Automatic Verification of Timing & Resource Requirements

TA Tool Suite Application Case
TA Tool Suite in the development process

**TATS:: ECU SW Integration**
- Define Timing Requirements & Constraints
- Analyze timing behavior (by simulation) of software architecture
- Evaluate and optimize timing & performance behavior (by simulation and model analysis)

**TATS:: ECU SW Verification**
- Verify target behavior for fulfilling specified timing requirements
- Understand timing behavior by interactive visualizations
- Evaluate timing and performance properties for project management
Use Case: SW Integration with target

- **SWC Detailed Design**
- **DaVinci Developer**
- **RTE & BSW Configuration**
- **DaVinci Configurator Pro**

**TA Tool Suite**

- **Visualise & Analyse SW architecture**
  - **TA.Design**
- **Simulate ECU Model**
  - **TA.Simulation**

**measurement**

- **Measurement Runtime**
  - **.AMD RTM**
- **CANoe**

**Integration phase**

- Verification phase
- Vector tool
Solution

TA Tool Suite Tools Interfaces - SW Verification

Use Case: SW Verification

Integration phase
Verification phase
Vector tool
3rd party tool

TA Tool Suite: Tools Interfaces - SW Verification

Define Requirements
TA Base: Standard Feature

Verify ECU target behavior
TA.Inspection

Trace Visualization & Requirement Verification

Timing Report

Trace Measurement
Scheduling Trace

MICROSAR

ECU

Trace
Debugger

Use Case: SW Verification
State Changes (BTF):
Time; Entity; State Transition

1ms; Task; activate
2ms; Task; start
3ms; Task; preempt
4ms; Task; resume
5ms; Task; terminate
Metrics

- CPU Load and other metrics to assess the software’s run-time performance

Realtime behavior under observation:

![Diagram showing 5ms timeline with start delay, preemption, and response time]

- Start Delay
- Preemption
- Response Time
Derive Requirements

TA.Inspection

Critical Requirement

Warning Requirement

Task 5ms

preemptions

available timeslot

5ms period

0
Which component is causing the load?

<table>
<thead>
<tr>
<th>Runnable group name</th>
<th>CPU Load Core 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>49.32%</td>
</tr>
<tr>
<td>BSW</td>
<td>10.33%</td>
</tr>
<tr>
<td>B</td>
<td>2.27%</td>
</tr>
<tr>
<td>C</td>
<td>0.42%</td>
</tr>
</tbody>
</table>

**Supplier A 50%**

**Supplier B 2.3%**
Completely Automated Workflow

The workflow can be completely automated:

- Get the Timing results, with every build
- Publish the results in Jenkins as post build report
Workflow Automation

Tracing in ECU’s Eco System with CANoe Automation

- Measure the ECU’s runtime behavior in conjunction with external trigger
- Test ECU runtime performance in a natural ECU environment
- Continuous testing throughout the development process
For more information about Vector and our products please visit

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