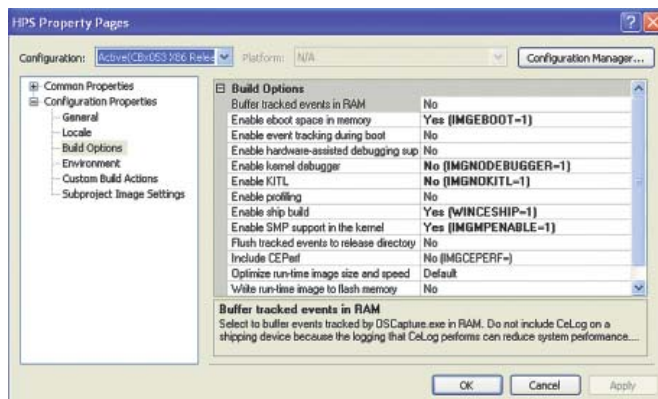


Advantages of Windows Embedded Compact 7 in automation technology

Microsoft launched Windows Embedded Compact 7 (WEC7 for short) at Embedded World 2011. A public WEC7 CTP version ('Community Technical Preview') had already been available since June 2010. Compact 7 is the latest version of Windows Embedded CE and offers a complete update of the kernel as well as the IP stack, new developer tools and additional features. Stefan Hoppe, Beckhoff Product Manager for TwinCAT and Microsoft eMVP, provides an overview of the advantages of Windows Embedded Compact 7 for automation technology.

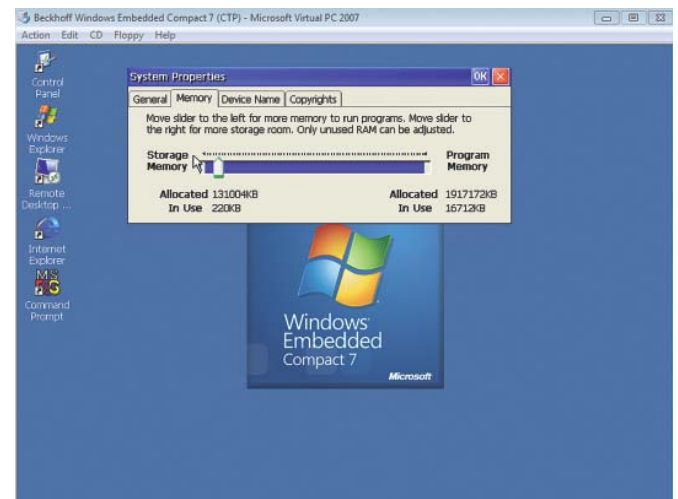
The Windows Embedded versions are generally scalable, i.e. OEMs can scale the included features of the operating system to the needs of their devices. Compared with Windows Embedded Standard 7 (the componentized version of Windows 7 with additional Embedded features), Embedded Compact generates a significantly smaller footprint (between 3 MB and 70 MB) and is thus also optimized for the smallest Embedded hardware. The source code for the operating system is not available to end users, but it is to OEMs and already offers hard, deterministic real-time capabilities.

The kernel offers the most important changes: Compact 7 is the first version to support SMP (Symmetric Multiprocessing). The kernel can use several CPU cores simultaneously and distribute the execution of different processes and threads to them. The number of available cores can be determined by API from the application – the processing and assignment of a thread to a specially selected core is possible. For solutions this allows to execute the hard real-time application on one core while a User interface app or other solutions can be scaled unimpaired on another core. In addition to the distribution of processes and threads, however, the cores themselves can be managed: With the exception of the main core, all other cores can be switched on or off dynamically by API at runtime.



SMP support for multi-core systems can be activated in the Compact 7 Platform Builder.

