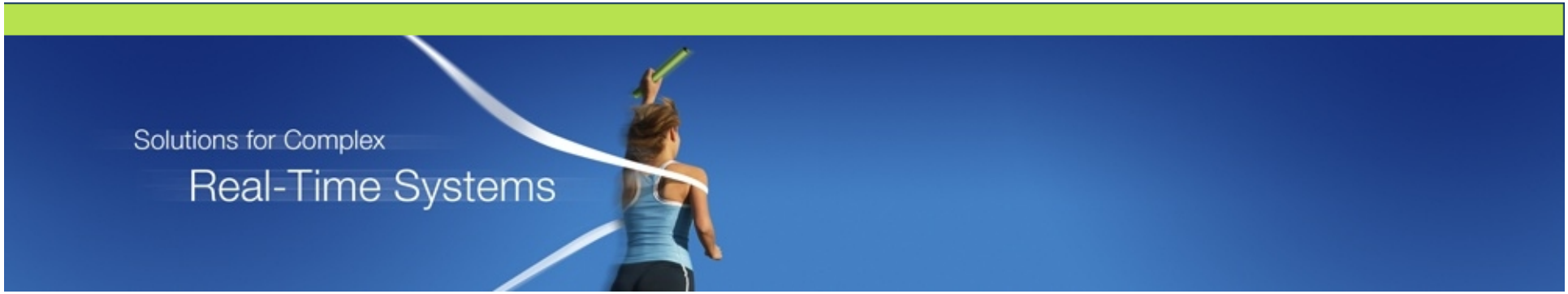
SYMTA VISION

Scheduling Analysis for Control Units and Networks

Torino
June 09, 2011



Symtavision – Who we are

Company

- Founded 2005, 25 employees
- Based in Braunschweig, Germany
  - Munich branch, distributors in France, Italy, Japan, China, Korea. USA expansion in 2011

Dr. Jersak
CEO

Expertise: timing design and timing verification for embedded control units and networks

Solutions

- Tools: SymTA/S®, TraceAnalyzer™
- Standards-based tool-integration
- Methodology consulting and engineering services

Dr. Richter
CTO

W. Ries
CSO

AUTOSAR
Development member

REAL-TIME EXPERTS
Founding member

Our Customers

OEMs & Suppliers

- Automotive
- Aerospace
- Transportation & Automation

Use-Cases

- Architecture Design
- Network Optimization
- Software Integration
- Timing Verification

