Review

Intel P4 3.46EE CPU and 925XE Chipset Review

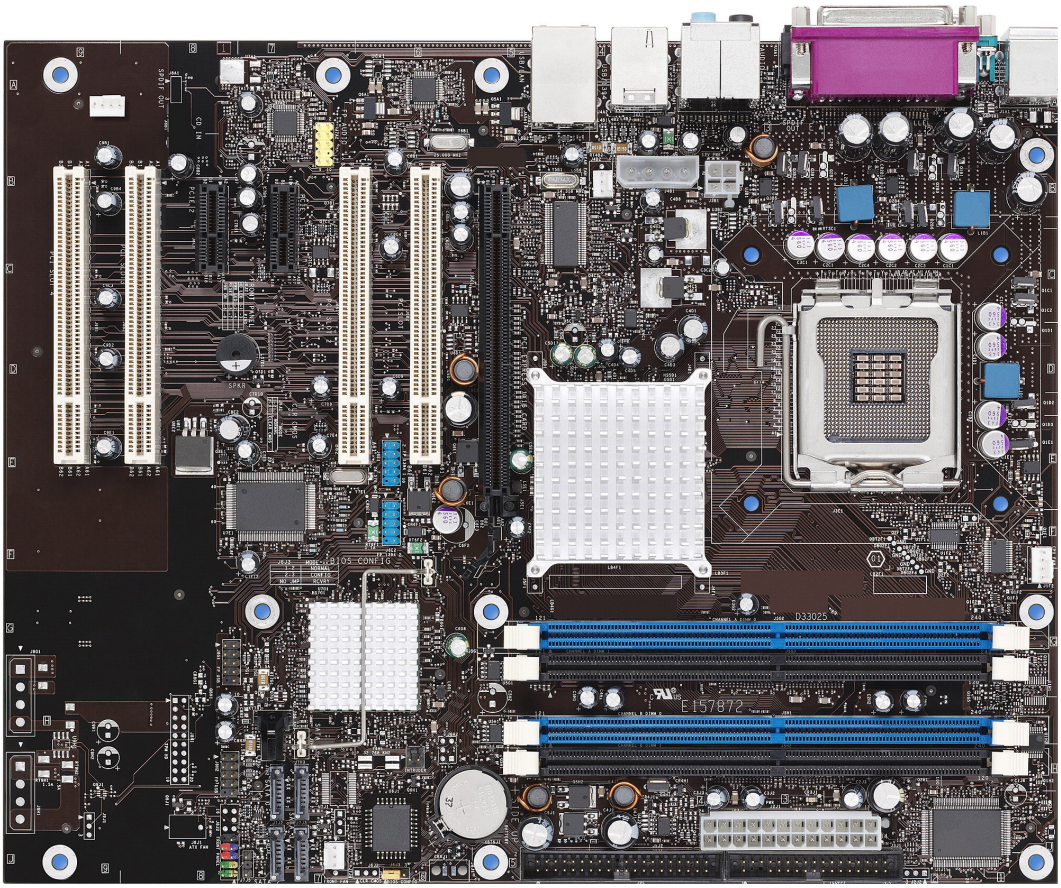
by **John Reynolds**

Introduction

When Intel introduced the Prescott processors this past summer the event was received by the online hardware and gaming community with less enthusiasm than what past Intel launches have garnered. Manufactured using Intel's 90nm process, the Prescotts did not exhibit the traditional benefits of new fabrication techniques, which have been reduced voltage and heat that allow for higher clock speeds. In fact, the P4 3.6 GHz processor, announced this June, did not become available on the market until late September, some three months after its introduction, giving Intel time to make minor changes to the core-a new stepping, as it's referred to in the industry-to alleviate some of its heat issues. The company's recent cancellation of the expected 4 GHz Prescott and announced new focus on means to increase processor performance aside from the tradition of higher core frequencies clearly indicate a paradigm shift in Intel's market strategy.

