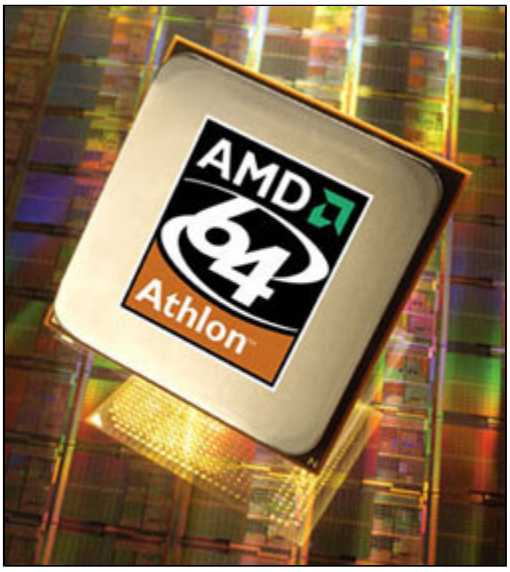
Review

AMD Athlon™ 64 3400+

by **Bubba "MasterFung" Wolford**

Introduction

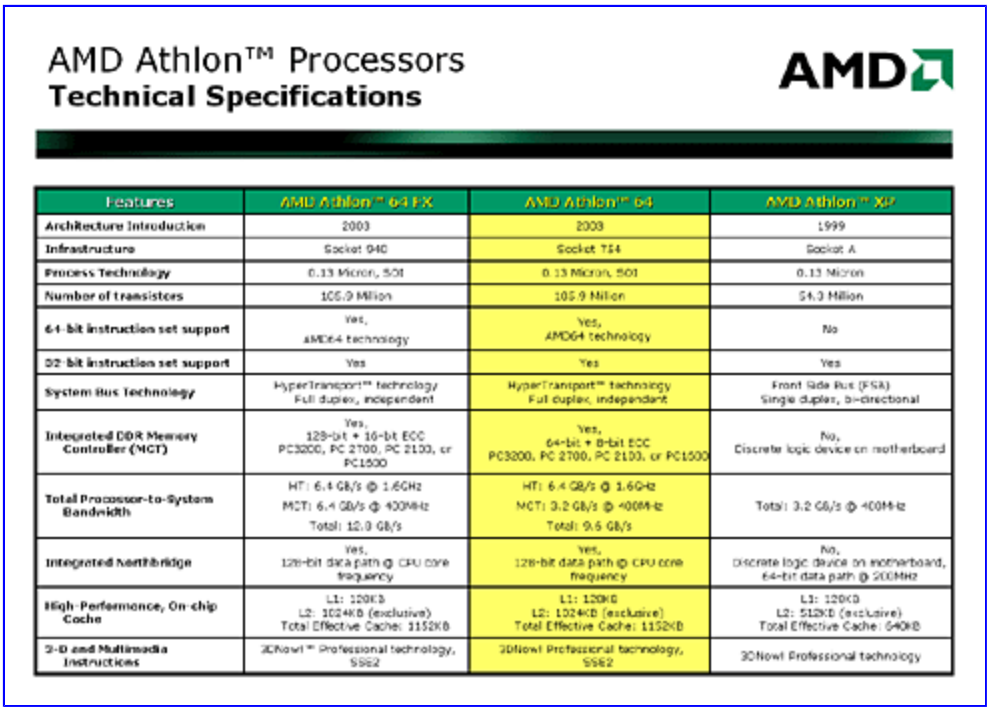
AMD is launching their second Athlon64 (A64) CPU today. This 3400+ is running at 2.20GHz and comes on a 1600MHz (1.60GHz) Hypertransport connection between the memory and CPU or a 2.20GHz connection between the memory controller (integrated) and CPU. You might recall we reviewed the FX-51 just a few months ago and found it's performance to be spectacular. The 3XXX+ series have now become AMD's "mainstream" part and thus should not be considered in the same class as the FX-51. Intel should be countering the 3XXX series with their upcoming Prescott CPU core but we have yet to see Prescott make its introduction. We believed that we might see Prescott about when the FX-51 came to market, but Intel has been rumored to be having heat issues with Prescott and has delayed it's launch to sometime later this quarter. In the meantime, AMD is running right along with their A64 core and seeing wonderful results. Rumor on the AMD side is that we might be seeing a newer FX chip sometime soon. I'm sure it's only a matter of time.