Community Activities

Collaborative Projects

SuReal

INTEREST

TIMMO

ALL times

TIMMO2use

REAL TIME APPROVED

recomp

iMES

INTERESTED

Networking Events

SYMTA S News Conference since 2007

2010, 1st Symtavision Asia Conference

2011, Conferences in F, IT, USA

Real-Time Experts Road Shows

Standardization

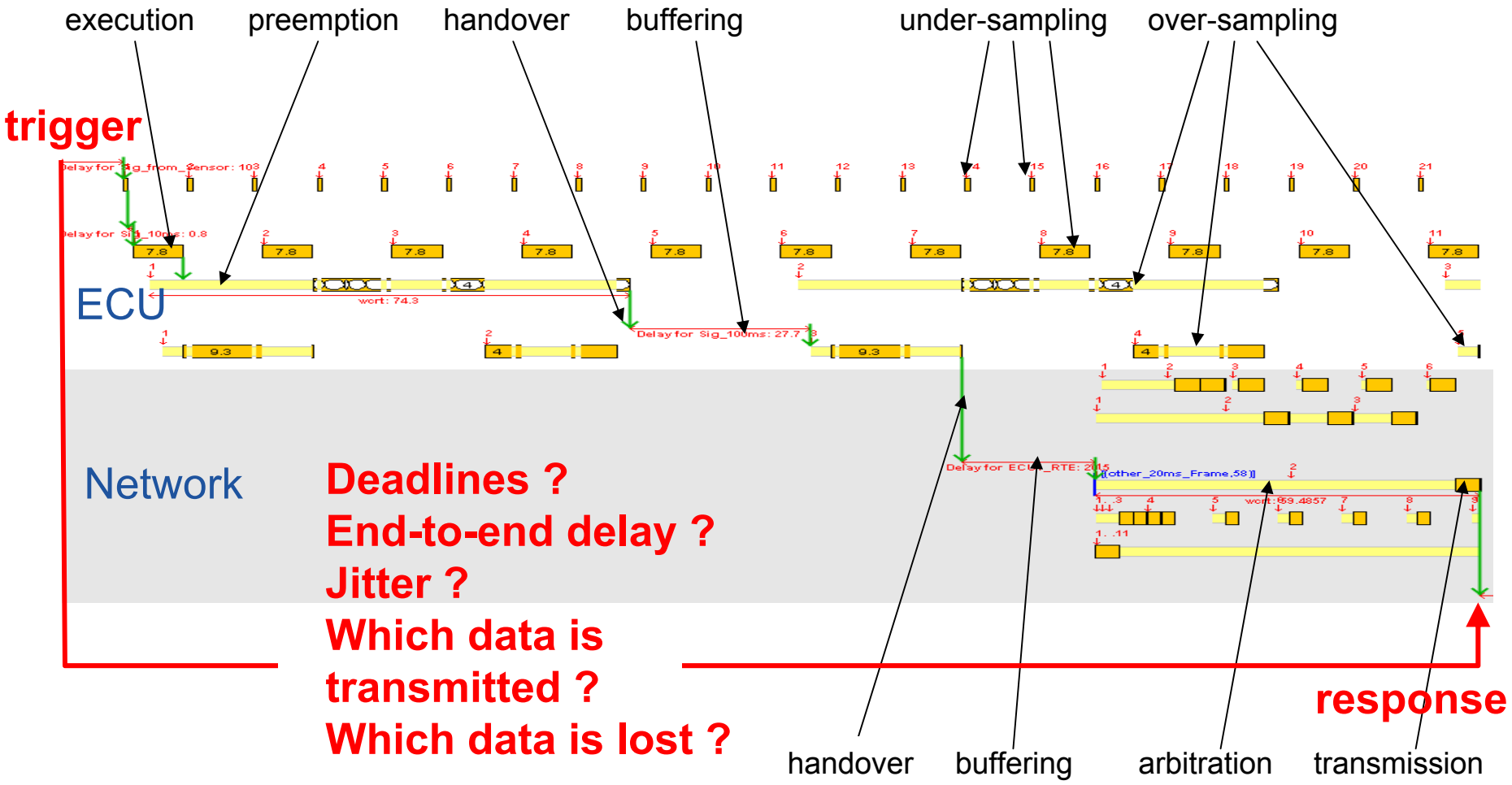
AUTOSAR

ISO 26262

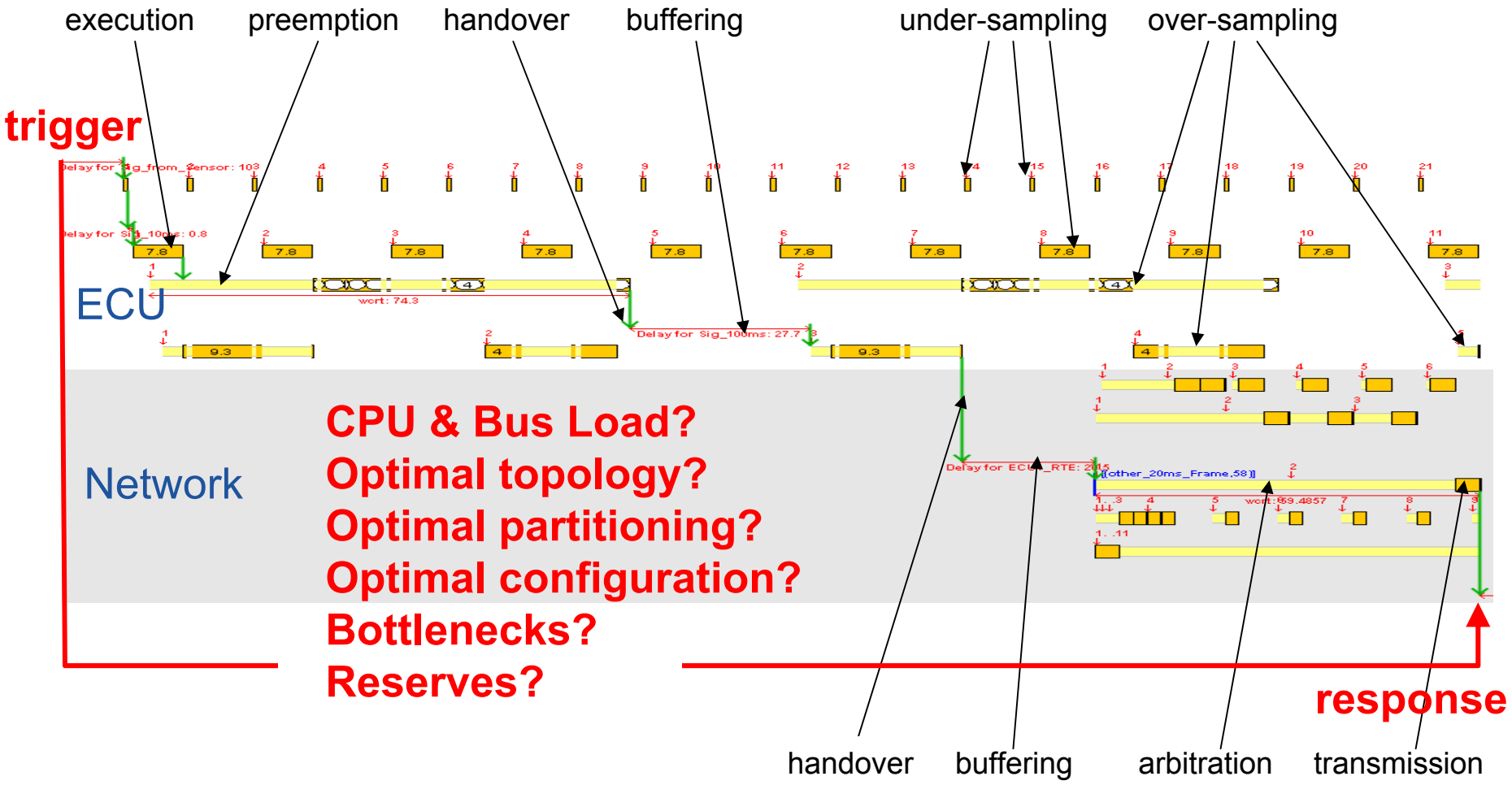
Common Trace Format

Artop AUTOSAR Tool Platform User Group

Scheduling Analysis for Virtual Timing Verification



Scheduling Analysis for Architecture Optimization



Symtavision in the Development Cycle

- **System design and virtual timing verification**
  - Architecture alternatives