In addition to the new Prescotts, Intel also released its 9xx chipset architecture, a 800 MHz front side bus design that offered a host of advanced features, such as a new serial bus, PCI Express, support for dual channel DDR2, wireless networking, and 8-channel onboard audio. Yet despite its forward-looking feature set, from a performance perspective the new chipset did not offer power users a clear motivation to upgrade. The brass at Intel were certainly aware of the above situation, and have worked to quickly bring to market an answer: the 925XE Express chipset, an update to the 925X chipset that sports a 1066 MHz front side bus. Moreover, Intel claims that the 925XE includes an improved MCH (memory controller hub) that has wider data buses and specialized arbitration for greater throughput and lower latencies. We'll see what impact the faster FSB has on SimHQ's benchmark suite. A brief list of the 925XE features is as follows:

- PCI Express Bus
- Dual Channel DDR2 533 MHz memory
- Intel GMA 900 integrated graphics
- High Definition Audio
- Onboard RAID 1 + 0 support
- Wireless network connectivity



As described in SimHQ's review of the 925X chipset earlier this summer, and probably of most interest to the gaming community, PCI Express is a serial, bi-directional connection that offers 2.5 Gbits of bandwidth per lane, which gives a real-world throughput of roughly 125 MB per second. Where the PCIe bus gets interesting, however, is that each lane can be grouped with additional lanes for increased bandwidth. Replacing AGP as the new graphics bus, PCI Express x16 is a 16-lane array that essentially doubles the bandwidth of AGP 8x. Yet regardless of this increased throughput between the system's memory and the graphics card, very few games, if any, display a direct benefit from the new graphics bus; the performance of current games is simply not based on or influenced by a system's graphics bus (PCIe or AGP), though this could certainly change with future games. That said, PCI Express' design will allow for interesting options, with motherboard vendors readying dual PCIe graphics slot boards for this fall.

Pricing on the P4 3.46 GHz EE processor will be $999 in units of 1,000 and roughly $180-190 for 925XE-based motherboards (Intel will charge $50 for the chipset itself).

Test System Setup

- Intel Pentium 4 3.4 GHz and 3.46 GHz Extreme Edition processors
- Intel D925XCV (925X) and D925XECV2 (925XE) motherboards
- 1 GB (2x512 MB) Micron DDR2 533 MHz memory
- ATi Radeon X800 XT 256MB PCI Express graphics card (Catalyst 4.10)
- Maxtor MaXLine III (16 MB buffer) 250 GB native SATA hard drive
- Windows XP Professional (SP2)
- DirextX 9.0c

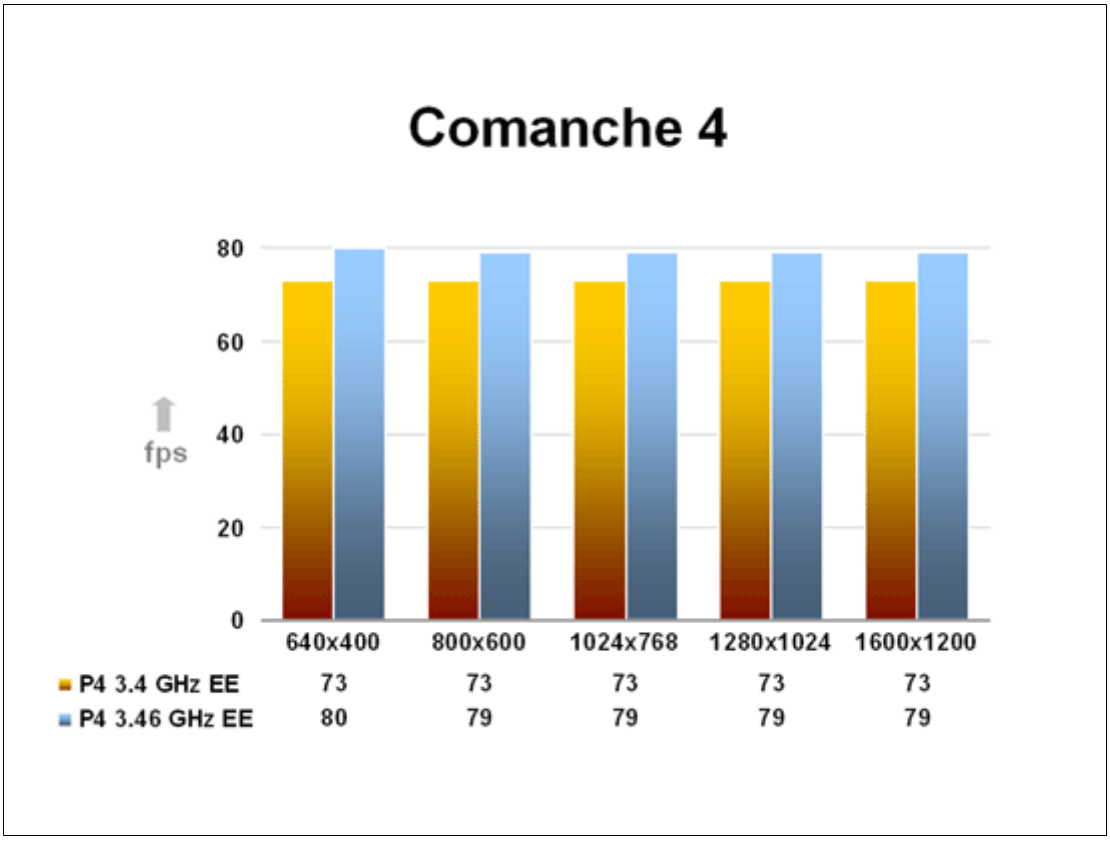
The benchmark suite used to evaluate this test system is here: http://www.simhq.com/_technology/technology_tests.html. As standard, 32-bit color and trilinear texture filtering are the default baseline during testing. Anti-aliasing and anisotropic texture filtering are, of course, disabled throughout all tests. Also, Windows XP Professional is configured to have Automatic Update, System Restore, and all unnecessary startup services disabled. Fraps v2.3.2 is used to record performance scores unless otherwise noted. While SimHQ traditionally

