WINDOWS EMBEDDED COMPACT 7.0

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1 Document Intention

1.1 Purpose and scope

This document presents the qualitative evaluation results of the **Windows Embedded Compact 7** operating system. The testing results of this operating system employed on an x86 processors can be found on our website. (www.dedicated-systems.com).

The layout and the content of this report follow the one depicted in "The evaluation test report definition" [Doc. 3] and "The OS evaluation template" [Doc. 4]. See section 1.4 of this document for more detailed references. Therefore 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 can be found in "The evaluation framework" see [Doc. 1] in section 1.4 of this document.

1.2 Document issue: the 2.9 framework

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

1.3 Conventions

Throughout this document, we use certain typographical conventions to distinguish technical terms. Our used conventions are the following:

- ***Bold Italic*** for OS Objects
- **Bold** for Libraries, packets, directories, software, OSs...
- `Courier New` for system calls (APIs...)

2 Introduction

2.1 Overview

Releasing a new OS with a different name (changed from **Windows CE** to **Windows Compact 7**) does not mean that we are up with a new OS! Such naming change was mainly done for marketing purposes, as there were no fundamental changes in the OS itself!

Luckily, Microsoft continued using the same criteria for numbering its new releases. In this case, the current release that we are evaluating (**Compact 7**) can be considered as being **CE 7.0** version. This step was a lucky shot from Microsoft, as their current desktop operating system (**Windows 7**) is getting a positive feedback from the market, so they used the same version number for their embedded OS release.

A more confusing fact is the existence of a similar named OS called **Windows Embedded Standard 7**. However, this **Standard 7** OS has nothing in common with **Compact 7**. It is a special version of the **Windows 7** desktop operating system and as such it has nothing to do with real time and so cannot be used for real-time purposes!

Further in the document, the full name "**Windows Embedded Compact 7**" or the short name "**Compact 7**" will be used.

2.1.1 Windows Embedded Compact 7

Fundamentally, looking in the OS internals, these are the major changes between **Compact 7** and its predecessor **CE6R3**:

- **Compact 7** kernel supports now multi-core architectures and thus has SMP functionalities.
- **Compact 7** now supports up to 3GB physical RAM (which was limited to 512MB in CE6R3).
- Microsoft has also redesigned their heap manager to reduce memory fragmentation compared with **CE6**. This is surely important for long time running devices (without reboot), which is typical for embedded systems.
- The possibility to use Address Space Location Randomization: this will adapt randomly the addresses of the DLL loaded functions to the application. As such, a hacker cannot know how to jump to a library routine.

Beside these low-level changes, there were some improvement in the cryptographic support, and a new security loader was created for verifying installed modules (keys, certification…).

Since our previous review of the **CE6R2** version, we see that only few changes in **Compact 7** were performed on the internal behavior (workings) of the RTOS while most of the changes were performed on the application level and tool integration as we can see here:

- **Silverlight**, the new development platform for GUIs (being it web, desktop or smart phone).
- Newer versions of browsers
- Upgrade in (mobile) Office products
- Support for **PDF**
- Multi-touch

Furthermore, the **Platform Builder** toolset uses now **Visual studio 2008 SP1**, where the previous release used **Visual studio 2005**.

Microsoft claims as well that their tools are improved; they mention as example their new remote toolset to access/monitor remote **Compact 7** devices. We will see further in this document what our experiences with these tools are.

2.2 Evaluated (RTOS) product

The RTOS that will be evaluated and tested is **Windows Embedded Compact 7**. This OS was launched by Microsoft Corporation at the beginning of 2011. In fact, this OS "**Windows Embedded Compact**" is the successor of **Windows CE6R3**.

The tests for evaluating this OS were done in March 2011 which is the date when this OS was released as a manufacture release.

Installing **Windows Embedded Compact 7** required the usage of the following products

- **Visual Studio 2008 SP1**
- **.NET Framework 3.5**
- **Windows Embedded Compact 7**

2.3 Supported CPU

The following Instruction set families are supported by **Windows Embedded Compact 7:**

- ARM
- MIPS
- x86

Remark that the SH4 support has been dropped with this release.

3 Evaluation results summary

Following is a summary of the results of evaluating **Windows Embedded Compact 7**, released by Microsoft Corporation, Inc.

3.1 Positive points

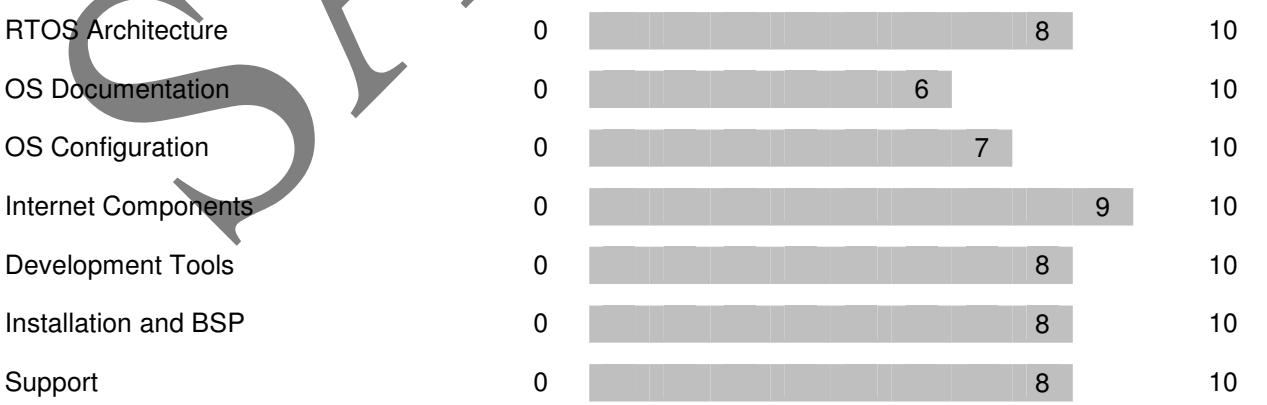
1) All protection primitives use priority inheritance, which is a major plus for achieving real-time behavior
2) Good debugging tools: Available also for kernel/driver debugging.
3) Very easy to install and to set-up a target (from templates).
4) Provides the same flexibility as a 32-bit general purpose OS

3.2 Negative points (see Microsoft's comments in section 3.4)

1) The operating system documentation has taken a step backwards compared with the previous versions. A lot of background information is removed (***see MS comments***).
2) Customizing the kernel and adding custom drivers (BSP) stays a daunting task once you go away from the default configurations.
3) The remote tool has been changed since last version. We noticed two issues, the more important of which is that there is no officially-supported method to include the remote tools within a device image using Platform Builder. Additionally, we noticed during our testing that establishing a connection between the tools and the target took in excess of a minute, which was longer than our expectation (***see MS comments***).

3.3 Ratings

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



3.4 Vendor Comments

Following are the comments of Microsoft on the negative points:

- **For point 1** Microsoft notes that documentation is a focus for the next release, and the product team plans to bring forward any relevant content from earlier releases, which will be identified as still applicable to the current release.
- **For point 3** Microsoft notes that the ability to add the remote tools to a device image using Platform Builder is by design, as generally a finished device's final image would not normally include debug support. Additionally, because some devices won't have a .CAB installer, making installation of the remote tools a challenge. They are investigating now how to provide this support in a future release of Platform Builder. Microsoft also notes that the Compact Product Team was unable to reproduce the delayed connection time experienced by Dedicated Systems but will continue to investigate whether connection time is a persistent issue.