4 GB Architectural Details for Intel® 915G, 915P and 925X Express Chipsets and the Intel® E7221 Chipsets

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Platform Applications Engineering

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Issue

- When the Intel® 915G/P, 925X Express chipsets and/or E7221 chipsets are populated with its maximum system memory of 4 GB, the Operating System (OS) may report a lower amount of available memory

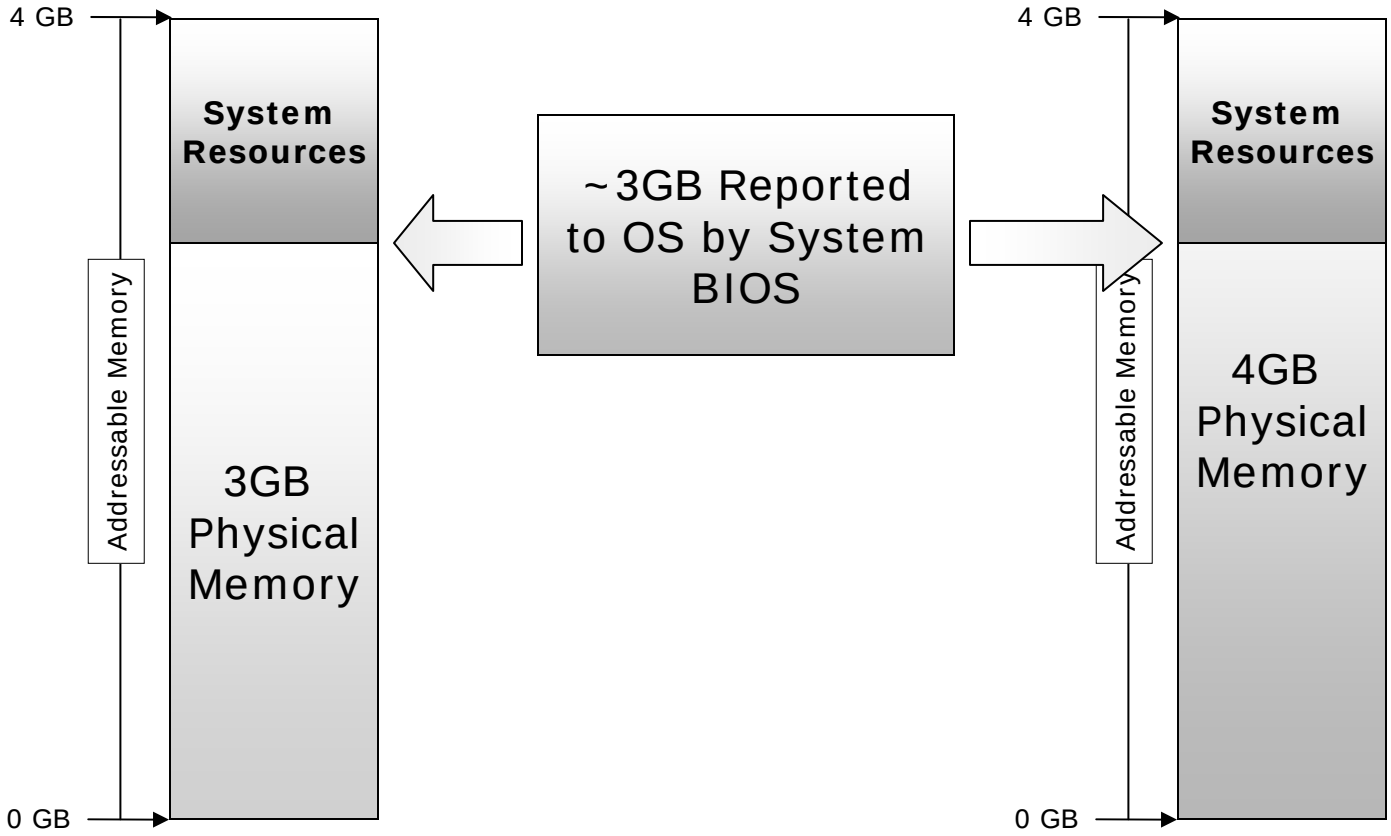
Explanation

- Standard PC Architecture System Resources require addressing which overlaps physical memory below 4 GB:
  - System BIOS
  - Motherboard Resources (I/OxAPIC)
  - Memory Mapped I/O
  - PCI Express* Configuration Space
  - Additional PCI Device Memory (Graphics Aperture)
  - VGA Memory
  - Etc..
- These requirements may reduce the addressable memory space available to and reported by the Operating System
- These memory ranges, while unavailable to the OS, are still being utilized by subsystems such as I/O, PCI Express and Integrated Graphics and are critical to the proper functioning of the PC

Explanation (cont…)

- Use of Available memory below 4 GB by system resources is not specific to Intel chipsets, but rather a limitation of the existing PC architecture and current limitations of the desktop OS
  - Current Desktop OS' may not currently recognize >2 GB of memory
- This issue potentially impacts all desktop PC chipsets with 4-GB maximum memory configuration
- Intel has addressed this from a hardware perspective in future platforms, anticipating that future Operating Systems will provide greater than 4 GB of memory support.

