Agenda

• Desktop Overview
• Processors & Roadmap
• Software Architecture & Performance
• Desktop Platforms
• Future AMD Technology Directions
• AMD Developer Resources
• Call to Action
AMD Desktop Overview
AMD Desktop Advantage

• Built from the ground up, AMD x86 processor technology makes it possible to improve responsiveness to changing business needs

  **AMD64** offers flexibility by supporting 32- and 64-bit applications across desktop, mobile and server applications

  **Direct Connect Architecture** enables increased performance, scalability and improved multi-tasking

  **AMD Dual Core** provides enhanced performance without increasing power requirements

  **AMD Cool ‘n’ Quiet™** decreases overall power consumption by optimizing performance on demand

  **Enhanced Virus Protection** adds an extra level of virus protection to your security solution
**AMD64™**

**Powerful 64-Bit Computing**

- Technology that gives total backward compatibility with leading-edge 32-bit computing performance.
- Technology that paves the way to multi-core computing with cutting-edge communications technology.
- Technology is more than 64-bit computing—it’s also about next-generation architecture.
- Technology that allows software developers to create new functionality for end users.
- Technology that solves real problems.
AMD Direct Connect Architecture

Direct Connect Architecture moves more data more efficiently, allowing more performance and better switching between windows.

Legacy Front-Side Bus Architecture

Competing Dual-Core Processors

Direct Connect Architecture

AMD Dual-Core Processors
AMD Dual-Core Processors

Architecture Advantage

Competing Dual-Core Processor

800MHz FSB bottleneck

I/O Chipset

other I/O links

PCI

PCI EXPRESS

AMD Athlon 64 X2 I/O and memory calls are implemented on separate, dedicated high-speed busses

 Integrated memory controller operating at full CPU clock speed

2000MHz HyperTransport™ technology link

I/O Chipset

other I/O links

PCI

PCI EXPRESS

AMD Athlon 64 X2

AMD Technology & Software
AMD Cool'n'Quiet™ Technology

With AMD's efficient core design, AMD Cool'n’Quiet Technology optimally self-regulates power consumption without performance interruptions or delays.

- AMD Cool'n'Quiet Technology
  - Reduces power at idle by up to 65%
  - Optimizes platform power consumption
  - Provides performance on demand by dynamically adjusting performance based on CPU utilization
Enhanced Virus Protection

- Helps prevents “buffer overflow” virus attacks from harming the PC and spreading through the network
- Enabled in Windows® XP with Service Pack 2
- Native to Windows XP x64 Edition and Windows Vista client OS
- For Virus TCO savings, please refer to the following white paper: http://www.loglogic.com/documents/white-papers/ROI-white-paper-july-final.pdf
AMD Processors & Roadmap
AMD Desktop Processors

ULTIMATE PERFORMANCE

• The ultimate processor for PC enthusiasts
  - The AMD Athlon™ 64 FX processor is the ultimate processor for PC enthusiasts, breaking the limits of 32- and 64-bit performance.

PERFORMANCE

• Do more in less time
  - The AMD Athlon™ 64 X2 dual-core processor enables everyone to do more in less time by delivering exceptional multi-tasking capabilities and increased performance on digital media over similar single-core processors

MAINSTREAM

• The performance you want for your unique digital experience
  - The AMD Athlon™ 64 family of powerful 32/64-bit desktop processors, made to perform.