  - Cost effective real-time computation and communication
  - Avoid late integration problems
    - deadline overruns, lost or inconsistent data, excessive jitter …

- **Software implementation and refinement**
  - Timing requirements and software budgets for suppliers
  - Timing verification for each implementation step
  - Early warning and remedy for impending timing problems

- **System integration and verification**
  - Maximize system reliability
  - Functional safety: system is free from unacceptable risk due to timing failures

Scheduling Analysis

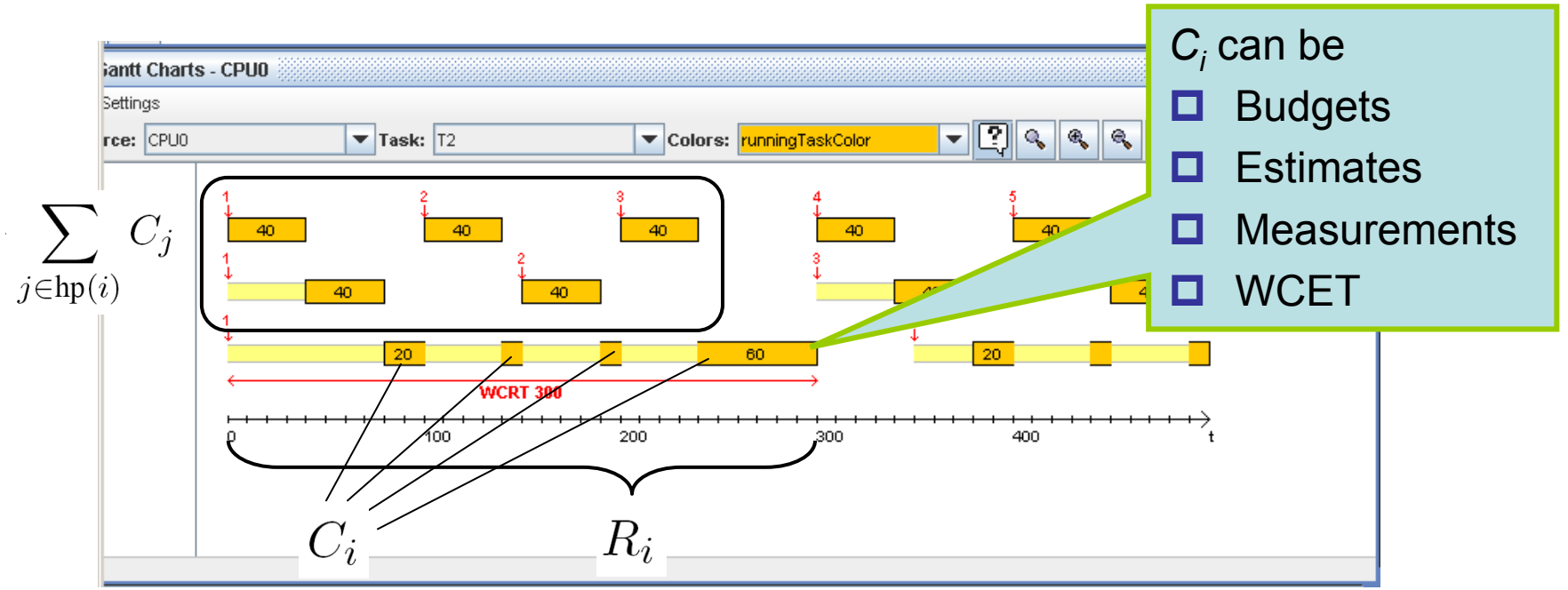
$$R_i = C_i + \sum_{j \in \mathrm{hp}(i)} C_j \left\lceil \frac{R_i}{T_j} \right\rceil$$

Worst-Case Response Time (WCRT)

