What are the page sizes used by Windows on various processors?

devblogs.microsoft.com/oldnewthing/20210510-00

May 10, 2021

Raymond Chen

One detail I've been overlooking in my processor retrospective series is the choice of page size. For many processors, the page size is dictated by the processor, but some processors give you a choice.

	Page size		
Processor	**Normal**	**Large**	**Reasonable choices**
x86-32 without PAE	4KB	4MB	4KB only
x86-32 with PAE	4KB	2MB	4KB only
x86-64	4KB	2MB	4KB only
SH-4	4KB	—	1KB, 4KB
MIPS	4KB	—	1KB, 4KB
PowerPC	4KB	—	4KB only
Alpha AXP	8KB	—	8KB, 16KB, 32KB
Alpha AXP 64	8KB	—	8KB, 16KB, 32KB
Itanium	8KB	—	4KB, 8KB
ARM (AArch32)	4KB	N/A	1KB, 4KB
ARM64 (AArch64)	4KB	2MB	4KB only

I arbitrarily define "reasonable choices" for the page size to be sizes less than 64KB, although 64KB pages were considered for ia64.

The large page size on x86-32 is determined by hardware depending on whether PAE is enabled. Windows enables PAE by default starting in Windows XP, since it is required for Data Execution Prevention.

The MIPS and ARM natively use 4KB pages, but they support subdividing those pages into 1KB "subpages". Windows CE for ARM920 took advantage of this and used 1KB "pages". All other flavors of Windows use the native 4KB pages. (ARM formally deprecated subpages in ARMv6.)

Windows never shipped a 64-bit version of Windows for Alpha AXP, but internal builds of it were produced to serve as the early proving ground for 64-bit Windows while the team waited for 64-bit CPUs to arrive from Intel.

Windows dropped support for many of these processors before large page support was added to the operating system. For those processors, the large page size is given as —, indicating that no choice was ever made. This is different from the N/A entry for 32-bit ARM, which indicates that 32-bit ARM explicitly does not support large pages.

Note that the operating system can always synthesize larger page sizes by simply allocating memory in multiples of the CPU native page size, but this doesn't mean that you can have mixed page sizes. If you decide to have (say) artificial 8KB pages constructed from pairs of 4KB pages, you need to do this consistently if you allow visibility into page frames. Otherwise, you can get into the situation where you need to allocate 8KB of contiguous physical memory, but all you can find are two 4KB native pages that aren't adjacent to each other.

Raymond Chen

Follow