

# ESX Monitor Modes

VMware has supported Intel and AMD's virtualization assist since 2006. Long before then we were using an all-software approach that we call binary translation (BT). With the benefit of years of development and optimization, BT outperformed the early versions of hardware assist. But as hardware assist evolved the use of these new features became more attractive.

Because our support for hardware assist is rich and BT is heavily optimized, the monitor can benefit from using either technology in different situations. The following tables detail the defaults in ESX 4.0, which can be changed through VM settings if desired.

## Monitor Defaults with Intel Processors

VM Configuration	Core-i7 (Nehalem)	45nm Core2 with VT-x	65nm Core2 with VT-x and FlexPriority	65nm Core2 with VT-x and No FlexPriority	P4 with VT-x	EM64T without VT-x	No EM64T
FT enabled	VT-x + SPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	Not runnable	Not runnable	Not runnable
64-bit guests	VT-x + EPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	Not runnable	Not runnable
VMI enabled	BT + SPT	BT + SPT	BT + SPT	BT + SPT	BT + SPT	BT + SPT	BT + SPT
OpenServer, UnixWare, OS/2	VT-x + EPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	BT + SPT	BT + SPT
32-bit Linux and 32-bit FreeBSD	VT-x + EPT	VT-x + SPT	BT + SPT (*)	BT + SPT (*)	BT + SPT (*)	BT + SPT	BT + SPT
32-bit Windows XP, Windows Vista, Windows Server 2003, Windows Server 2008	VT-x + EPT	VT-x + SPT	VT-x + SPT	BT + SPT (*)	BT + SPT (*)	BT + SPT	BT + SPT
Windows 2000, Windows NT, DOS, Windows 95,	BT + SPT (*)	BT + SPT (*)	BT + SPT (*)	BT + SPT (*)	BT + SPT (*)	BT + SPT	BT + SPT

Windows 98, Netware, 32-bit Solaris							
All other 32-bit guests	VT-x + EPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	VT-x + SPT	BT + SPT	BT + SPT

(\*) When we use BT on an Intel system with VT-x capability, we dynamically switch to VT-x if the guest enters long mode.

## Monitor Defaults with AMD Processors

Configuration	Barcelona, Phenom, and Newer	AMD64 pre-Barcelona	No AMD64
FT enabled	AMD-V + SPT	Not runnable	Not runnable
64-bit guests	AMD-V + RVI	BT + SPT	Not runnable
VMI enabled	BT + SPT	BT + SPT	BT + SPT
OpenServer, UnixWare, OS/2	AMD-V + RVI	BT + SPT	BT + SPT
32-bit Linux and 32-bit FreeBSD	AMD-V + RVI	BT + SPT	BT + SPT
32-bit Windows XP, Windows Vista, Windows Server 2003, Windows Server 2008	AMD-V + RVI	BT + SPT	BT + SPT
Windows 2000, Windows NT, DOS, Windows 95, Windows 98, Netware, 32-bit Solaris	BT + SPT	BT + SPT	BT + SPT
All other 32-bit guests	AMD-V + RVI	BT + SPT	BT + SPT

## Legend

- VT-x: Intel's virtualization hardware assist.
- EPT: *Extended Page Tables*. Intel's on-board, virtualization-aware memory management unit (MMU).
- EM64T: Intel's 64-bit extensions to the x86 architecture.
- SPT: *Shadow page tables*. ESX's software memory management unit (i.e., not EPT or RVI.)
- BT: *Binary translation*. ESX's software virtualization capability (i.e., not VT or AMD-V)
- AMD-V: AMD's virtualization hardware assist.
- RVI: *Rapid Virtualization indexing*. AMD's on-board, virtualization-aware memory management unit (MMU).