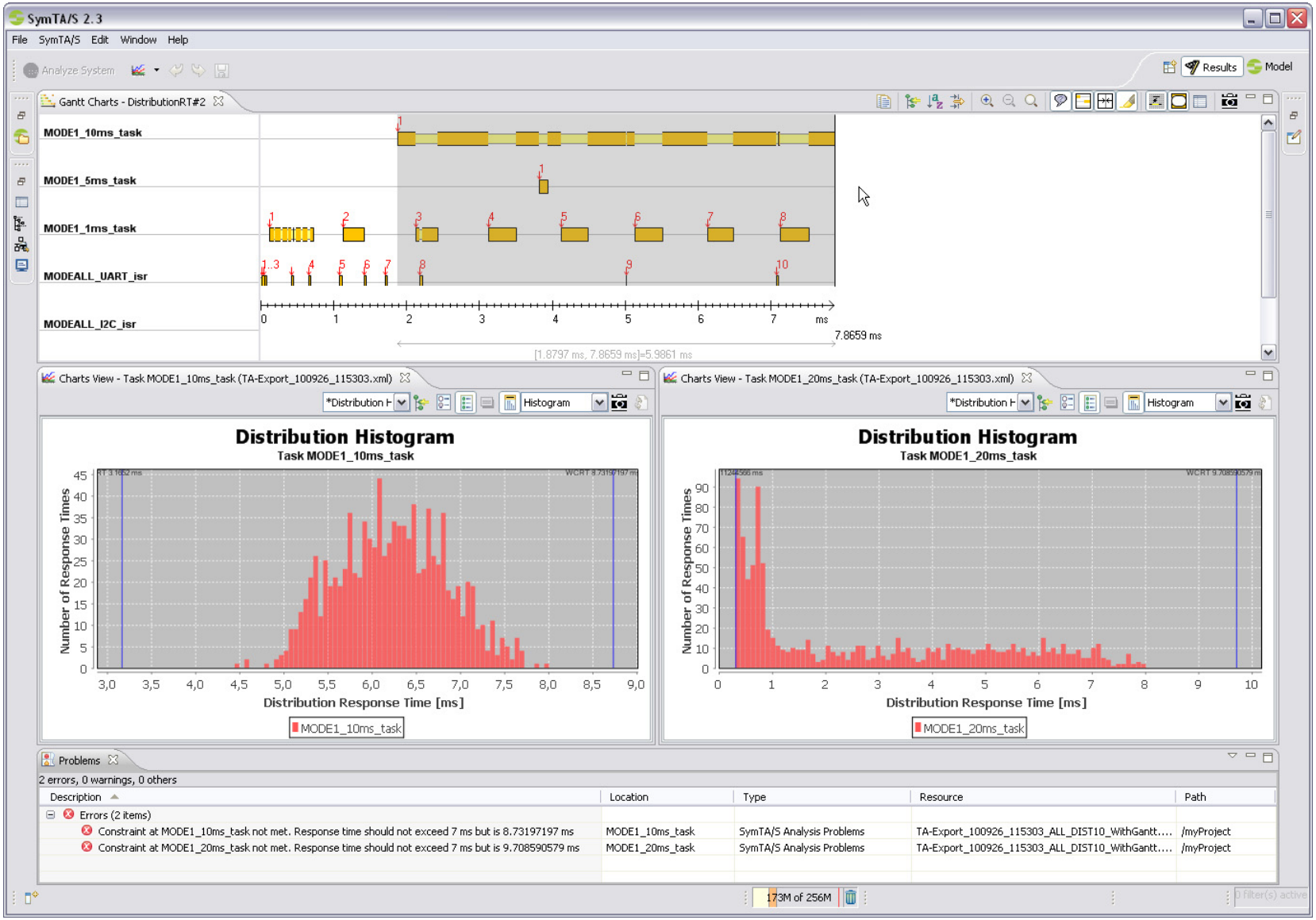
code execution time

# of preemptions

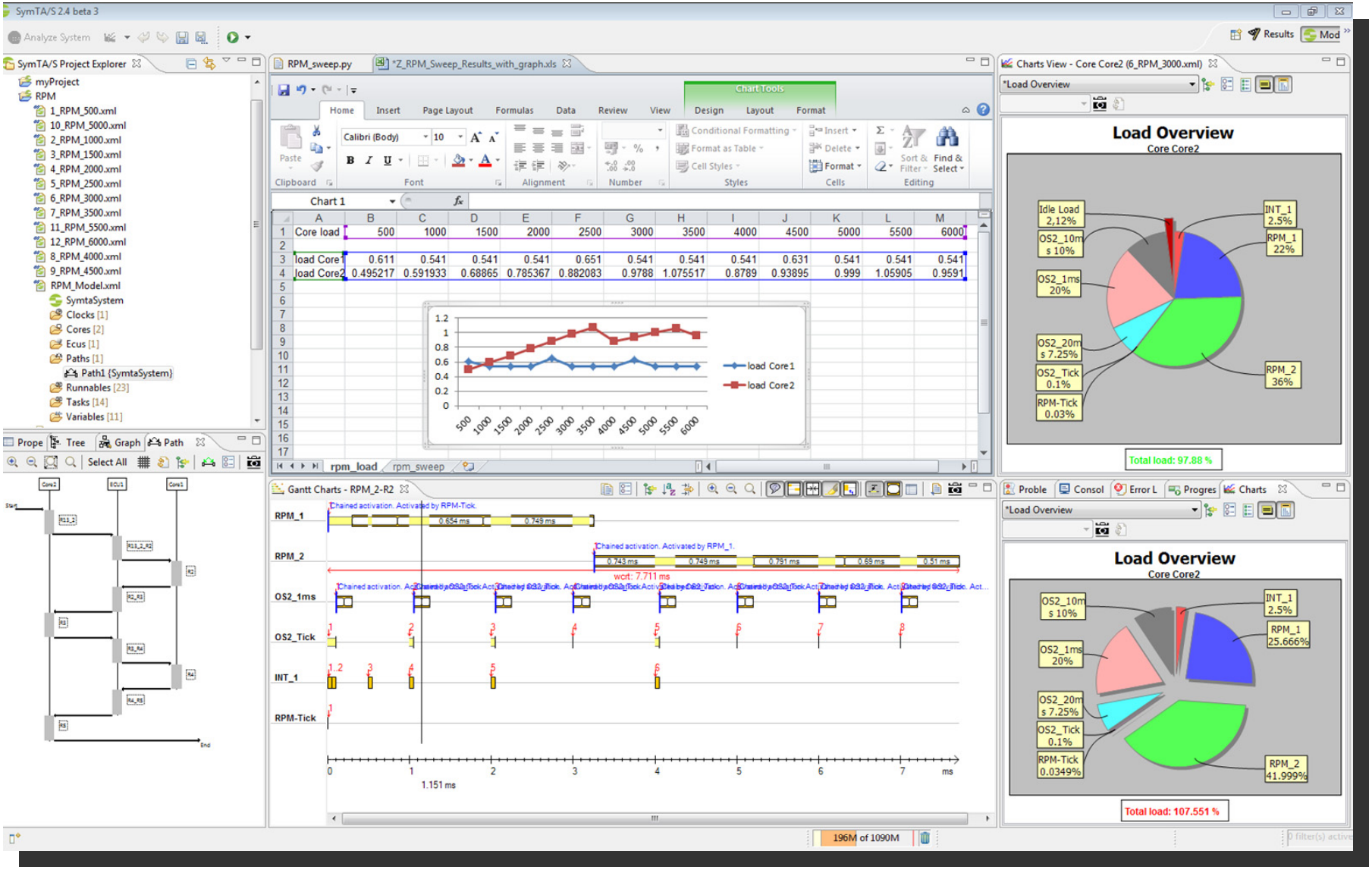
interference term I_i