A further kernel change concerns the available RAM: Although the preceding version 'Windows Embedded CE 6.0' offered 2 GB of virtual memory, a physical 512 MB RAM limit was historically imposed, dating from the old CE origins with support for MIPS and SH3 CPUs. It was possible to access the additional RAM oneself from an application with the aid of 'tricks,' but the operating system itself recognized only 512 MB of RAM. This limit has now been lifted and 3 GB of physical RAM are now available.



The Compact 7 operating system runs in a Windows Virtual PC environment with 2 GB of available memory.

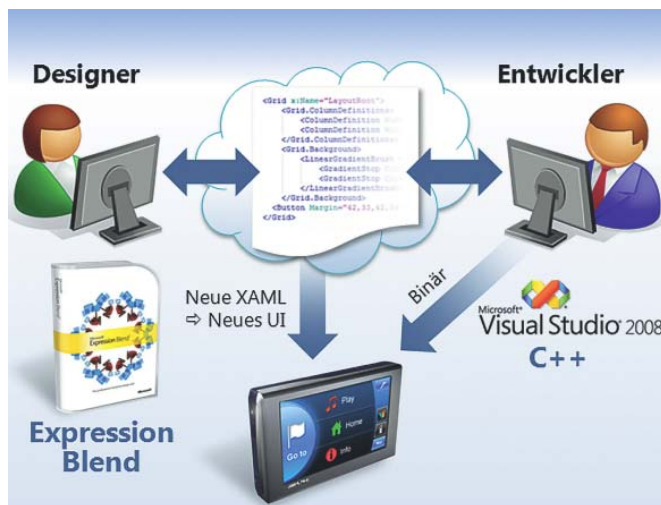
The Compact 7 operating system is now also available for the latest ARM-v7 architectures and still for the ARMv5 and ARMv6 platforms – but no longer for the ARMv4 architecture of the old StrongARM processors.

There have also been many innovations in the area of networks and connectivity: the operating system provides not only a new, higher-performance Internet Explorer version, but also Internet Protocol Security (IPSec), WinSocket2 and a new NDIS 6.1 stack, which is also used in Windows 7 and Windows Server 2008. Apart from general updates for Wi-Fi, Bluetooth

and safety, 'Windows Device Stage' is a visible innovation: on connecting Embedded consumer devices to a PC, the user can now be presented with a dialog tailored to the device function instead of a default dialog. This will be noticeable in the future, for example, when connecting a digital camera by USB to a PC by the automatic starting of dialogs specially tailored to the camera model.

The 'Windows Filtering Platform' (WFP), which replaces various previous technologies for filtering IP packets, could be of interest for some automation applications: the incoming data stream can be analyzed and also modified first by API before it is passed on to the actual IP stack or completely rejected.

For the creation of user interfaces, 'Silverlight for Windows Embedded' (SLWE for short) was integrated with Windows Embedded CE 6.0 R3 which, from a technological point of view, means the separation of the actual design of the interface and the implementation of the logic. As a result, the layout of the user interface can be delivered in a different design style without having to adapt or specially test the source code of the logic. Compact 7 now integrates the more powerful Silverlight 3 engine here as an update. Expression Blend 3 is now supported as a design tool and, as a result, delivers with XAML a description of the user interface based on XML.



Silverlight for Windows Embedded separates the design of the user interfaces from the creation of the logic.

The BAML data format as a binary version of XAML is new: BAML enables the compression of large XAML files for sophisticated user interfaces into a more efficient binary format. This can be interpreted with higher performance

using a parser at the GUI runtime. The GUI logic is coded in the Compact 7 version exclusively using C++ in Visual Studio 2008.