tests the games included in our benchmark suite using high in-game settings, because the clock speeds of the processors are so minute (60 MHz), lower, less demanding, settings were used to allow the two test systems to differentiate their performance scores, if possible.

The P4 3.46 GHz Extreme Edition processor Intel has provided for testing with the 925XE chipset is a 775-pin, Socket T part. Unlike past designs, the Socket T format has moved the connection pins from the processor to the motherboard, leaving flat contacts called a LGA (Land Grid Array) on the bottom of the processor. The P4 3.46EE naturally includes the usual 512K of L2 cache and 2 MB of L3 cache found in Intel's Extreme Edition processors. Of the most interest, however, is that the CPU is still a 130nm rather than 90nm part.

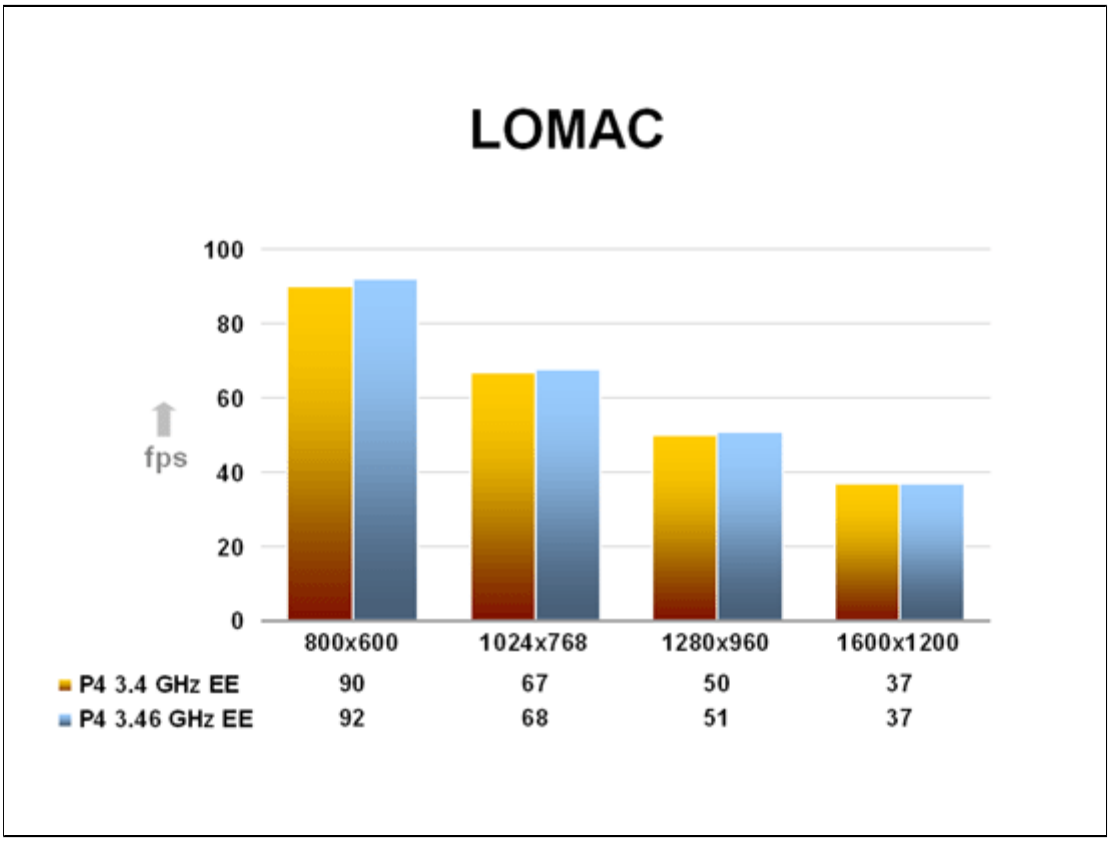
Benchmark Scores

The **Comanche 4** benchmarking demo was run with texture compression and hardware shaders enabled and sound disabled.



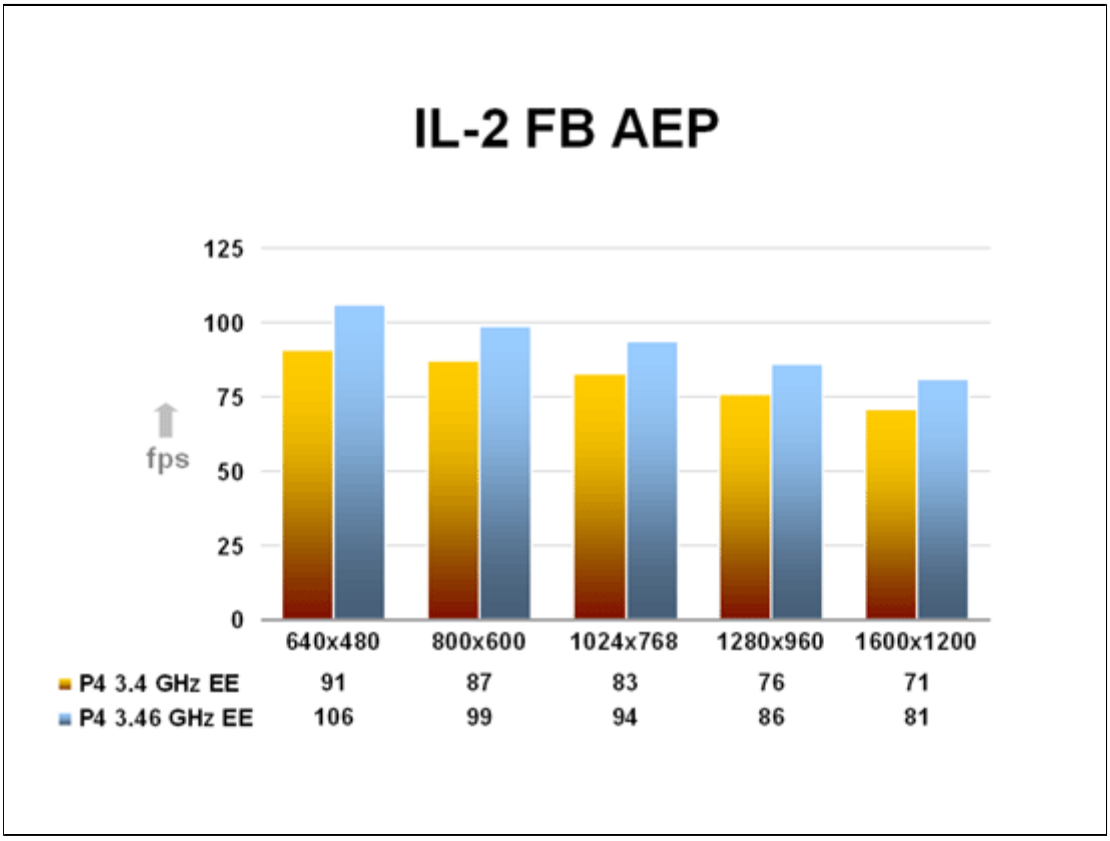
A piece of software that has traditionally scaled very closely with CPU speed, the C4 demo gives the P4 3.46 and 925XE chipset almost 10% across the tested resolutions, barely cracking the 80 fps barrier at 640x480. This score makes the new processor the second CPU tested by SimHQ to reach a score of 80 (the first being the Athlon 64 FX-55).