Best-Case, Worst-Case and Distribution Analysis

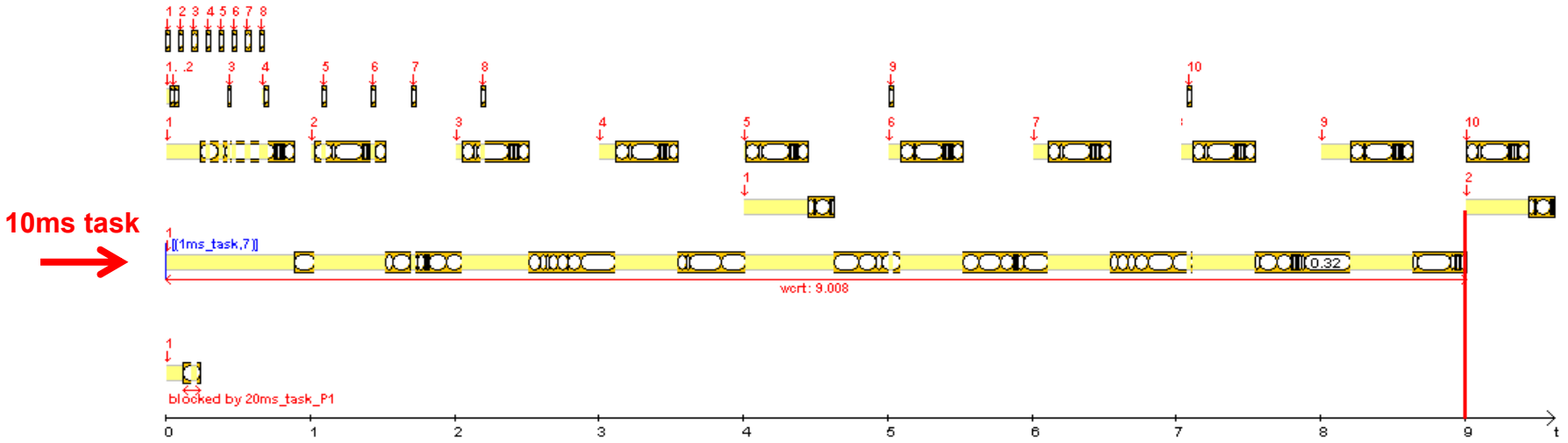


SymTA/S – Control-Unit Timing Perspective

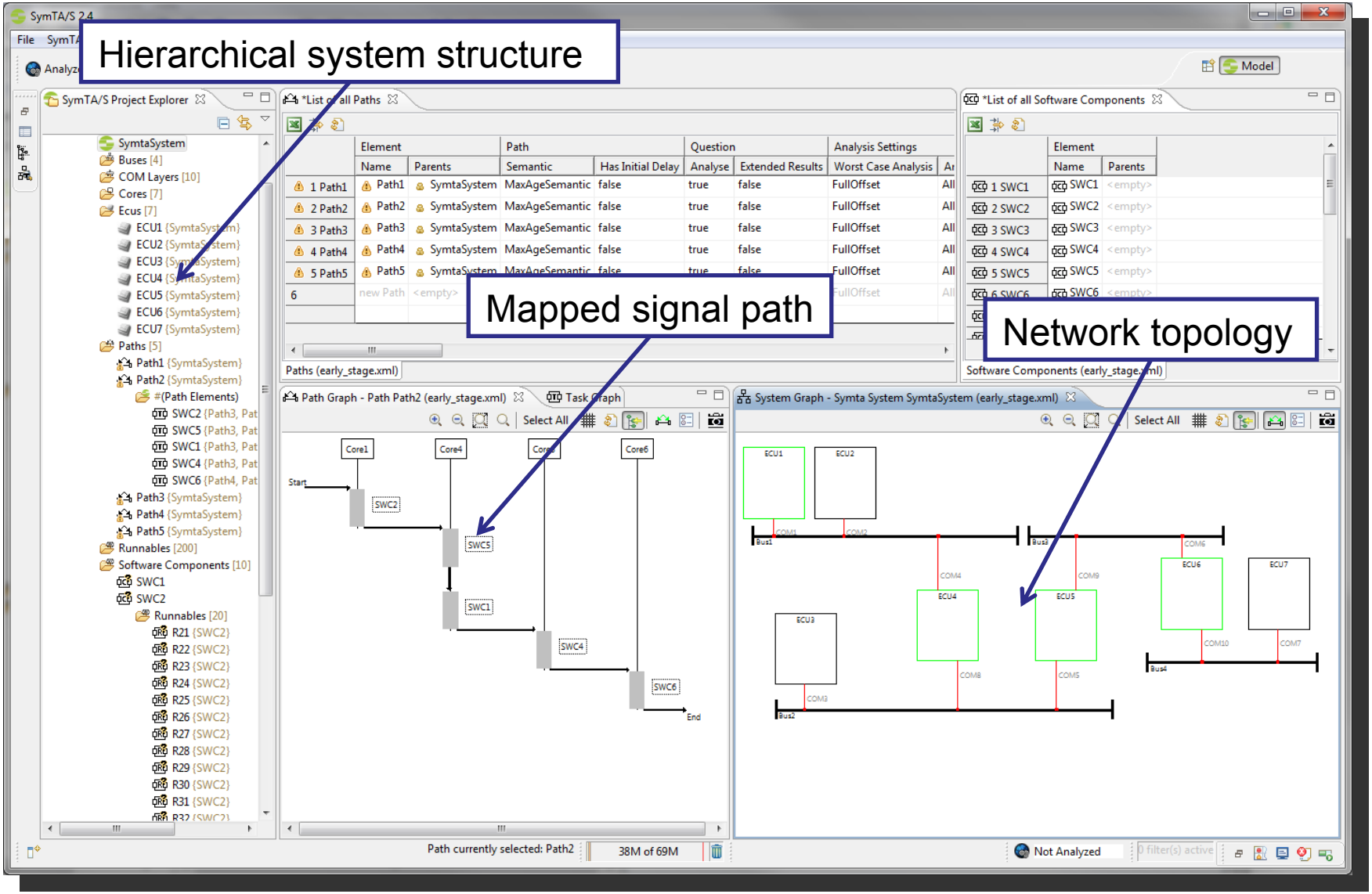


Automotive ECU example

- **SymTA/S guarantees worst-case coverage**
  - 10 CAN, 8 SPI interrupts, 9 preemptions by 1ms task, blocking → 9ms Worst-case response time

