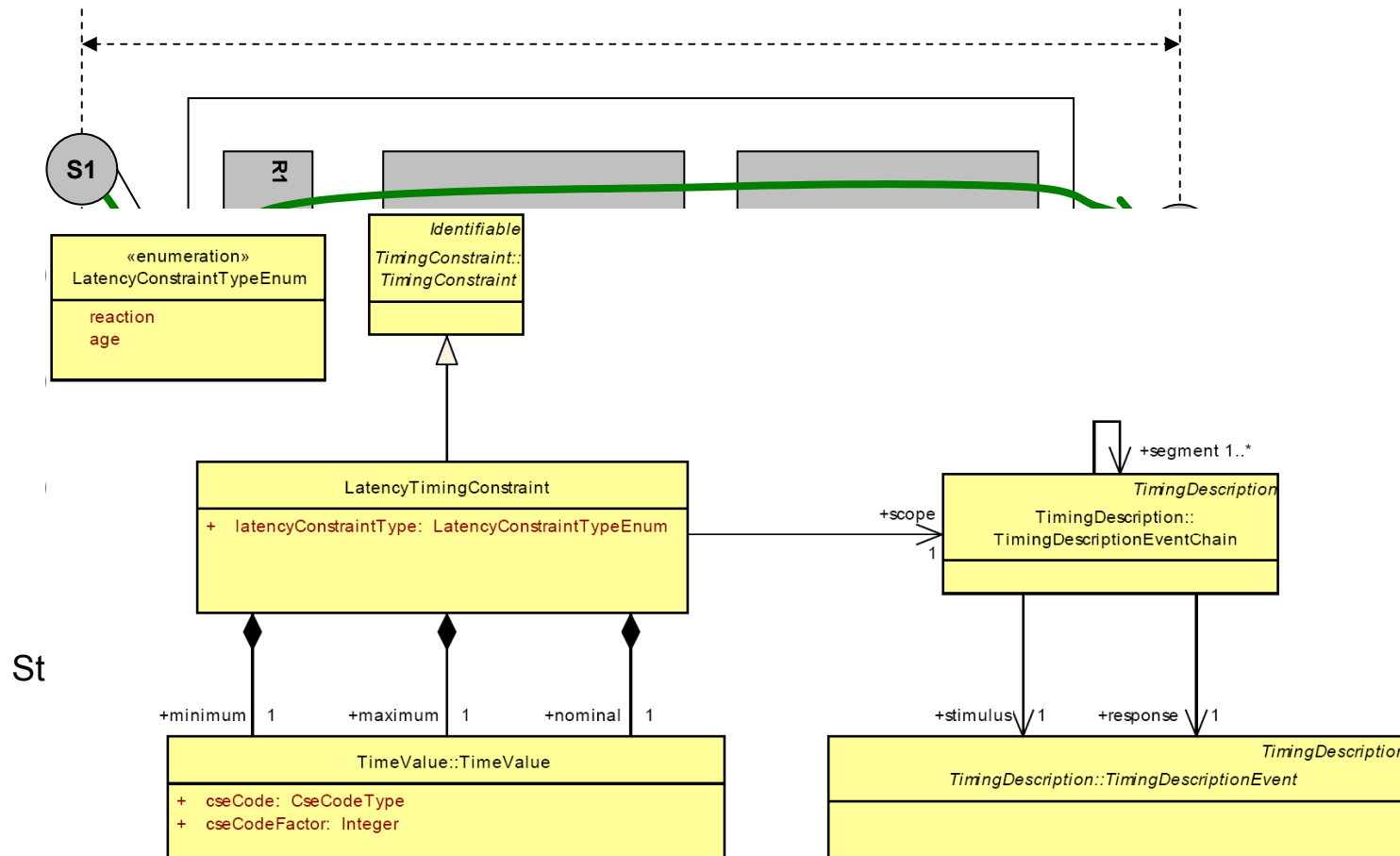


# Timing Model in AUTOSAR

- AUTOSAR 3.2
  - System: SW architecture
  - OS config: tasks, schedule table, offsets, ...
  - RTE config: runnable mapping, position in task, ...
  - SW Module Description: runnable / task execution times
  
