

eVM[®] for Windows*

Consolidate embedded and real-time applications with Windows*

Eliminate the two-box solution

Reduce the cost and complexity of multi-computer systems using eVM for Windows embedded virtualization technology. Consolidate a headless x86 operating system with its applications onto a shared multi-core platform with Windows. eVM for Windows allows the quick and easy integration of embedded or real-time applications onto newer, more reliable, and more powerful platforms with Intel Virtualization Technology. The result is a simultaneous, side-by-side deployment of native Windows with embedded OSs and applications that eliminates the need for multiple compute platforms.

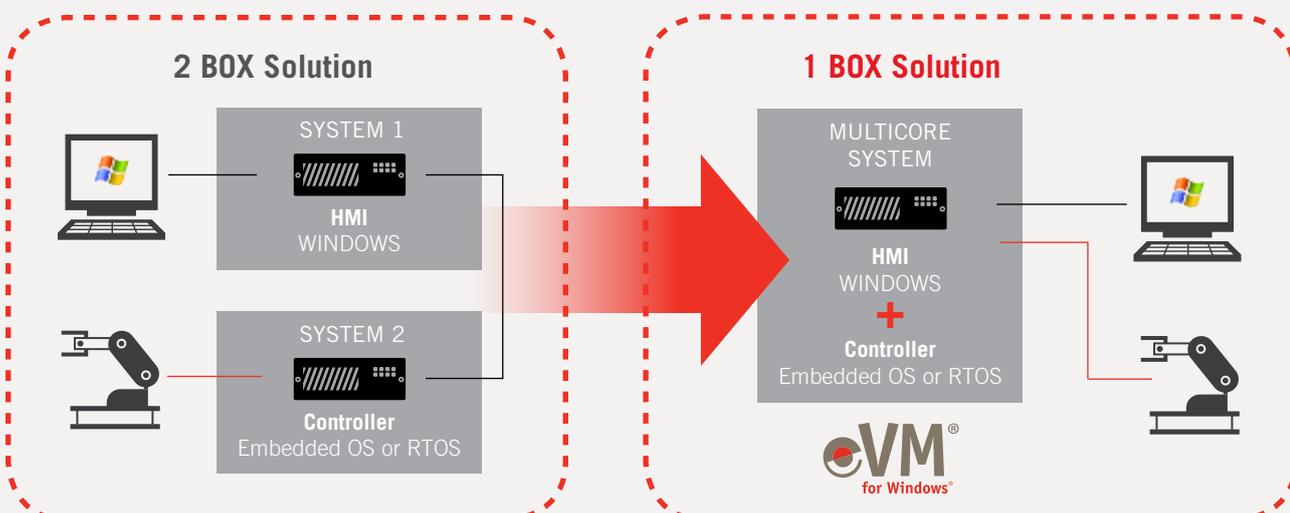
eVM for Windows builds on our unique embedded virtualization approach that utilizes explicit hardware partitioning, combined with our hard real-time hypervisor (HaRTH™) technology. This technology preserves the determinism of existing embedded applications due to its underlying real-time OS environment and allows direct access to critical I/O, using native, unmodified Guest OS drivers.

eVM for Windows creates separate hardware subsystems on a single platform, onto which you can consolidate your Windows and Guest OS along with new or existing applications to lower system hardware costs and reduce integration complexity.

eVM[®] for Windows* Highlights

- Real-time hypervisor, preserving Guest OS determinism with core affinity
- Leverages multicore x86 CPUs to reduce system cost and complexity
- Guest OS applications run unmodified preserving customer IP
- Explicit HW partitioning provides for optimum performance – Windows runs unvirtualized
- Protected isolated environments by Intel* Virtualization Technology
- Fast installation and integration gets you up and running quickly

Embedded virtualization enables advanced system consolidation



Tested Guest OSs

Microsoft* Windows* CE
QNX* Neutrino*
SUSE* Linux*
TenAsys® iRMX®
Ubuntu* Server Linux*
Wind River* VxWorks*