Lock On: Modern Air Combat was tested using the first three minutes of the MiG-29 Intercept demo. The in-game graphics default setting of low was used to see if the two systems would display any performance differences.



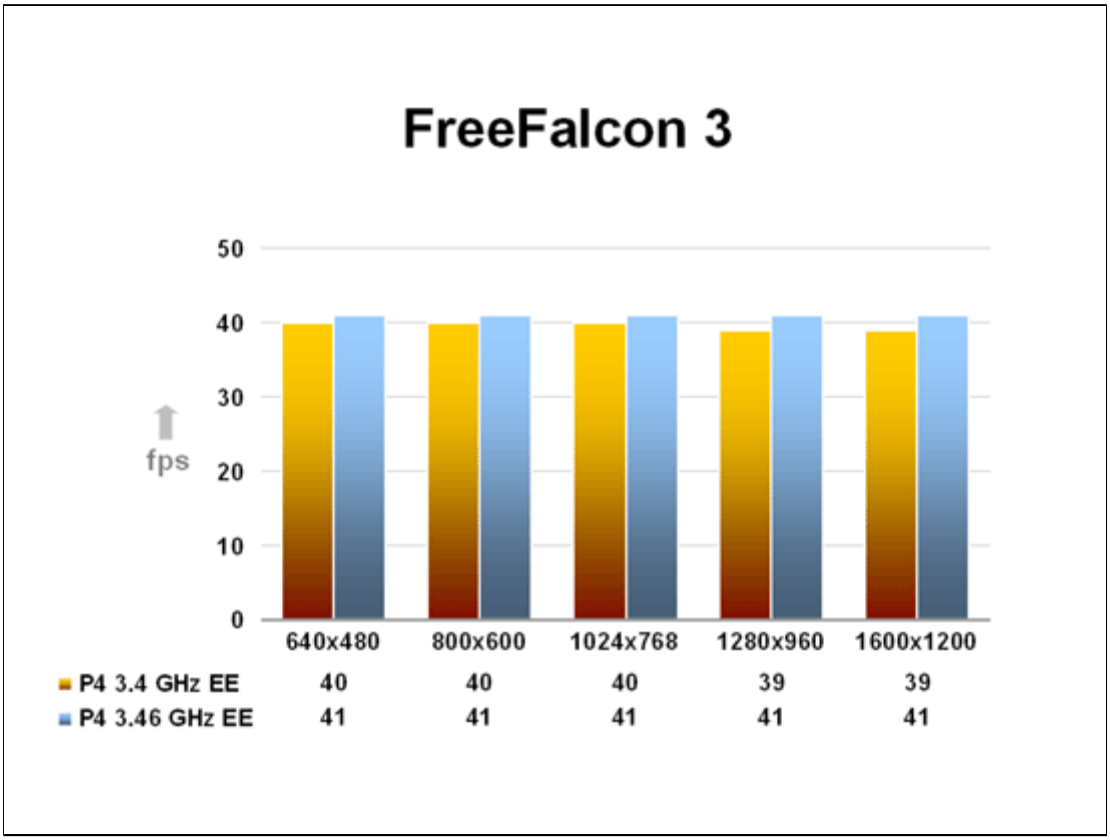
LOMAC gives the new Intel setup a very slight edge, but nothing that would be discernible during actual gameplay. For a flight simulation, Lock On has certainly proven itself very dependent on the installed graphics board for good frame rates.

IL-2: Sturmovik Forgotten Battles - Aces Expansion Pack was tested in OpenGL and with all video options set to medium (normal for Objects detail) using the Black Death track.