- AUTOSAR 4.0 Timing Extension
  - timing constraints, requirements, and budgets
  - event chains (for end-to-end constraints)
  - event triggerings (for capturing dynamic behavior)

# Timing Event Chains

- signal path through application
- defined by stimulus and end event

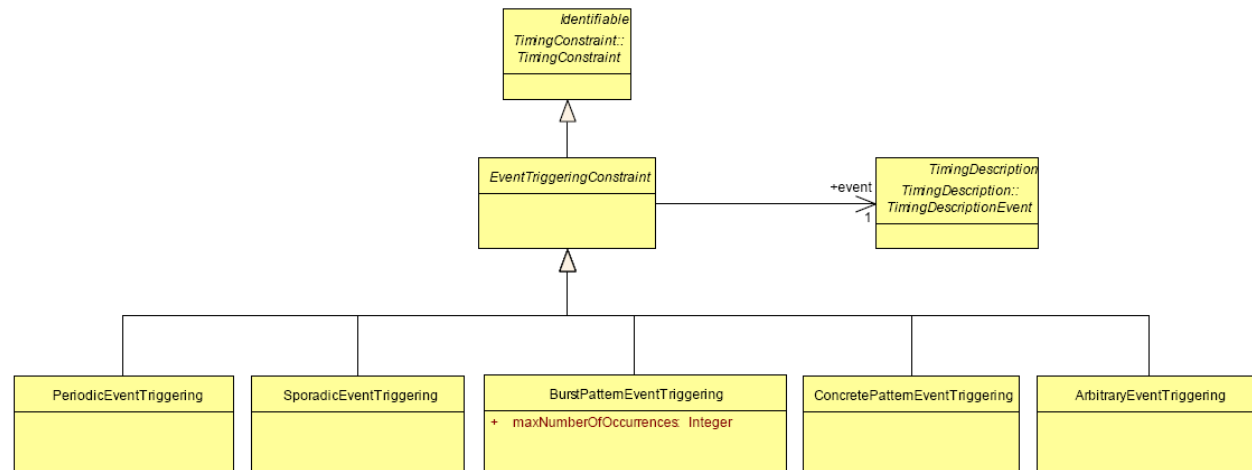


# Event Triggering Constraints

- capture dynamic timing behavior of event occurrences
  - external signals (sensors, buttons, etc.)
  - interrupts
  - etc.

- 5 basic models:

- periodic
- sporadic
- burst
- concrete
- arbitrary



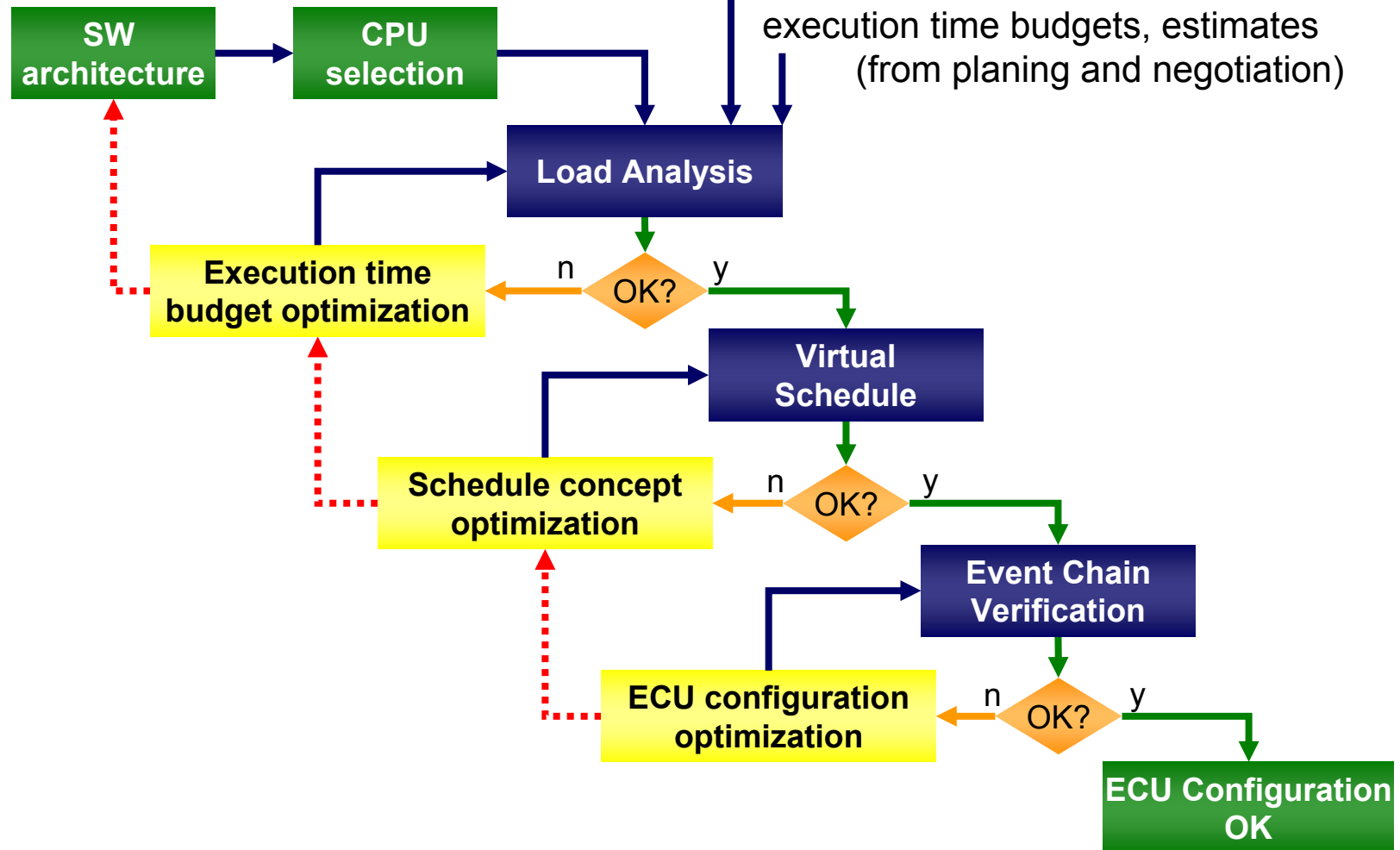
- each with model-specific parameters, e.g. period, jitter, min/max interarrival, offset, occurrence, etc.