System Resources



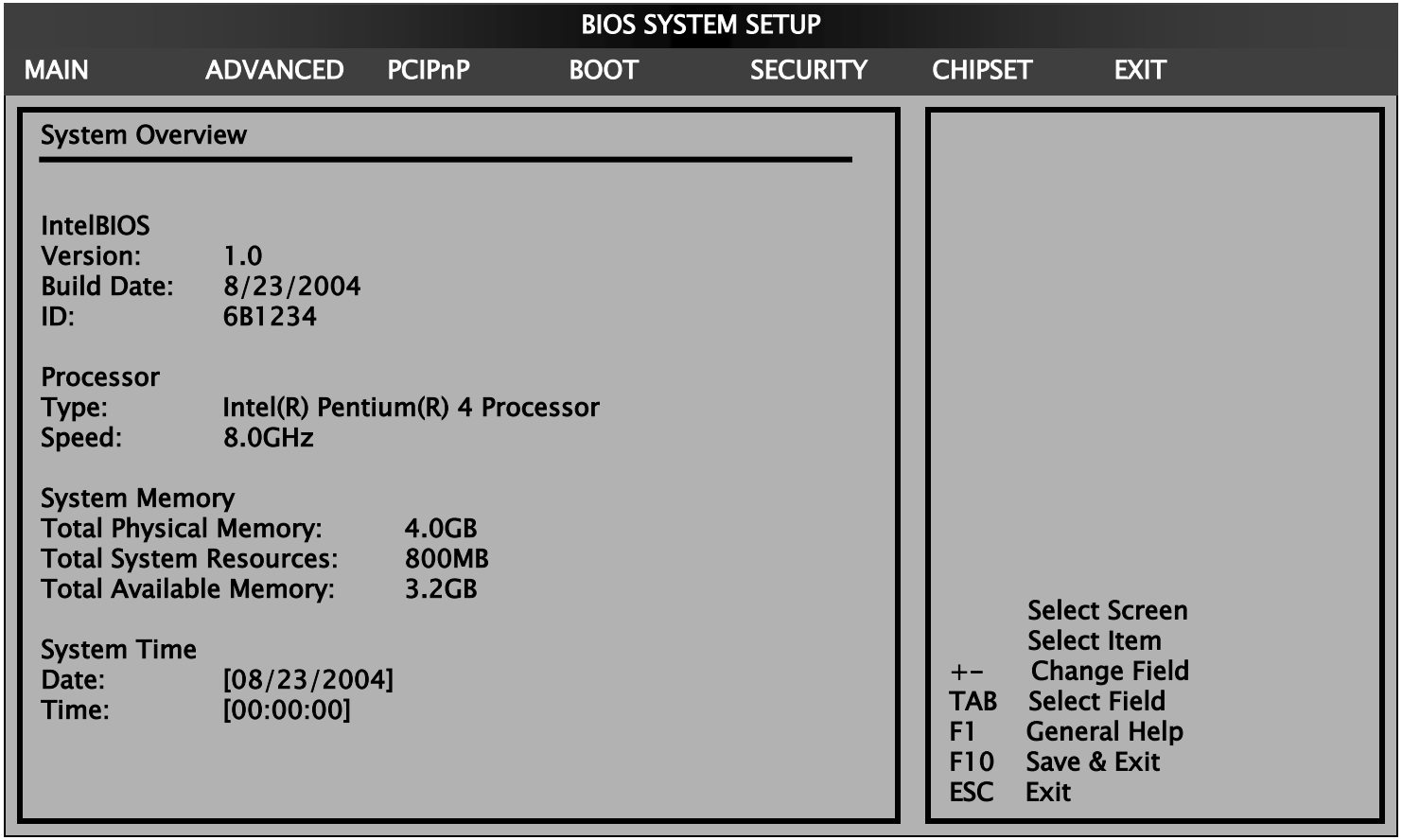
Example System Memory Map

System Resource	Size	Physical Memory Remaining (4 GB Total System Memory)	Physical Memory Remaining (3 GB Total System Memory)
Firmware Hub flash memory (the BIOS)	*1MB*	3.99	3.00
Local APIC	*4KB*		
Area available to the chipset	*2MB*		
IO APIC (4 Kbytes)	*4KB*		
PCI Enumeration Area 1	*256MB*	3.76	3.00
PCI Express* area (256 MB)	*256MB*	3.51	3.00
PCI Enumeration Area 2 (if needed) (aligned on 256-MB boundary)	*512MB*	3.01	3.00
VGA memory	*16MB*	2.85	2.85
TSEG	*1MB*	2.84	2.84
Memory available to BIOS, OS, and applications.		**2.84**	**2.84**

Recommendations

- Intel recommends that when 4 GB of memory is populated, system BIOS should indicate the following on information screens:
  - Total physical memory populated in the system
  - Total memory dedicated to motherboard resources
  - Total memory reported as available to the operating system
    - This information should align to the INT15h E820h standard that BIOS uses to communicate memory usage to the operating system.
- This BIOS feature will clarify the memory subsystem support and usage for the end user and may help reduce support calls

Example BIOS Info Screen



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