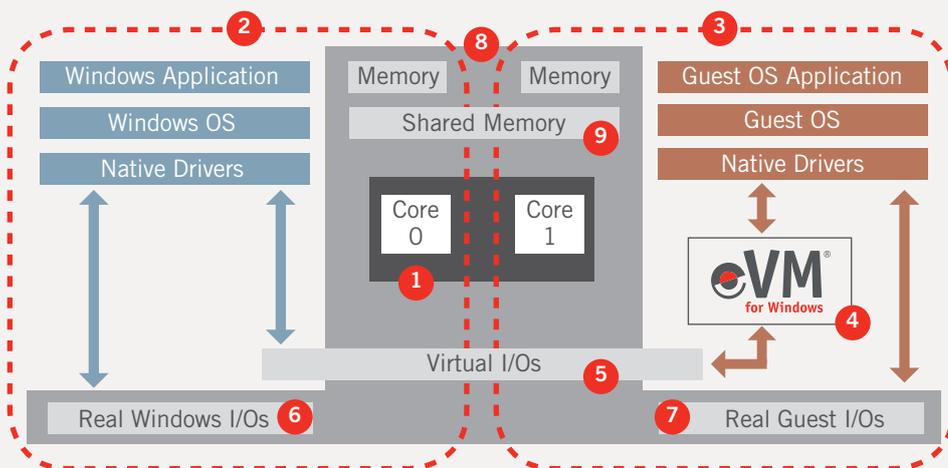
Fast migration and deployment

eVM for Windows installs like any standard Windows application. Your system is integrated and up and running in minutes with all necessary services in place, enabling you to easily and quickly take advantage of the latest PC platforms for your embedded solutions alongside Windows. You can run the TenAsys VTProbe tool from our website to validate that the designated target platform is supported.

eVM for Windows common use cases

- Add a Windows-based HMI, including graphics, mouse or touch screen support, as well as web connectivity and storage to an existing x86 embedded or RTOS application.
- Decrease system cost and improve reliability by eliminating redundant hardware when combining Windows and embedded or RTOS applications onto one system.
- Upgrade the HW platform for embedded legacy SW, preserving existing applications while increasing functionality and improving the user interface.
- Virtualize end of life hardware devices for legacy application binaries and migrate to newer platforms with increased performance and updated connectivity.
- Incorporate an isolated software firewall appliance into a Windows platform without the need for a separate platform or gateway hardware.

A headless x86 OS that boots using common low-level disk services



eVM System Diagram

1. Multi-core Intel Processor with VT-x
2. Unvirtualized standard Windows
3. Unmodified headless Guest OS
4. eVM for Windows hypervisor
5. Virtual I/O allows communication between the Guest OS and Windows
6. I/O devices used by Windows
7. I/O devices used by Guest OS
8. Partitioned memory
9. Shared memory option for messaging API

Explicitly Partitioned



Cores are partitioned between Windows and the Guest OS. Each OS boots from its own separate cores. Both OSs have dedicated resources for maximum independence and reaction times.



Memory is partitioned and reserved for each OS. Each OS does not have access or visibility to the memory of the other OS. Each OS sees a zero-based address range. For communication and data transfer, a shared memory device and API is provided.



I/O devices are assigned to Windows by default. Devices can be passed to eVM control with the eVM Device Manager making the device only visible to the Guest OS. Critical I/O and their associated Interrupts are controlled by the Guest OS with very low additional latencies. Both IRQ and MSI interrupts are supported.

Communication between the Windows OS and the Guest OS with a Virtual Ethernet port and up to 4 serial communication ports is provided by eVM for Windows. No change is required in the Guest OS as virtualized devices appear as native ports.