# ECU Timing Design

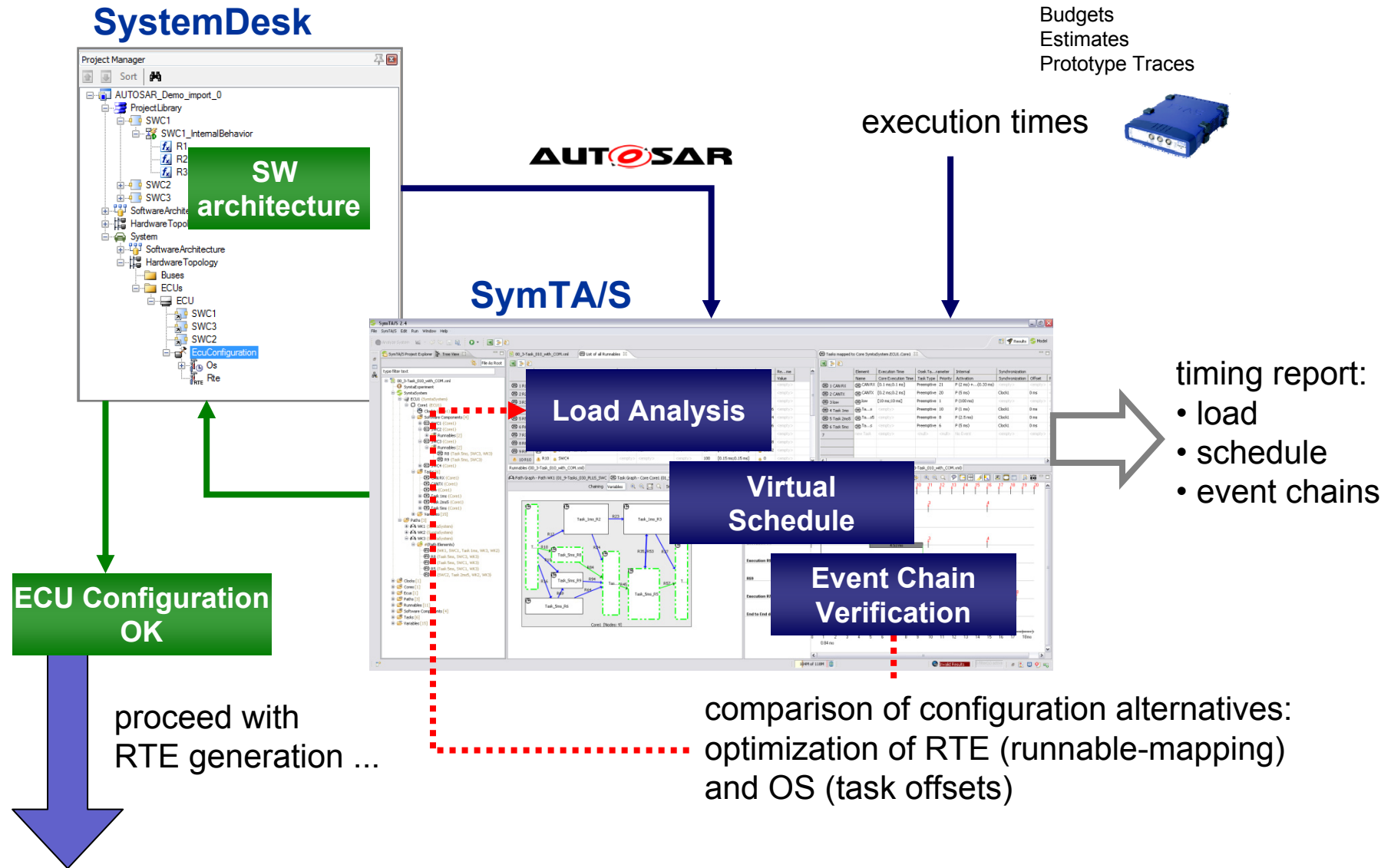


execution times (from prototype trace)

