

OSE 5.1 ON A PPC PLATFORM

© Copyright Dedicated Systems Experts NV. All rights reserved, no part of the contents of this document may be reproduced or transmitted in any form or by any means without the written permission of Dedicated Systems Experts NV, Bergensesteenweg 421 B12, B-1600 St-Pieters-Leeuw, Belgium.

Disclaimer

Although all care has been taken to obtain correct information and accurate test results, Dedicated Systems Experts and Dedicated Systems Magazine cannot be liable for any incidental or consequential damages (including damages for loss of business, profits or the like) arising out of the use of the information provided in this report, even if Dedicated Systems Experts and Dedicated Systems Magazine have been advised of the possibility of such damages.

<http://www.dedicated-systems.com>

E-mail: info@dedicated-systems.com

Date: **May 10, 2006**

Doc: **EVA-2.9-TST-OSE-PPC-02**

Issue: **1.1**

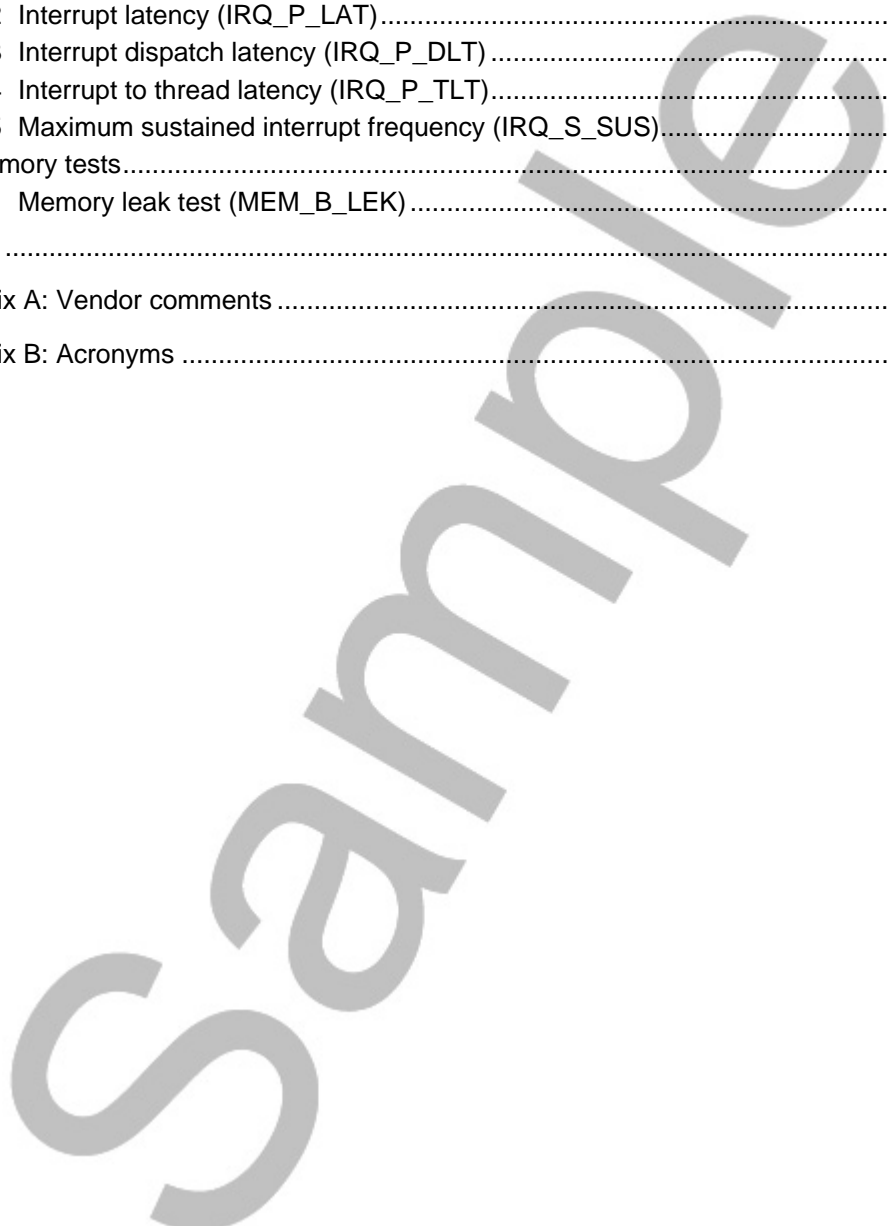
1	Introduction	6
1.1	Purpose and scope	6
1.2	Document issue: the 2.9 framework	6
1.3	Related documents	7
2	Results summary	8
2.1	Product under test	8
2.2	Test result.....	8
2.2.1	Positive points	8
2.2.2	Negative points.....	8
2.2.3	Ratings	8
3	Introduction	9
3.1	Product under test.....	9
3.1.1	Software	9
3.1.2	Hardware	9
3.2	Introduction	9
4	Installation and BSP	11
4.1	Installation	11
4.1.1	Installation on Host (OS only).....	11
4.1.2	Installation on host (Tools)	11
4.1.3	Installation on target	12
4.2	BSP	13
5	Test Results	14
5.1	Calibration system test (CAL)	14
5.1.1	Tracing overhead (CAL-P-TRC).....	14
5.1.2	CPU power (CAL-P-CPU)	14
5.2	Clock tests (CLK)	16
5.2.1	Operating system clock setting (CLK-B-CFG)	16
5.2.2	Clock tick processing duration (CLK-P-DUR)	16
5.3	Thread tests (THR)	18
5.3.1	Thread creation behaviour (THR-B-NEW)	19
5.3.2	Round robin behaviour (THR-B-RR)	20
5.3.3	Thread switch latency between same priority threads (THR-P-SLS).....	21
5.3.4	Thread creation and deletion time (THR-P-NEW).....	23
5.4	Semaphore tests (SEM).....	28
5.4.1	Semaphore locking test mechanism (SEM-B-LCK)	28
5.4.2	Semaphore releasing mechanism (SEM-B-REL).....	28
5.4.3	Time needed to create and delete a semaphore (SEM-P-NEW).....	29
5.4.4	Test acquire-release timings: no contention case (SEM-P-ARN).....	31
5.4.5	Test acquire-release timings: contention case (SEM-P-ARC).....	34
5.5	Mutex tests (MUT).....	36
5.5.1	Priority inversion avoidance mechanism (MUT-B-ARC)	36