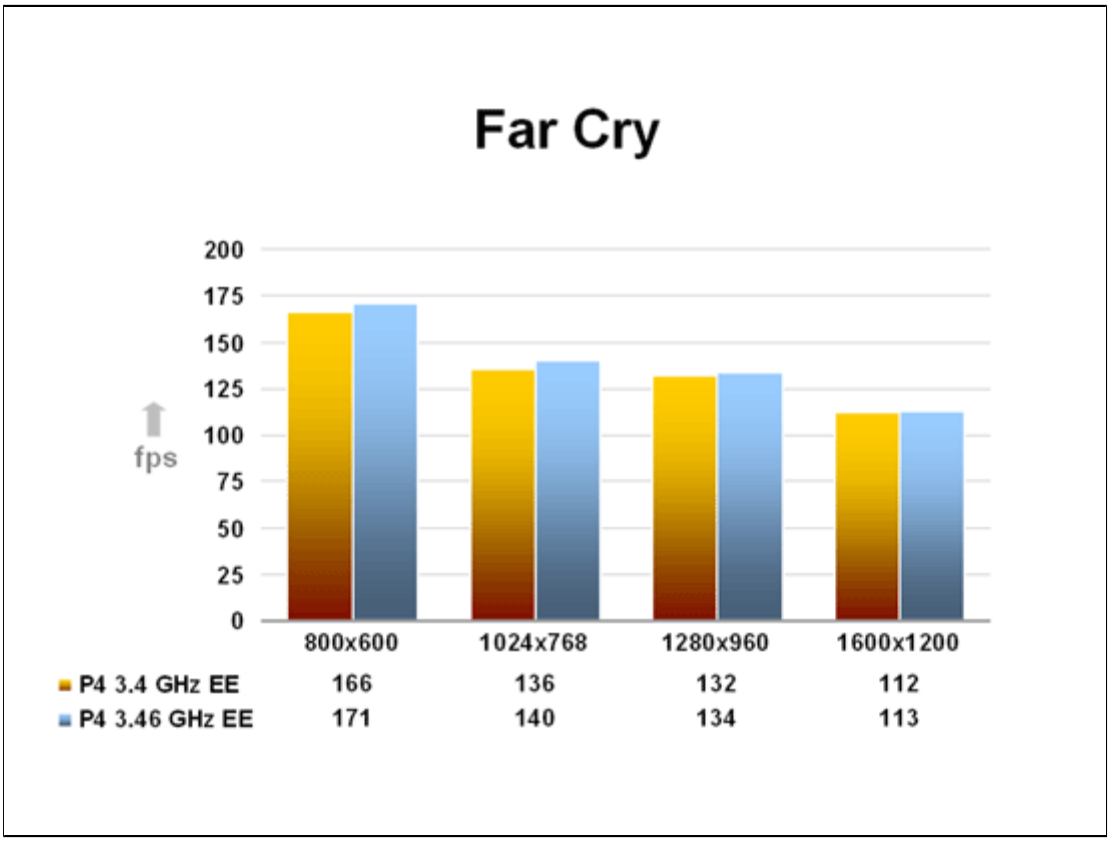
Of all the games tested for this review, IL-2: FB AEP showed the most appreciation for the 925XE's faster front side bus, giving an almost 20% increase at 640x480 over the P4 3.4-based test system. The advantage does lessen slightly as the resolution increases, but the new setup still commanded a solid 15% lead at 1600x1200. Fans of the IL-2 series considering a Pentium 4 upgrade in their future should definitely take note of the 925XE's performance advantage.

Falcon 4 performance testing again used the FreeFalcon 3 upgrade mode with SimHQ's in-house test of a low level, air-to-ground flight that consists of two Falcons using Mk20s and Mavericks. Graphics options, however, were left at their highest settings since the title can hardly be considered as stressful to the test rig's graphics sub-system.



