Real-Time Performance Analysis on Infineon AURIX™
The Timing Aspect

Safety requires perfect synchronization in time
Pioneer in advanced **real-time systems development methodology**

Comprehensive portfolio of **state-of-the-art tools** and **services**

17+ year track record in

- Supporting customers in developing **excellent products** for a highly competitive mass market
- Making complex real-time systems development **predictable**
- Making legacy systems **transparent**
- **Optimizing** bill of materials
INCHRON Tool-Suite

Analysis
Powerful real-time performance analysis and effective data visualization

Test
Automated end-to-end real-time performance monitoring

Optimization
State-of-the-art real-time performance optimization

INCHRON Tool-Suite
Comprehensive solution for the development of real-time systems

Design
Real-time performance designed-in right from the beginning
Timing Analysis on AURIX™

No 3rd party trace hardware required!

Infineon AURIX™ emulation device

USB

INCHRON Tool-Suite
Environment – Technical Details

Infineon Triboard/Application Kit
  • AURIX™ with MCDS

Custom Hardware
  • Infineon “miniWiggler” for device access

Infineon DAS
  • DAS UDAS Server

INCHRON Tool-Suite
  • INCHRON Trace Importer for trace generation
  • Configurations for trace, view profile and requirements
Typically a one-time configuration effort per project:

- Identify relevant variables in source code, get respective addresses from map file
- Fill the information into the JSON manifest:

```json
"config": {
  "elf": "[TC135x_DeInchronMacBoot_PARENT.elf]",
  "use_64bit": "Cmpx_control",
  "mode": {
    "name": "next_core_modules",
    "jump_node": true,
    "dump_node": true,
    "mode": "Continuous",
    "num_trace_bytes_MAX": 1000,
  }
}
```

- Start the tracing triggered by the JSON manifest
The INCHRON Tool-Suite converts the trace from the target.

The trace data can also be saved as an MCDS file.

Optional:
- Load Requirements configuration
- Load View Profile configuration
Trace Visualization & Analysis

1) Load view profile and timing requirements

2) Report and trace are showing the system behaviour:
Automatically include all functions and triggers from trace file:
Timing Analysis of Event Chains

Add event chains and compare end-to-end latencies against requirements:
Timing Analysis of Data Values

Visualize how values change over time:

- Process of data change
- Time stamp for data change
For detailed analysis, jump to each individual occurrence that contributes to a given bar in the histogram:
The generated report shows comprehensive timing data. See the excerpt below:

<table>
<thead>
<tr>
<th>RTOS Errors</th>
<th>Total</th>
<th>TerminateTask</th>
<th>Activation Limit</th>
<th>Memory Access</th>
<th>Division by Zero</th>
<th>RTOS Object</th>
<th>API Call</th>
<th>ISR Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Passive</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Times</th>
<th>Avg</th>
<th>Min</th>
<th>Max</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Execution Times</td>
<td>787.429659 us</td>
<td>330.626667 us</td>
<td>1.341380000 ms</td>
<td>38.584053333 ms</td>
</tr>
<tr>
<td>Gross Execution Times</td>
<td>883.894285 us</td>
<td>330.626667 us</td>
<td>1.485953333 ms</td>
<td>43.310820002 ms</td>
</tr>
<tr>
<td>Response Times</td>
<td>886.512380 us</td>
<td>333.406667 us</td>
<td>1.488580000 ms</td>
<td>43.439106668 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Jitter</th>
<th>Start Latency</th>
<th>Termination Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Visualization & Analysis Provide Deep Insights

State View

Gantt View

Trace View

Detailed Statistics

Requirements

Event Chains

Histogram

Load View
Provides comprehensive insights into run-time behavior on AURIX™

- Using Infineon AURIX™ emulation devices and Infineon’s Direct Access Server (DAS) → no need for additional trace hardware
- Alternatively using tracing solutions provided by iSYSTEM, Lauterbach, Gliwa
- Powerful visualization & graphical timing analysis capabilities
  - On ISR, task, function, runnable, core, microcontroller and system levels
- Comprehensive automated timing analysis capabilities
  - Based on timing requirements
  - Detailed timing analysis of event chains
- For development, integration, test

Goes far beyond analysis of measurements

- Design – excellence in real-time, designed-in right from the beginning
- Optimization – automated state-of-the-art real-time performance optimization

Safety requires perfect synchronization in time
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Thank you