Date: **May 10, 2006**

Doc: **EVA-2.9-TST-OSE-PPC-02**

Issue: **1.1**

5.5.2	Mutex acquire-release timings: contention case (MUT-P-ARC)	36
5.5.3	Mutex acquire- release timings: no-contention case (MUT-P-ARN)	38
5.6	Interrupt tests (IRQ)	41
5.6.1	Simultaneous interrupt priority handling (IRQ_B_SIM)	41
5.6.2	Interrupt latency (IRQ_P_LAT).....	42
5.6.3	Interrupt dispatch latency (IRQ_P_DLT)	43
5.6.4	Interrupt to thread latency (IRQ_P_TLT).....	44
5.6.5	Maximum sustained interrupt frequency (IRQ_S_SUS).....	45
5.7	Memory tests.....	46
5.7.1	Memory leak test (MEM_B_LEK)	46
6	Support	47
7	Appendix A: Vendor comments	48
8	Appendix B: Acronyms	49



1 Introduction

1.1 Purpose and scope

This paper presents the test results of the OSE 5.1 operating system running on a Motorola Sandpoint PPC system.

The layout of this report follows the one depicted in “The evaluation report template.” [Doc. 4]. The test specifications can be found in “The evaluation test report definition.” [Doc. 3]. See section 1.3 of this document for more detailed references. These documents have to be seen as an integral part of this report!

Due to the tightly coupling between these documents, the framework version of “The evaluation test report definition.” has to match the framework version of this evaluation report (which is 2.9). More information about the versioning of documents, tests and the relations between both can be found in “The RTOS evaluation framework.”, see [Doc. 1] in section 1.3 of this document.