AMD Athlon™ 64 3400+

Some of you might be wondering what the differences are between the Athlon64 3XXX series (like our 3400+) and the FX series (like the FX-51). The main architecture differences revolve around the integrated memory controller. The FX-51 uses a 128-bit wide bus to transfer data while our Athlon64 3400+ uses a 64-bit interface. Essentially the FX-51 has twice the memory bandwidth from information being sent to and from the integrated memory controller interface.

AMD Athlon™ Processors Technical Specifications
(click on the image for an enlarged version)



AMD Athlon™ Processors
Technical Specifications

AMD

Features	AMD Athlon™ 64 FX	AMD Athlon™ 64	AMD Athlon™ XP
Architecture Introduction	2003	2003	1999
Infrastructure	Socket 940	Socket 754	Socket A
Process Technology	0.13 Micron, SOI	0.13 Micron, SOI	0.13 Micron
Number of transistors	105.9 Million	105.9 Million	54.3 Million
64-bit instruction set support	Yes, AMD64 technology	Yes, AMD64 technology	No
32-bit instruction set support	Yes	Yes	Yes
System Bus Technology	HyperTransport™ technology Full duplex, independent	HyperTransport™ technology Full duplex, independent	Front Side Bus (FSB) Single duplex, bi-directional
Integrated DDR Memory Controller (MCT)	Yes, 128-bit + 16-bit ECC PC3200, PC 2700, PC 2100, or PC1600	Yes, 64-bit + 8-bit ECC PC3200, PC 2700, PC 2100, or PC1600	No, Discrete logic device on motherboard
Total Processor-to-System Bandwidth	HT: 6.4 GB/s @ 1.6GHz MCT: 6.4 GB/s @ 400MHz Total: 12.8 GB/s	HT: 6.4 GB/s @ 1.6GHz MCT: 3.2 GB/s @ 400MHz Total: 9.6 GB/s	Total: 3.2 GB/s @ 400MHz
Integrated Northbridge	Yes, 128-bit data path @ CPU core frequency	Yes, 128-bit data path @ CPU core frequency	No, Discrete logic device on motherboard, 64-bit data path @ 200MHz
High-Performance, On-chip Cache	L1: 128KB L2: 1024KB (exclusive) Total Effective Cache: 1152KB	L1: 128KB L2: 1024KB (exclusive) Total Effective Cache: 1152KB	L1: 128KB L2: 512KB (exclusive) Total Effective Cache: 640KB
3-D and Multimedia Instructions	3DNow! ™ Professional technology, SSE2	3DNow! Professional technology, SSE2	3DNow! Professional technology

As you can see in the chart above, there are few other differences between the FX-51 and A64. The biggest physical difference is a major issue if your looking for a new machine, The FX-51 and A64 use different socket sizes. They are *not* pin compatible. Both CPUs take advantage of 1MB of L2 cache. They share the same die size and both support the same 3D instructions, including SSE2.

A new feature added to the 3XXX series is what AMD calls “Cool’ n ‘Quiet”. When your desktop CPU is up and running, it runs at full speed 100% of the time. It does not matter if you're playing LOMAC or typing a review in Microsoft Word, the CPU is always throttled up to maximum. On mobile CPUs, the chips will scale up and down as per use. If you’re watching a DVD or typing in Microsoft Word, the CPU might only be running at 50% utilization. If you switch off the DVD and start a game, the CPU recognizes (instantaneously) that there are more demands being made and it throttles up to 100%.

AMD has taken those same features and implemented them on a desktop CPU. When your CPU needs to be at full speed, it will operate at (in this case) 2.20GHz. If your typing in Microsoft Word and your CPU has decided to throttle down (say to 1GHz) two things happen.

You’re not producing as much heat. Your system runs cooler and keeps lockups from occurring. Now your fan will also slow down to create less noise because less heat is being generated from a CPU that is operating at a lower CPU speed.

This is all good unless the CPU is deciding to throttle down on it’s own for other reasons. We will have to get with AMD and find out exactly what point the CPU determines that it’s "all clear" to throttle down. We certainly would not want the CPU to throttle down suddenly in the middle of a LOMAC mission!