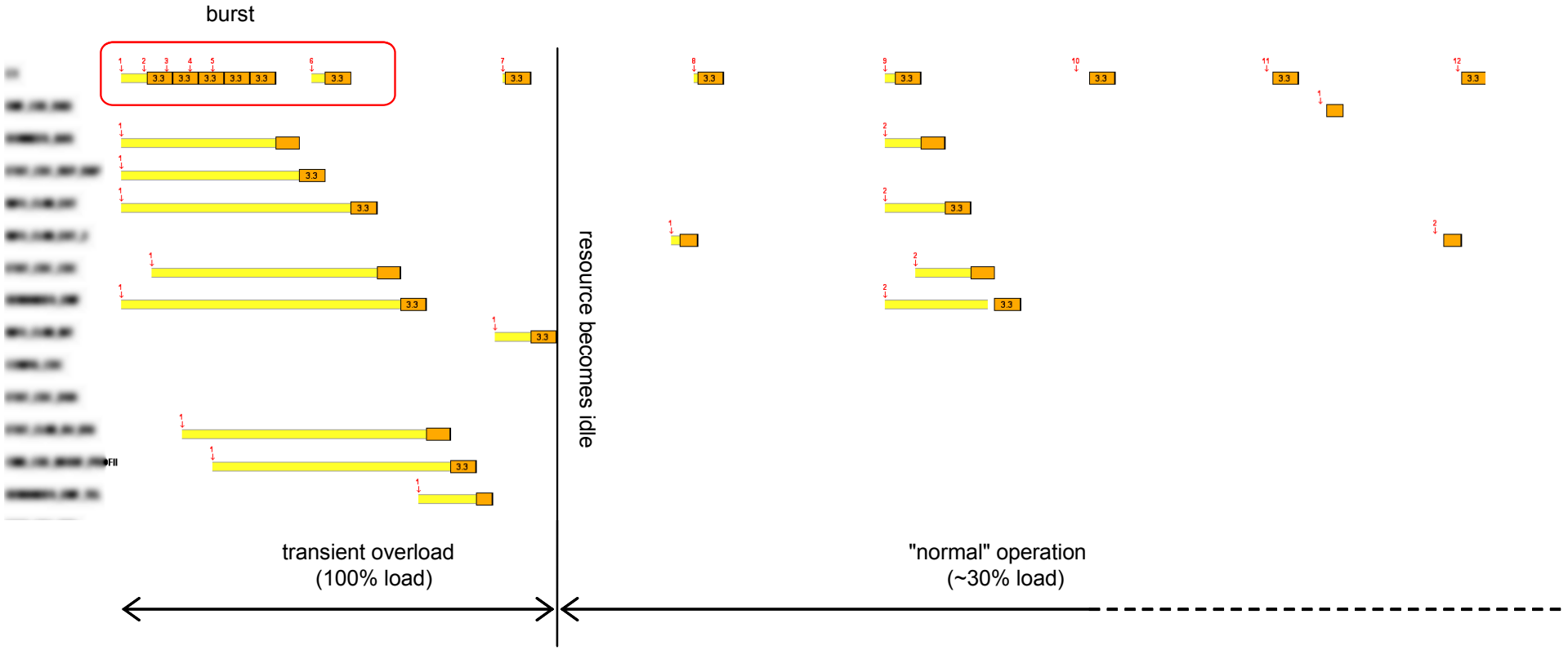


SymTA/S – Network Timing Perspective

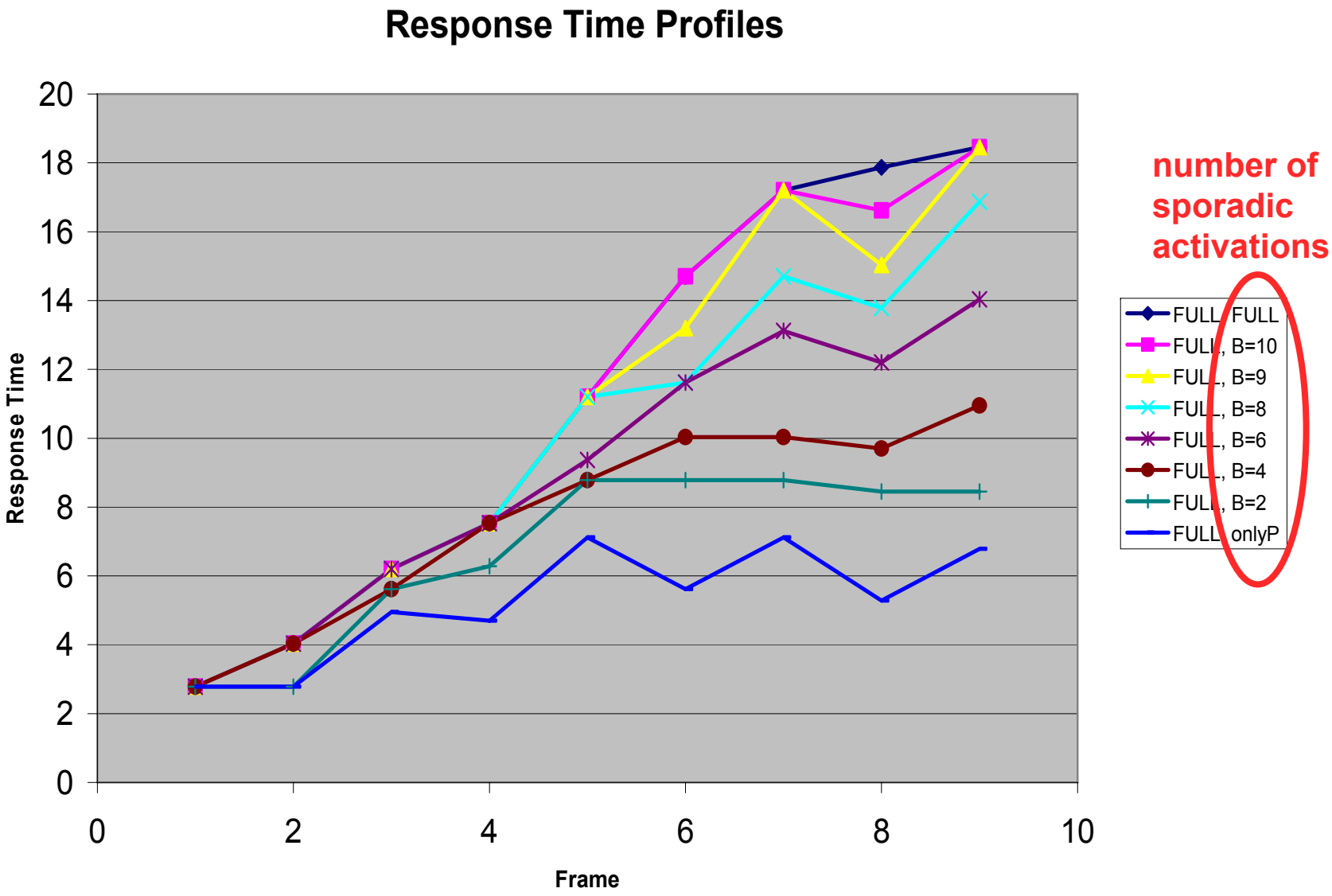


Example: transient CAN bus load analysis

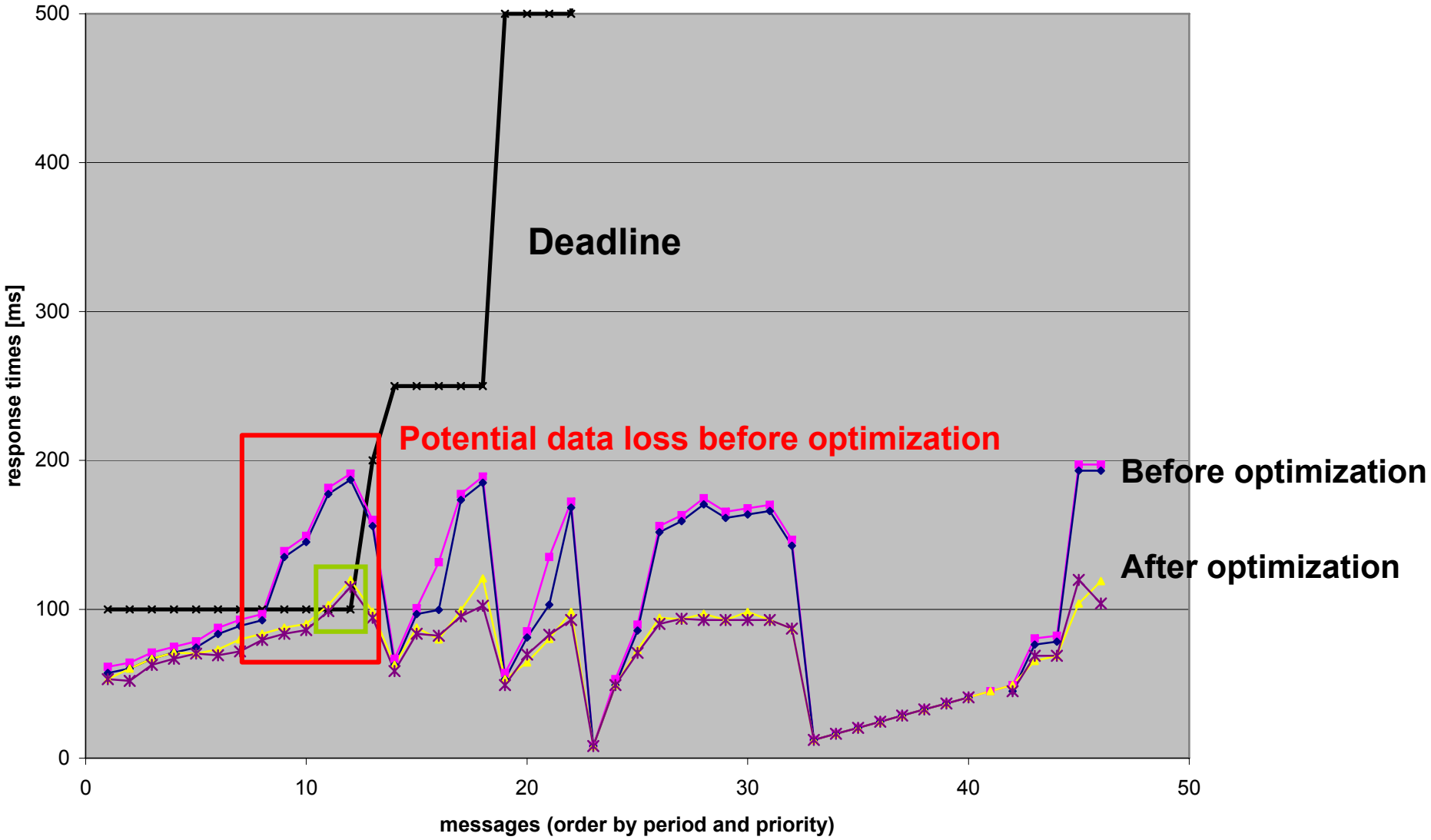
- Varying loads must be considered (see below) – in the body domain, most of the load is sporadic!
- Dynamic interdependencies affect end-to-end timing



Response Times at Different Dynamic Loads



CAN bus offset optimization



Thank You!

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