The generic test code used to perform these tests can be downloaded on our website by using the link in the related documents section.

1.2 Document issue: the 2.9 framework

This document shows the test results in the scope of the evaluation framework 2.9.

3 Introduction

3.1 Product under test

3.1.1 Software

OSE 5.1 from ENEA. see <http://www.ose.com>.

In this case we discuss the OSE Delta kernel. This was delivered with the Board Support Package for the Motorola PPC Sandpoint evaluation system.

☞ The operating system was used with the patch OSEhq20405 installed.

Tests were run using the flat user space model, except when otherwise specified (no protection domains between the processes).

The qualitative evaluation of this product is done in [Doc. 5].

3.1.2 Hardware

The operating system was tested on the Motorola Sandpoint X3 evaluation system (PPCEVAL-SP3 rev X.3). This motherboard has four PCI slots and one PMC slot for a PrPMC processor module. The installed processor module was one based on the MPC7410 PowerPC processor (PPCEVAL_SP3_7410 Altimus X3).

- Processor: PowerPC MPMC7410 running on 333MHz
- Board: Motorola Sandpoint (Altimus X3)
- Bus Frequency: 83MHz
- 64 MB DRAM
- 2MB L2 cache
- 32KB Instruction and Data cache on the processor.

The OSE boot system (POLO 5.1) was already installed in flash upon delivery.

The hardware configuration was exactly the same as the QNX V6.3.0 operating system of December 2004 (see doc EVQ-2.9-TST-QNX-PPC-01).

3.2 Introduction

This is another evaluation of the OSE RTOS. This time on a PPC based platform for OSE 5.1. The previous one was done on the same PPC platform.

The OSE RTOS is a product developed by ENEA, a Swedish based company founded already in 1968. One of their first assignments was to write an operating system for flight control-computers. The development of the OSE RTOS started around the mid-80s.

The OSE RTOS-family offers three kernels, all of which share the same lower level API.

4 Installation and BSP

Installation and BSP	0	<div style="display: inline-block; width: 100px; height: 15px; background-color: #ccc; position: relative;"> <div style="position: absolute; left: 0; top: 0; bottom: 0; right: 0; background-color: #999; width: 70%;"></div> </div>	7				10
----------------------	---	---	---	--	--	--	----

Installation on the development host could be improved.

The way how BSPs are handled and configured is improved compared with the 4.5.x.

The Sandpoint platform was already delivered with the OSE debug boot ROM (flashed) called "POLO".

4.1 Installation

4.1.1 Installation on Host (OS only)

OSE 5.1 is delivered with two CDs: one containing the operating system and one containing the Tools. The operating system CD contains all command line tools needed to build a system. We used this in a first time to go through the different scenarios for using OSE. In the tools section we will discuss how the Tools software help the developer in developing an embedded application.

We used a Windows XP workstation as host: installing was easy, but the selection of CPU/environment/optional modules is long and it is very easy to do mistakes. The installation is started with a request for a license key file. As we received license keys for all options/CPU's we had a very long selection list, where each line stands for a module/CPU combination. Normally you will only see the products that are contained in the license file making your list smaller. Anyhow, it would be better to have a selection array with on one axis the modules and on the other one the CPU.

Also there is no dependency check for the different options: so you are not sure that you can build the platform correctly.

The OSE OS CD-Rom installs also a version of Cygwin. We discovered some little problems when you have already another version of Cygwin installed (which was the case during our installation).

The tools delivered with OSE itself are mostly command line based using shell scripts and make files. Therefore OSE installs in your startup menu only links to Cygwin. Lucky the documentation is also installed (as PDF documents somewhere in the installation path, no menu links provided).

4.1.2 Installation on host (Tools)

The IDE environment is delivered on a separate Tools CD-ROM. This contains ECLIPSE with some plugins for debugging remote OSE targets. Also Illuminator (a tracing debugging tool) can be installed with this CD-ROM.

Alike the OSE installation, the tools/CPU selection process could be seriously improved. The installation goes via a dos shell, which starts-up an X-motif like graphical installation interface.