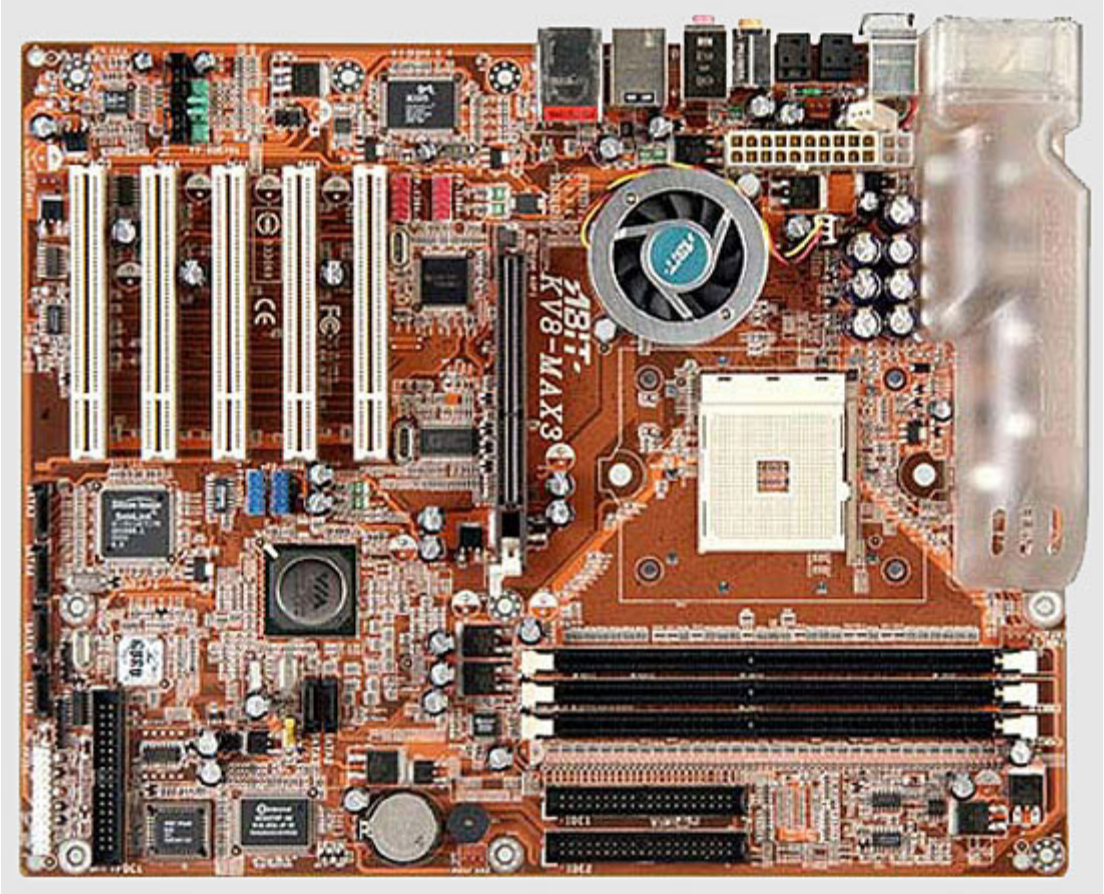
This 3400+ has friends

Here are the supporting partners who provided their products to make this review possible.

The motherboard

When AMD sent us the 3400+ for review, we immediately went out to find a good socket 754 motherboard to use in our review. **Abit** answered the call by offering to send us their KV8-MAX3. The KV8 use VIA’s newest K8T800/VT8237 chipset North and South Bridge.

This has to be the baddest looking motherboard I've ever seen. It has OTES cooling system for the power regulators and capacitors. First time I have ever seen cooling for anything on a motherboard besides the Northbridge. This board is loaded with Gigabit LAN, 1394 Firewire, USB 2.0, RAID SATA 150, onboard sound and of course, Abit's excellent Soft Menu functions. I've been a long time fan of Abit's motherboards so I was very excited to be getting back and running with an Abit product.



Moving on to cables, this board has every cable under the sun including four (4) SATA cables. The truth is that I'm frankly shocked at the extra's in the box. I'm not sure how it somehow became the motherboard vendor's job to make sure the box is packed with extras — but WOW it is great. The motherboard has been stable as a rock and with Abit's overclocking prowess, I can't wait to get under the hood and "play". Be sure to look at the features **here**. They are impressive.

We need storage!

Seagate has been making excellent hard drives for a very long time now. I have been using various Barracuda drives for quite a time and so when I needed to add some SATA HDD for this review, I did not hesitate to request a couple of the newest **160GB 7200 RPM Barracuda drives**.

They have always proven to be fast, quiet and reliable. I had a **Western Digital** drive die on me a couple of months ago and it reminded me that I have not had that many drives go bad on me in the 10+ years I have been using computers. That dead drive was the 3rd Western Digital drive that failed on me. I then realized that I have quite a few Seagate drives and not a single one has ever failed.