Easy to setup and run

1. Installation

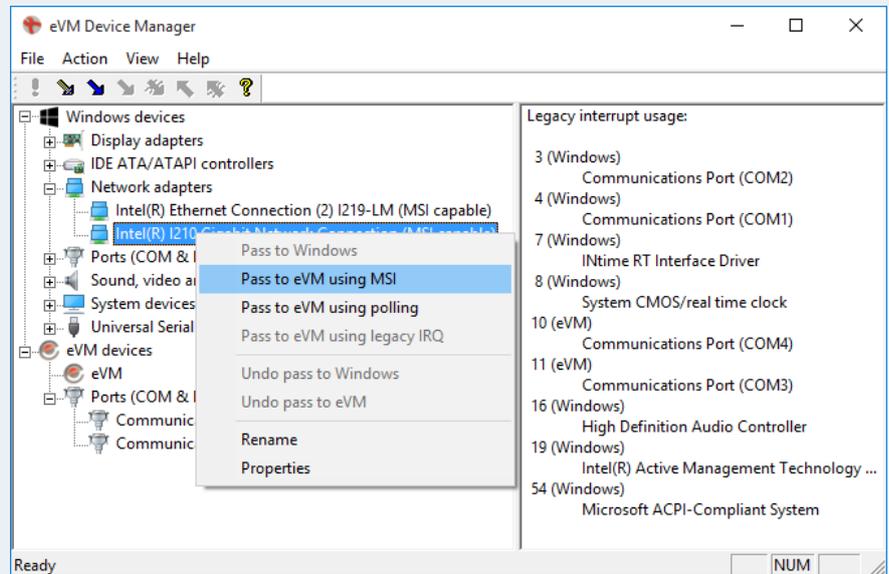
After installation of eVM for Windows using the standard Windows installer, the system's CPU cores and memory are partitioned. eVM runs on one core with Windows running on remaining cores. The separation of cores between the two OSs is vital to preserve the performance of a real-time Guest OS, as this method prevents any CPU contention.

2. Configuration

System resources

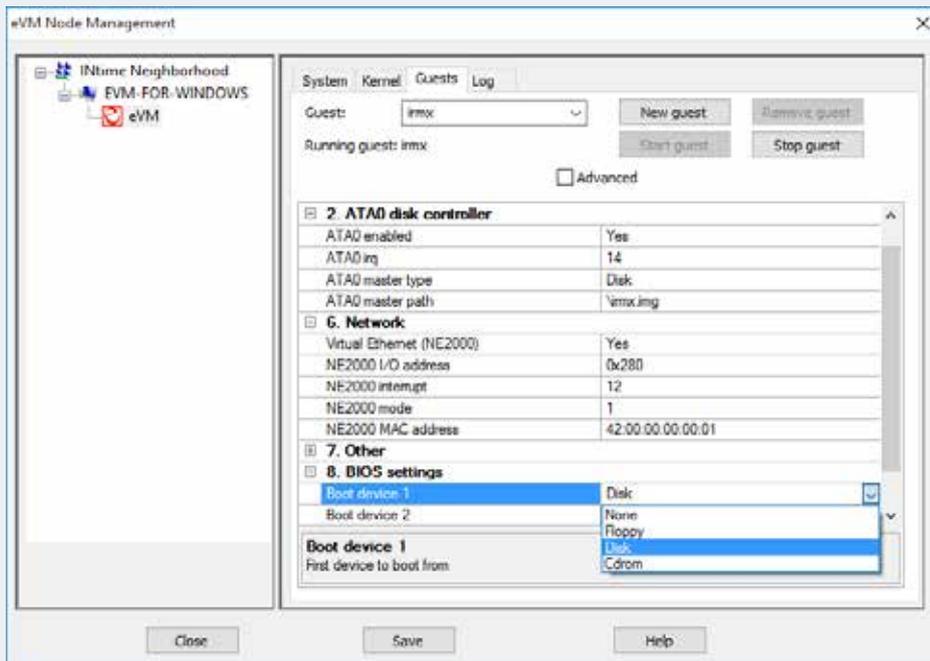
Explicit hardware partitioning is the key benefit provided by eVM for Windows to host two OSs on the same platform. Each OS has its own dedicated processor cores, memory, I/O, and interrupts, keeping the OS environments separate in order to preserve each one's performance. There is no special boot loader, or need to re-install Windows on any supported platform.

