Real-Time Performance Analysis on Infineon AURIX™, Using the INCHRON Tool-Suite
Safety requires perfect synchronization in time
From Pioneer to Key Partner

Pioneer in advanced **real-time systems** development **methodology**

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

15+ 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

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

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

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

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

No 3rd party tracing solution needed!

AURIX™ TriBoard

DAS MCDS Trace Viewer

Trace Importer

USB

INCHRON Tool-Suite
Environment – Technical Details

Infineon Triboard/Application Kit
- AURIX™ with MCDS
- Infineon “miniWiggler” for device access

Infineon DAS
- DAS UDAS Server
- Tool MTV (MCDS Trace Viewer)

INCHRON Tool-Suite
- INCHRON Trace Importer for trace conversion
- Configurations for trace import, view profile and requirements
Trace Importer - Generic Conversion Scheme

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
"project": {
  "name": "DAS_TC39xA_Importer"
},
"config": {
  "counter_tick": 1000000,
  "counter_rshift": 0,
  "comment": "encoding: 3 -> suspended, 2 -> ready, 0 -> running"
},
"events": [
  {
    "pattern": {
      "type": "data", "address": "0x70000284", "data": "0x03", "readnotwrite": "false"
    },
    "name": "",
    "records": [
      {
        "process": "Task1ms", "cpu": "cpu0", "type": "process", "event": "terminate"
      }
    ],
    "description": ""
  }
]```

- Import the trace file
OS example with pseudo “random” load distribution.

The OS variable “EE_th_status” (holding the task states) and an example application are traced:
The trace data is saved to an MCDS file.

The MTV tool also has a command line interface for measurements.

The MCDS file is imported into the INCHRON Tool-Suite.

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:

Analysis in terms of timing requirements
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
Statistics View – Distribution of Task Runtimes

Jump to each individual occurrence that contributes to a given bar in the histogram for further analysis:
Detailed Statistics – Comprehensive Report

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>1.489933333 ms</td>
<td>41.310820002 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>
</table>

- ![Graph 1](image1.png)
- ![Graph 2](image2.png)
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
Learn More

Infineon DAS Tool Interface: 

INCHRON website: www.inchron.com

INCHRON Tool-Suite & Infineon AURIX™: 
www.inchron.com/real-time-performance-analysis-on-infineon-aurix/

INCHRON references: www.inchron.com/voices-of-our-customers/

INCHRON for Automotive: www.inchron.com/automotive/

INCHRON Tool-Suite: www.inchron.com/tool-suite/

INCHRON Tool-Suite user manual: www.inchron.com/manuals/current/

Contact us for more information about the INCHRON Tool-Suite: info@inchron.com