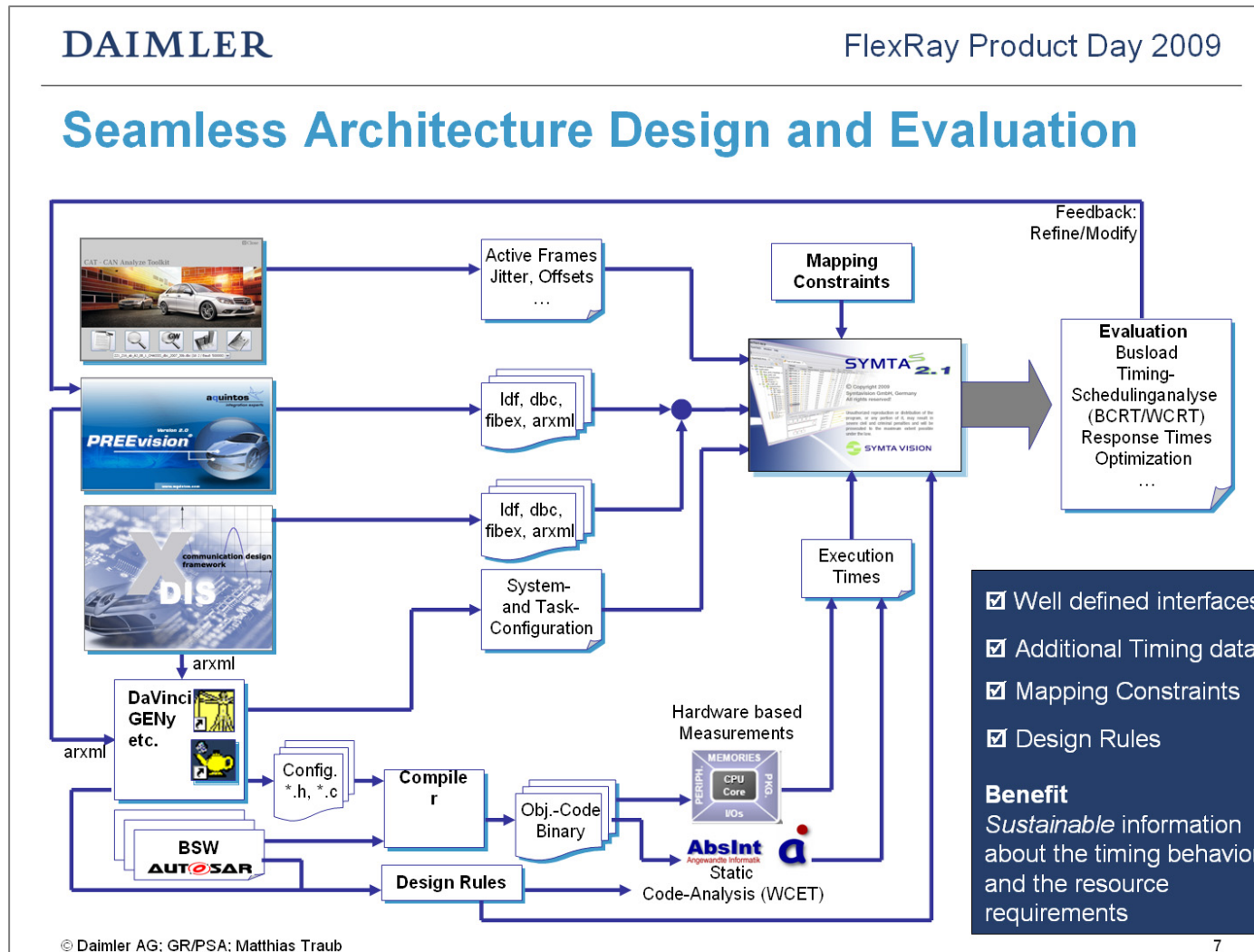
execution time budgets, estimates (from planing and negotiation)