Memory is a requirement too

We have often worked with **Corsair** in a roundabout sort of way. Never asking them directly for samples but since AMD is so fond of Corsair, we decided to give them a ring. They were happy to send us samples for our AMD 3400+ review. They sent us their newest **XMS PC3200** sticks that actually had LED on top to monitor the memory access.

The XMS PC3200 performed great and is very, very quick. Of course they operate at CAS 2 and with this motherboard, overclocking should be a breeze. I'm counting on this Corsair memory being stable as the FSB climbs.

It's all about the pictures

We have been working on getting samples of the Radeon 9800XT and NVIDIA based 5950 boards especially to benchmark with LOMAC. We have had some success, so we decided to throw in a Radeon 9800XT and see how it performed with our 3400+.

Sapphire was the board I decided to use in my review. They have a very balanced feature set along with a nicely designed 9800XT. The board was stable and blazing fast. It comes with a nice bundle including a free coupon for **HalfLife2**.

The **Sapphire Radeon 9800XT Atlantis** comes with 256MB of DDR RAM and uses a 256-bit interface like the 9700 PRO. The core is clocked at 412MHz and the memory is clocked at 730MHz (365MHz DDR). The board is DX9 compliant. *Did I mention it was fast?*

AMD Athlon™ 64 3400+ Technical Specifications

- Model number: 3400+
- L1 Cache Size: 64KB data + 64KB instruction = 128KB Total
- L2 Cache Size: 1MB (exclusive)
- CPU Core Frequency: 2.20GHz
- CPU to Memory Controller: 2.20GHz
- HyperTransport Links: 1
- Infrastructure Support: Socket 754 motherboards
- Fab location: AMD's Fab 30 wafer fabrication facility in Dresden, Germany
- Process Technology: 130nm (.13-micron) Silicon on Insulator (SOI)
- Approximate Transistor count: 105.9 million
- Approximate Die Size: 193mm squared
- Nominal Voltage: 1.50 V
- Max Ambient Case Temp: 70 degrees Celsius
- Max Thermal Power: 89 W
- Max Icc (processor current): 57.8 A

Specs @ Intermediate P-State (2.0 GHz)

- Voltage: 1.40 V
- Icc Max: 48.4 A
- Max Thermal Power: 70 W

Specs @ Min P-State (800 MHz)

- Voltage: 1.30 V
- Icc Max: 25.2 A
- Max Thermal Power: 35 W

System Setup: AMD Setup

- AMD Athlon64 3400+ processor at 2.20GHz
- Abit KV8-MAX3 VIA KT800 Motherboard
- Corsair XMS 1.0GB kit of PC3200 DDR RAM (400MHz DDR)
- Sapphire Atlantis Radeon 9800 XT 256MB
- 2 X Seagate 160GB SATA Hard Drives 7200 RPM (RAID 0)
- Onboard VIA sound
- DVD ROM
- Integrated Gigabit NIC
- Computer also tested with:
- Microsoft Sidewinder Force Feedback 2 joystick
- Viewsonic 21" G810-2
- Windows XP RTM Professional SP1

Benchmarks

Benchmarks demonstrate the AMD 3400+ is very strong overall. This is a great core and AMD knows it. The integrated memory controller plays a very big part in relieving bottlenecks. These are some of the fastest scores we have ever seen from a CPU and this is AMD's 2nd fastest part.

Note to PDF readers: Please see the online version for enlargements of these charts.

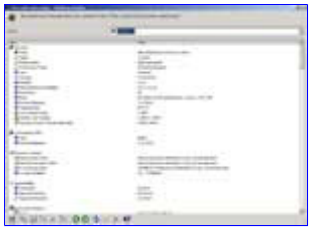
Synthetic:

SiSoft Sandra 2003 MAX3

Cache and Memory

Combined Performance Index Wizard

CPU Arithmetic



CPU BIOS

CD-ROM / DVD

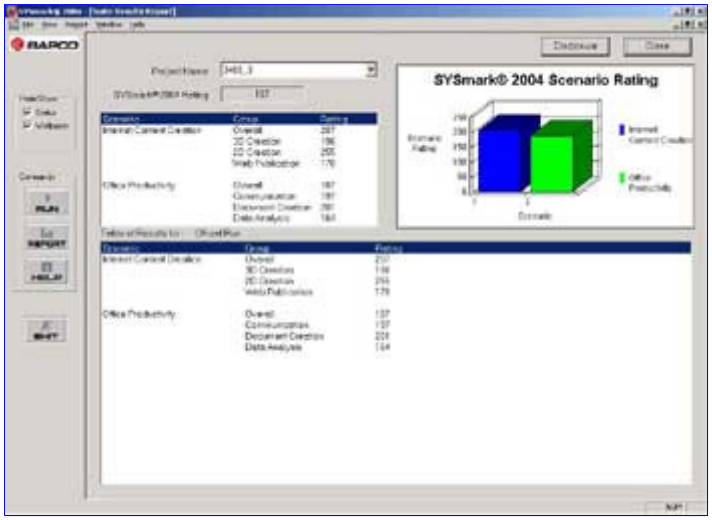
File System

Memory Bandwidth

CPU Multimedia

System Summary

SysMark 2004



3DMark2003

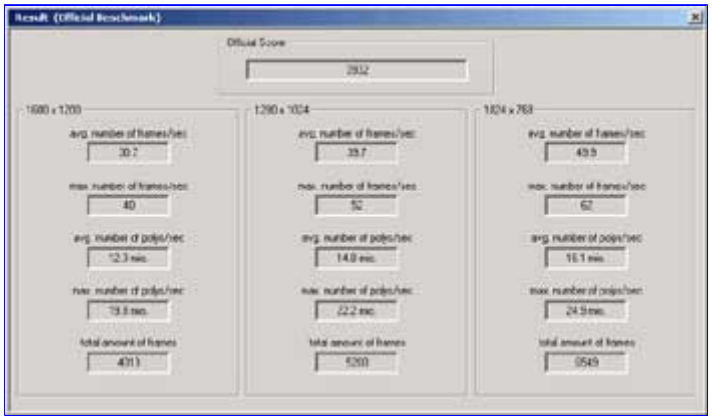
1024 x 768
no FSAA, no AF

1024 x 768
6x FSAA, 16x AF

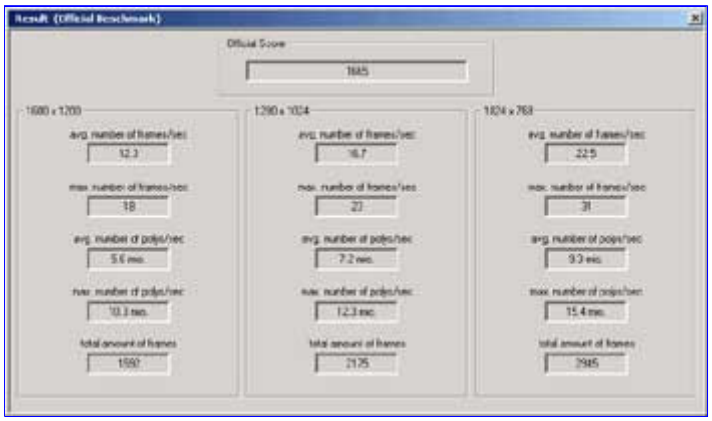
1600 x 1200
no FSAA, no AF

1600 x 1200
6x FSAA, 16x AF

CodeCreatures



no FSAA, no AF



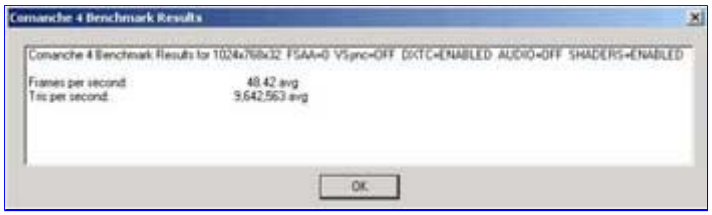
with 6x FSAA, 16x AF

PCMark

PCMark02 PCMark04

Commanche 4

1024 x 768
no FSAA, no AF



1024 x 768
6x FSAA, 16x AF

1600 x 1200
no FSAA, no AF

1600 x 1200
6x FSAA, 16x AF

Games / Sims:

All tests with no FSAA, no AF

Title	1024 x 768 (fps)	1600 x 1200 (fps)
Falcon 4.0 / SP3	64	59
Flanker 2.5	33	na
Jane's F/A-18	33	na
Ghost Recon	176	89
Flight Simulator 2002	33	31
F1 Challenge '99 - '02	84	51
IL2: Forgotten Battles	103	70

Conclusion

AMD is once again proving to be the best bang for buck on market. This 3400+ is the cheapest launch I have seen from a mainstream CPU in a long time. It's $417 per 1K lots and I think its value is huge. Make no mistake that the FX series is AMD's strongest CPU. The 3400+ for all purposes a "mainstream" CPU now but its performance is excellent.