

QNX V6.5 ON ARM

© 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, Diepenbeemd 5, B-1650 Beersel, Belgium.

Authors: Luc Perneel (1, 2), Hasan Fayyad-Kazan (2) and Martin Timmerman (1, 2, 3)

1: Dedicated Systems Experts, 2: VUB-Brussels, 3: RMA-Brussels

Disclaimer

Although all care has been taken to obtain correct information and accurate test results, Dedicated Systems Experts, VUB-Brussels, RMA-Brussels and the authors 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 these organisations and authors have been advised of the possibility of such damages.

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

E-mail: info@dedicated-systems.com

EVALUATION REPORT LICENSE

This is a legal agreement between you (the downloader of this document) and/or your company and the company DEDICATED SYSTEMS EXPERTS NV, Diepenbeemd 5, B-1650 Beersel, Belgium.
It is not possible to download this document without registering and accepting this agreement on-line.

1. **GRANT.** Subject to the provisions contained herein, Dedicated Systems Experts hereby grants you a non-exclusive license to use its accompanying proprietary evaluation report for projects where you or your company are involved as major contractor or subcontractor. You are not entitled to support or telephone assistance in connection with this license.
2. **PRODUCT.** Dedicated Systems Experts shall furnish the evaluation report to you electronically via Internet. This license does not grant you any right to any enhancement or update to the document.
3. **TITLE.** Title, ownership rights, and intellectual property rights in and to the document shall remain in Dedicated Systems Experts and/or its suppliers or evaluated product manufacturers. The copyright laws of Belgium and all international copyright treaties protect the documents.
4. **CONTENT.** Title, ownership rights, and an intellectual property right in and to the content accessed through the document is the property of the applicable content owner and may be protected by applicable copyright or other law. This License gives you no rights to such content.
5. **YOU CANNOT:**
 - You cannot, make (or allow anyone else make) copies, whether digital, printed, photographic or others, except for backup reasons. The number of copies should be limited to 2. The copies should be exact replicates of the original (in paper or electronic format) with all copyright notices and logos.
 - You cannot, place (or allow anyone else place) the evaluation report on an electronic board or other form of on line service without authorisation.
6. **INDEMNIFICATION.** You agree to indemnify and hold harmless Dedicated Systems Experts against any damages or liability of any kind arising from any use of this product other than the permitted uses specified in this agreement.
7. **DISCLAIMER OF WARRANTY.** All documents published by Dedicated Systems Experts on the World Wide Web Server or by any other means are provided "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. This disclaimer of warranty constitutes an essential part of the agreement.
8. **LIMITATION OF LIABILITY.** Neither Dedicated Systems Experts nor any of its directors, employees, partners or agents shall, under any circumstances, be liable to any person for any special, incidental, indirect or consequential damages, including, without limitation, damages resulting from use of OR RELIANCE ON the INFORMATION presented, loss of profits or revenues or costs of replacement goods, even if informed in advance of the possibility of such damages.
9. **ACCURACY OF INFORMATION.** Every effort has been made to ensure the accuracy of the information presented herein. However Dedicated Systems Experts assumes no responsibility for the accuracy of the information. Product information is subject to change without notice. Changes, if any, will be incorporated in new editions of these publications. Dedicated Systems Experts may make improvements and/or changes in the products and/or the programs described in these publications at any time without notice. Mention of non-Dedicated Systems Experts products or services is for information purposes only and constitutes neither an endorsement nor a recommendation.
10. **JURISDICTION.** In case of any problems, the court of BRUSSELS-BELGIUM will have exclusive jurisdiction.

Agreed by downloading the document via the internet.