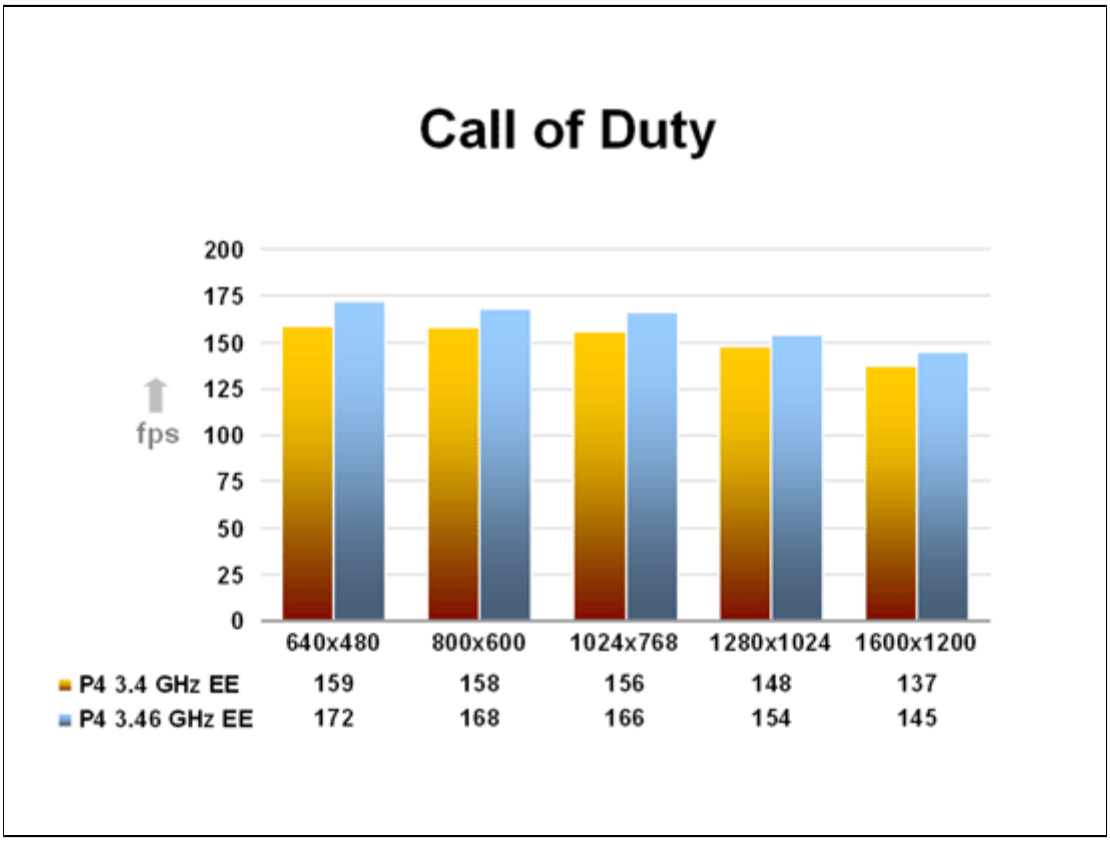
As with Lock On, Falcon 4 displays an in-game imperceptible advantage while running on the 1066 FSB, with a frame rate that's almost perfectly linear across the tested resolutions.

Far Cry is undoubtedly the most graphically advanced title in SimHQ's benchmark suite. As such, all in-game advanced video options were set at medium. Testing consisted of repeated run-throughs of the Research map in God mode since the level includes an excellent combination of the beach, jungle, and interior settings found throughout the game.



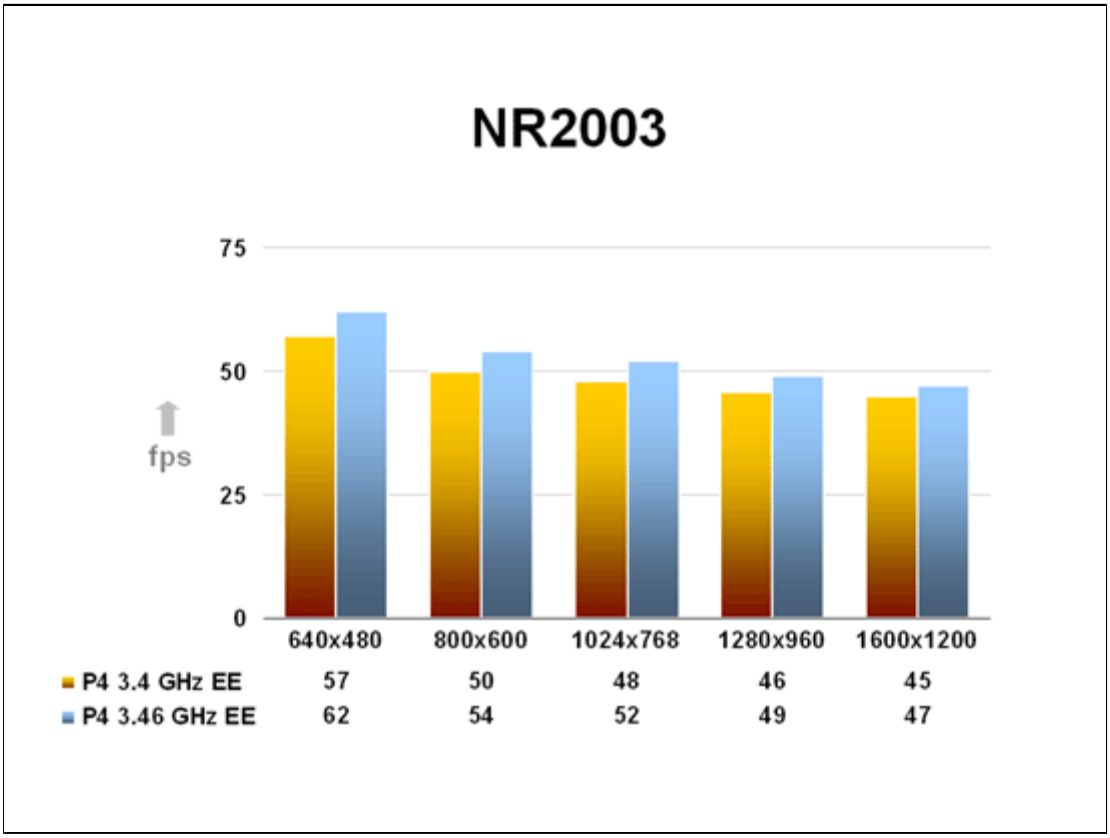
As expected Far Cry scales extremely well with graphics processing, and this is born out with the scores generated by the Radeon X800 XT installed. Nevertheless, performance between the two test systems was less than 5% even at 800x600, and with that delta vanishing at higher resolutions as the game's frame rate becomes limited by the graphics sub-system.