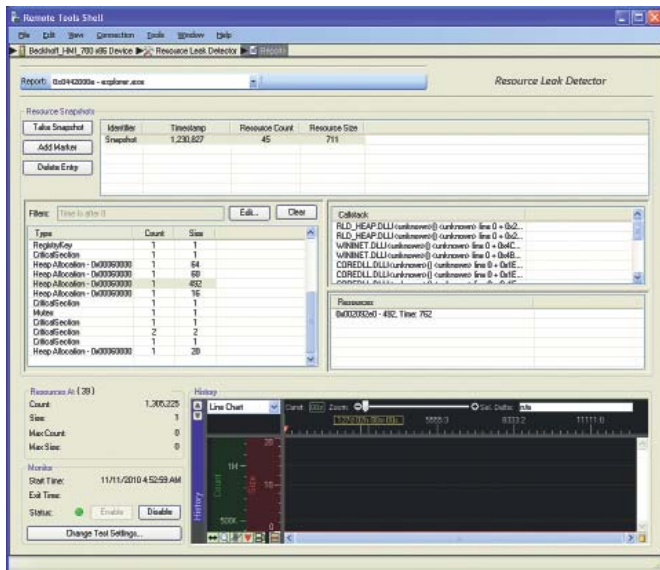
Various 'remote tools' have been available to the experienced CE developer for a long time in the engineering area. For example, it was possible to edit the registry of the target system via the network using the 'Remote Registry Editor.' Together with further tools such as the Performance Monitor, the Profiler or the Resource Leak Detection, these tools are now bundled in a new 'Remote Tools Framework.'



The Remote Tools Framework offers a useful collection of analysis tools – the tools themselves have been thoroughly revised.

At first sight the remote tools themselves have also been revised in terms of content and can be used more efficiently: As a result, the 'Remote Registry Editor' can now also log changes to the registry at the runtime of the Embedded device.

Heiko Wilke from Beckhoff Embedded PC product management at Embedded World in Nuremberg: "Compact 7 enables the time-critical real-time part to run on one core, while the extensive 'Silverlight for Embedded' user interface and the OPC-UA (Unified Architecture) communication for external data exchange runs in parallel on the second core."



The Resource Leak Detector Tool offers clearer and better diagnostics when compared to the previous 'Application Verifier'. If necessary, snapshots of the system condition can be generated and analyzed according to type, time or size and other criteria.

Conclusions

In conclusion, it can be said that the new Windows Embedded Compact 7 version offers considerable advantages over the previous Windows Embedded CE version for the field of automation: only with Compact 7 can the characteristics of multi-core CPUs be fully utilized. However, single core devices also benefit from the support for 3 GB physical RAM where memory-hogging applications are involved. Multi-touch functions for dynamic touch screens permit new control concepts on the smallest Embedded devices. These tidied and extended tools help create a modern approach and facilitate advancements in engineering.

Live 'Print Mark Detection' demo with Windows Embedded Compact 7 at Embedded World 2011

At Embedded World 2011, which took place from March 1 – 3, 2011 in Nuremberg, Germany, Beckhoff provided proof of concept of the new Embedded operating system Compact 7 in the form of an application example for print mark detection. The "Print Mark Demo" from Beckhoff illustrated implementation in an actual industrial application for the purpose of evaluating the new functions offered by Windows Embedded Compact 7. The most interesting innovation for industrial automation is the kernel with multi-core CPU support and higher RAM limits, in line with industry trends.

Advanced printing technology operates with high web speeds of more than 10 m/s. Despite this, the print quality must meet stringent requirements, and the print pixels must be set with a precision of less than 1/10 mm. This requires fast technology for controlling the print quality during production.

To identify the position of print colors, special patterns referred to as print marks are printed on the paper and generally cut off after completion. Since the fast-moving print marks cannot be detected by the human eye, they are often illuminated by stroboscopes for visual checking. This produces a recognizable, stationary image for the observer. Such an application was reproduced at Embedded World 2011 with realistic high speeds.

An "all-in-one" Beckhoff CP6201 Panel PC controlled the entire demo. It is equipped with an Intel® Core™ Duo 2.0 GHz and 2 GB of RAM and takes full advantage of the new Compact 7. In addition to offering an intuitive HMI, it meets the requirements of high-precision, real-time tasks. The machine ultimately works safely and highly deterministically.