1	Document Intention.....	6
1.1	Purpose and scope	6
1.2	Document issue: the 2.9 framework	6
1.3	Related documents	7
2	Introduction	8
2.1	Overview	8
2.2	Evaluated (RTOS) product.....	8
2.2.1	Software	8
2.2.2	Hardware	8
3	Evaluation results summary.....	9
3.1	Positive points	9
3.2	Negative points	9
3.3	Ratings	9
4	Test Results.....	10
4.1	Calibration system test (CAL)	10
4.1.1	Tracing overhead (CAL-P-TRC).....	10
4.1.2	CPU power (CAL-P-CPU)	11
4.2	Clock tests (CLK)	12
4.2.1	Operating system clock setting (CLK-B-CFG)	12
4.2.2	Clock tick processing duration (CLK-P-DUR)	13
4.3	Thread tests (THR)	14
4.3.1	Thread creation behaviour (THR-B-NEW)	14
4.3.2	Round robin behaviour (THR-B-RR).....	15
4.3.3	Thread switch latency between same priority threads (THR-P-SLS).....	15
4.3.4	Thread creation and deletion time (THR-P-NEW).....	18
4.4	Semaphore tests (SEM).....	23
4.4.1	Semaphore locking test mechanism (SEM-B-LCK)	23
4.4.2	Semaphore releasing mechanism (SEM-B-REL).....	23
4.4.3	Time needed to create and delete a semaphore (SEM-P-NEW).....	23
4.4.4	Test acquire-release timings: contention case (SEM-P-ARN)	26
4.4.5	Test acquire-release timings: contention case (SEM-P-ARC)	28
4.5	Mutex tests (MUT).....	31
4.5.1	Priority inversion avoidance mechanism (MUT-B-ARC)	31
4.5.2	Mutex acquire-release timings: contention case (MUT-P-ARC)	31
4.5.3	Mutex acquire-release timings: no-contention case (MUT-P-ARN)	33
4.6	Interrupt tests (IRQ)	35
4.6.1	Interrupt latency (IRQ_P_LAT).....	35
4.6.2	Interrupt dispatch latency (IRQ_P_DLT)	36
4.6.3	Interrupt to thread latency (IRQ_P_TLT).....	36
4.6.4	Maximum sustained interrupt frequency (IRQ_S_SUS).....	37
4.7	Memory tests.....	38

Doc: **EVA-2.9-TST-QNX-ARM-65**Issue: **draft 3.10**Date: **Sept 7, 2011**

4.7.1	Memory leak test (MEM_B_LEK)	38
5	Appendix A: Vendor comments	39
6	Appendix B: Acronyms	40

SAMPLE

1 Document Intention

1.1 Purpose and scope

This document presents the quantitative evaluation results of the QNX Neutrino operating system V6.5 employed on an ARM based platform, more specifically on the Beagle XM board.

The layout of this report follows the one depicted in “The OS evaluation 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 documents and tests versions together with their corresponding relation between both can be found in “The evaluation framework”, see [Doc. 1] in section 1.3 of this document.

The generic test code used to perform these tests can be downloaded from 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.

SAMPLE

2 Introduction

This chapter talks about the OS that we are going to test and evaluate, and the hardware on which the OS under testing will be employed.

2.1 Overview

QNX Software Systems Ltd was founded in 1980 and has been always focused on delivering solutions for the embedded systems market.

One of the main differences between QNX and other RTOS is the fact that QNX is built around the POSIX API standard. This has its advantages as a lot of code for Linux based platforms can be compiled and run on QNX Neutrino. However, bear in mind that we are discussing a real-time operating system here.

QNX Neutrino is based on true microkernel architecture with message-based inter-process communication. For instance, drivers are just applications with special privileges, and as such they cannot crash the kernel. The concept of kernel modules which is the case in Linux is not needed here, which makes QNX Neutrino a very stable product.

Furthermore, QNX Neutrino was initially built-up as a multi-processor capable operating system (both SMP and AMP). Nowadays, this is a very important asset in today's multi- and many-core business.

2.2 Evaluated (RTOS) product

2.2.1 Software

The operating system that we are going to evaluate is the QNX NEUTRINO RTOS v6.5.0 including patch 2530, from QNX Software Systems Ltd.

2.2.2 Hardware

The hardware that was used for executing our tests for the QNX Neutrino RTOS was a Beagle-XM Board Rev C with following characteristics:

- based on the Texas Instruments DM3730 Digital Media Processor
- ARM Cortex A8 running at 1GHz
- L1 Cache: 32KB instruction and 32KB data cache
- L2 Cache: 64KB
- 512MB RAM at 166MHz

3 Evaluation results summary

Following is a summary of the results of evaluating the QNX NEUTRINO RTOS v6.5.0, from QNX Software Systems Ltd.

3.1 Positive points








- Excellent architecture for a robust and distributed system.
- Very fast and predictable performance.
- Large number of board support packages (BSP) and drivers (the source for most of them is available for public) which can be easily downloaded.
- The availability of documentation which can be considered more than the average.
- Efficient and user friendly Integrated Development Environment (IDE)

3.2 Negative points

- Not all code is available in source code. Customers can apply for source access.

3.3 Ratings

For a description of the ratings, see [Doc. 3].

RTOS Architecture	0		10
OS Documentation	0		10
OS Configuration	0		10
Internet Components	0		10
Development Tools	0		10
BSPs	0		10
Support	0		10