Developed using id Software's five-year-old Quake 3 engine, **Call of Duty** (v1.4) is the second title SimHQ uses testing OpenGL rather than the D3D API. Because the game is based on such an aged engine, graphics settings were left unchanged. Scores were derived from the Dawnville demo using the in-game timedemo utility to capture performance. The "com_maxfps" console command was also used to lift the default frame rate cap of 85.



Call of Duty displayed roughly a 8% difference between the two systems at the lower resolutions, closing to around 5% at 1600x1200.

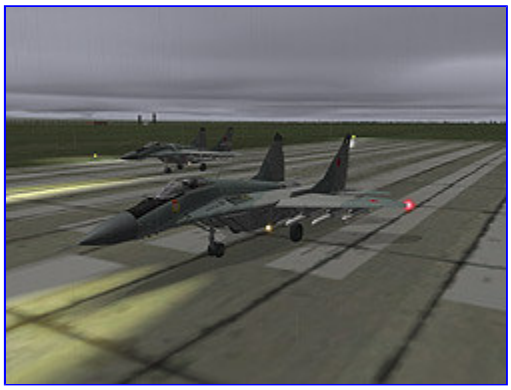
Last is **NASCAR Racing 2003 Season**, tested using a crowded Daytona track and a camera view set inside of Earnhardt's cockpit. Graphics settings were also configured to medium options and shadows disabled.



NR2003 displays a difference between the two systems that consistently stays at just under 5% between the scores generated. The game's frame rate scales fairly well as the resolution is increased, dropping down by some 20-25% on the two test systems.

Gallery

Call of Duty
(305 kb)



LOMAC
(2.16MB)

Conclusion

Using Intel's Desktop Control Center utility to monitor processor temperature, the P4 3.46EE would idle at the Windows desktop around 49-50 degrees celcius, compared to the P4 3.4EE which idled at roughly 34 degrees. While temperatures never quite reached the point at which the onboard heat sensor would begin clocking the processor's speeds down, after extended periods of heavy usage Intel's utility would show the CPU spiking well into the 70s. Nevertheless, the new motherboard was as stable as the industry has come to expect from Intel chipsets, and the 925XE offers an extremely rich set of onboard features.

The Intel's Desktop Control Center is here: http://www.intel.com/design/motherbd/software/dcc/

If the SimHQ benchmark suite is a accurate barometer by which to gauge the 925XE and its faster FSB's potential advantage, the number five, as in 5%, springs to mind. While IL-2 and the Comanche 4 demo scores displayed strong performance benefits, the rest of the suite demonstrated far lower gains, averaging either around 5% faster than the original 925X chipset or slightly less. If this pattern stays consistent for other genres of gaming software, Intel's 925XE chipset will be unable to shift the performance lead back to the company's corner in the eyes of the PC gaming community. Intel clearly needs a return to the halcyon days of when cranking their processors' clock speed up would allow the company's parts to dominate the market; yet with the recently announced shift away from this approach to one of relying upon larger caches and faster bus speeds one has to wonder if the current Extreme Editions will remain branded as such in 2005.