The **eVM Device Manager** (top) is used to assign required PC I/O resources from Windows to the Guest OS. Native Guest OS device drivers control the assigned I/O resources directly, without any para-virtualization layer. Assigning a device to the Guest OS environment leads to its interrupts being serviced by the Guest OS. A dedicated Ethernet controller and COM ports are shown as examples. eVM Device Manager manages the interrupt settings of the devices assigned.



Guest OS

The Guest OS virtual environment is configured in the **eVM Node Management** (bottom). Several virtual I/O devices are available to boot the Guest OS and to enable easy inter-platform communication with Windows. For example, a virtual ATA device to boot the Guest OS from a Windows hosted disk image file and a virtualized COM port on Windows for the console interface to the Guest OS. A virtualized Ethernet adapter allows for standard TCP/IP communication between the two OSs.



3. Execution

Load and run the Guest OS and application

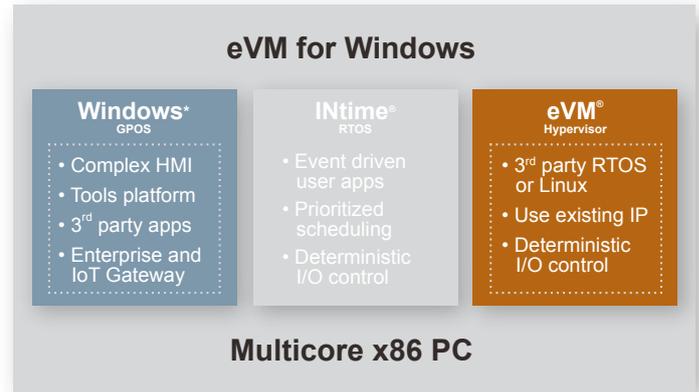
The eVM BIOS provides the standard functionality of a PC BIOS, including all of the functions required to boot a Guest OS natively from a hard drive, floppy disk, or CDROM image.

Multiple Guest OSs can be configured and interactively started and stopped from the eVM Node Management tool.

Part of the TenAsys Software Platform

Playing a strategic part in the TenAsys embedded virtualization initiative, eVM for Windows provides for an end use model leveraging advanced consolidation with any headless x86 guest workload. Designed from the ground up to be hard real-time, eVM compliments the TenAsys Software Platform alongside use models for the INtime real-time operating system and Microsoft Windows.

Learn more about INtime software and the overall TenAsys Software Platform at our website.



System Requirements

Minimum requirements for a Windows* PC-compatible host to run eVM for Windows:

- Any 32 or 64-bit versions of:
 - Windows 10
 - Windows 8.1
 - Windows 8
 - Windows 7
 - Windows Vista (SP1 or later)
 - Windows XP (SP3 or later)
 - Windows Server versions: 2016, 2012 R2, 2012, 2008 R2, 2008, or 2003 R2 (SP2 or later)
 - Windows Embedded versions of the above Windows releases
- Any Intel* or PC-compatible platform that runs Windows
- A validated multicore Intel CPU supporting Intel VT-x. Optional and preferred use of VT-d for DMA bus mastered interfaces to support native guest device drivers

Ordering Information

EVM STARTER KIT	eVM for Windows starter kit.
EVM THREE PACK	eVM for Windows run-time incorporation three pack.
EVM FIVE PACK	eVM for Windows run-time incorporation five pack.



For more information visit www.tenasys.com or contact one of our world wide offices

Tenasys is headquartered in Beaverton, Oregon U.S.A. with a global sales and support presence across the United States, Europe, and Asia.

Tenasys® Corporation

1400 NW Compton Drive
 #301 Beaverton, OR 97006 USA
 tel. +1 (503) 748-4720
 toll-free (USA only) 877 277-9189
info@tenasys.com

Tenasys® Europe GmbH

Hans-Stiessberger-Str. 2b
 D-85540 Haar / Munich
 Germany
 tel. +49 89 46 1498 45
europe-office@tenasys.com