# ECU Tooling Example: SystemDesk & SymTA/S



# E/E and Network Tooling Example: PREEvision & SymTA/S



taken from: *In search of the best migration strategy from CAN to FlexRay*. FlexRay Product Day 2009. DAIMLER, aquintos, Syntavision

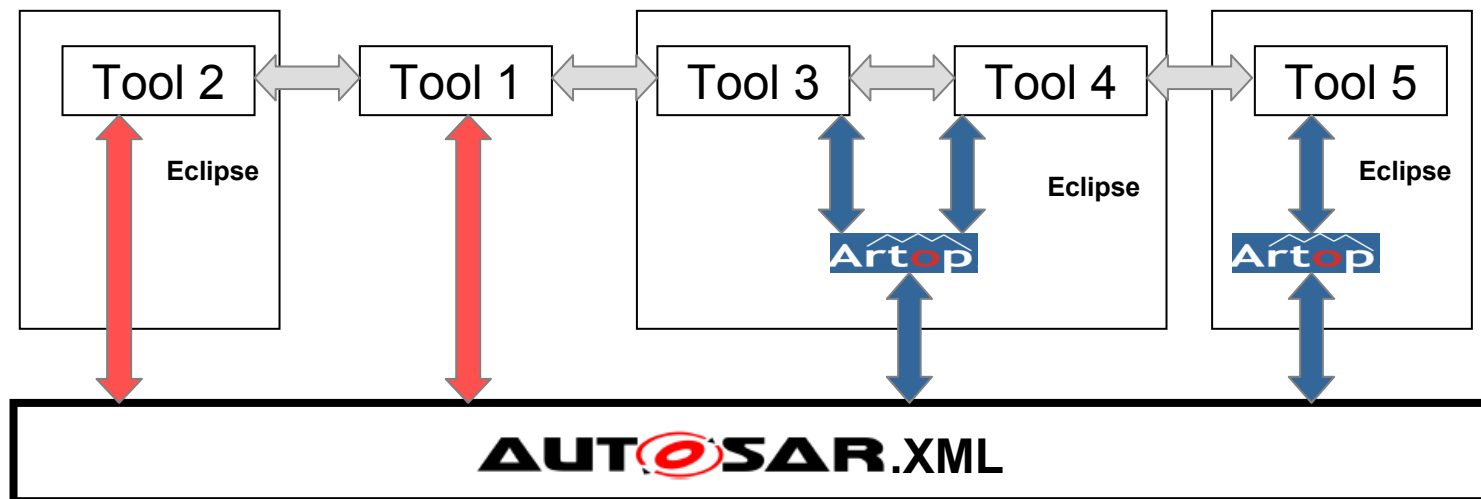
# General Tool Integration Aspects



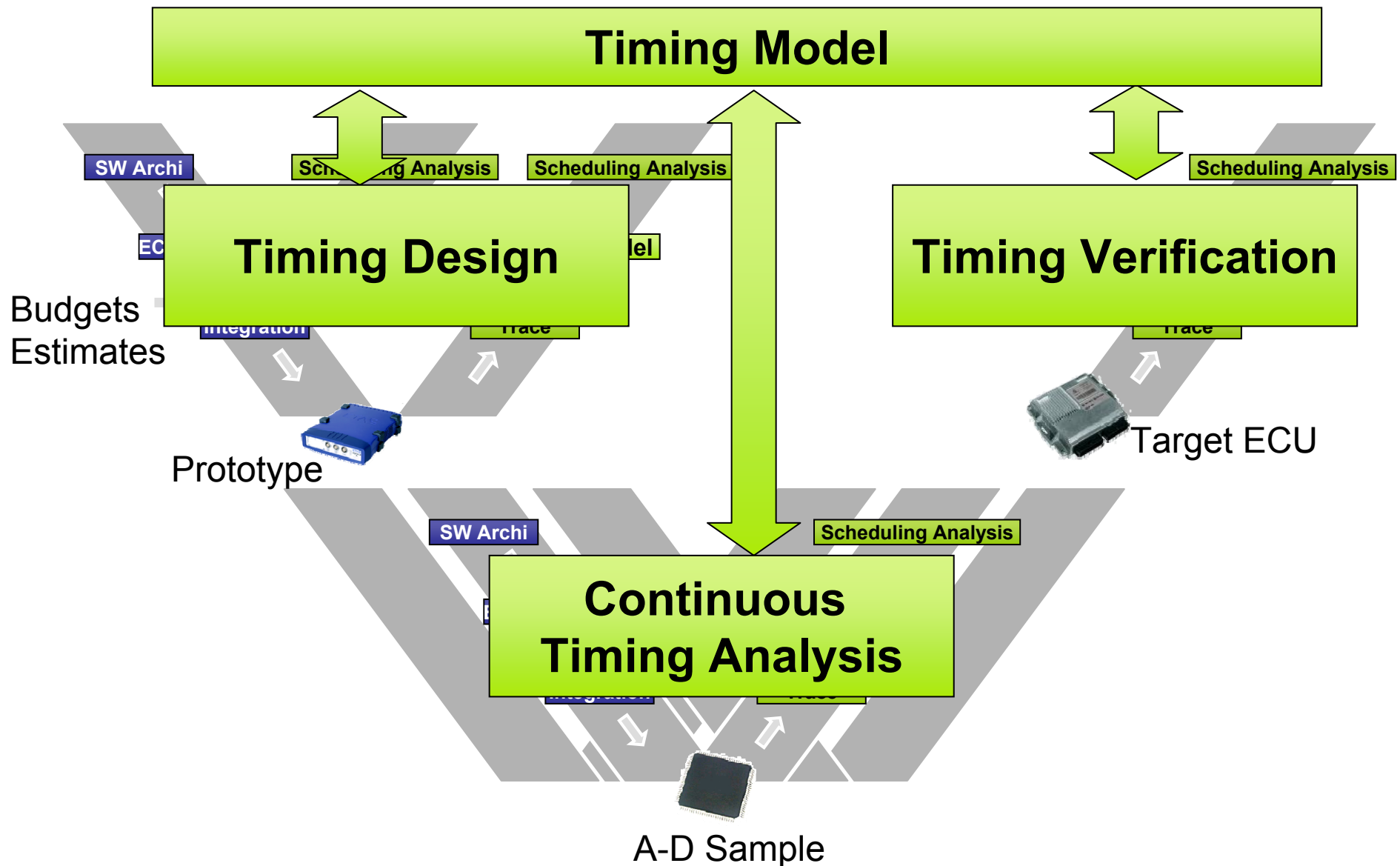
- AUTOSAR XML: standardized file-based configuration exchange



- ARTOP: optional Eclipse plug-in of base methods for AUTOSAR tools



# AUTOSAR Timing Methodology



Thank You!



**SYMITA VISION**