VALUE

• Affordable performance that redefines everyday computing
  - The AMD Sempron™ processor is the most affordable of AMD’s desktop processors. The AMD Sempron™ processor is designed for everyday computing by providing the right combination of affordability and performance to meet the needs of budget-conscious customers.
Desktop processor core roadmap
September 2006

**1H06**

- **"Windsor"** Dual-Core, 1MB or 2MB Total Dedicated L2 2-Ch DDR2, AMD-V™ Socket 939
- **"Venice" / "San Diego"** Single-Core 512KB or 1MB L2 2-Ch DDR 1-Ch DDR Socket 939
- **"Manila"** Single-Core 256KB or 128KB L2 2-Ch DDR2 Socket AM2
- **"Sparta"** Single-Core 256KB or 128KB L2 2-Ch DDR2 Socket AM2

**2H06**

- **"Brisbane"** Dual-Core 1MB Total Dedicated L2 2-Ch DDR2, AMD-V™ Socket AM2
- **"Palermo"** Single-Core 256KB or 128KB L2 1-Ch DDR Sockets 754 & 939

**1H07**

- **"Windsor" FX (2P)** Dual-Core for 2-Proc Platform 2MB Total Dedicated L2 2-Ch DDR2, AMD-V™ Socket 1207
- **"Toledo"** Dual-Core 1MB or 2MB Total Dedicated L2 2-Ch DDR2, AMD-V™ Socket AM2

**LEGEND**

- Red Font = New Features
- Solid Box = Current Release
- Dashed Box = Future Release
- Green Box = 90nm SOI
- Purple Box = 65nm SOI
Take the Muscle Car of Gaming
Add a Blower, Nitro and Pipes
and What do You Get?
You get the “4x4” Platform.

Fully leveraging the unique benefits of Direct Connect Architecture
Extending our legendary gaming and enthusiast platform performance

Fully leveraging the unique benefits of Direct Connect Architecture
Extending our legendary gaming and enthusiast platform performance
Socket AM2: DDR2 memory support

Socket AM2 platforms use DDR2 memory.

This chart shows the appropriate memory types suitable for each AMD processor brand.

<table>
<thead>
<tr>
<th>Processor Family</th>
<th>DDR2 memory supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMD Athlon™ 64 FX</td>
<td>DDR2-800 (PC2-6400)</td>
</tr>
<tr>
<td></td>
<td>DDR2-667 (PC2-5300)</td>
</tr>
<tr>
<td></td>
<td>DDR2-533 (PC2-4200)</td>
</tr>
<tr>
<td></td>
<td>DDR2-400 (PC2-3200)</td>
</tr>
<tr>
<td>AMD Athlon™ 64 X2</td>
<td>DDR2-800 (PC2-6400)</td>
</tr>
<tr>
<td></td>
<td>DDR2-667 (PC2-5300)</td>
</tr>
<tr>
<td></td>
<td>DDR2-533 (PC2-4200)</td>
</tr>
<tr>
<td></td>
<td>DDR2-400 (PC2-3200)</td>
</tr>
<tr>
<td>AMD Athlon™ 64</td>
<td>DDR2-667 (PC2-5300)</td>
</tr>
<tr>
<td></td>
<td>DDR2-533 (PC2-4200)</td>
</tr>
<tr>
<td></td>
<td>DDR2-400 (PC2-3200)</td>
</tr>
<tr>
<td>AMD Sempron™</td>
<td>DDR2-667 (PC2-5300)</td>
</tr>
<tr>
<td></td>
<td>DDR2-533 (PC2-4200)</td>
</tr>
<tr>
<td></td>
<td>DDR2-400 (PC2-3200)</td>
</tr>
</tbody>
</table>
AMD64 Software Architecture & Performance

- AMD64 ISA
- Software Performance
- NUMA
- Multi-threading
- Cache Performance
AMD64 Instruction Set Architecture (ISA)

• Support for all x86 instruction extensions
  – SSE, SSE2, SSE3, MMX™, x87, 3DNow!™

• Full performance with all kinds of code
  – Native 32-bit x86 mode
  – Enhanced capability in 64-bit mode
    64-bit general purpose registers
    64-bit addressing
    Twice as many general purpose registers
    Twice as many SSE registers

• Same familiar x86 instructions
AMD64 Programmer’s Model

In x86

Added by AMD64

Note: x87 not available in native 64-bit Windows Applications
Software Performance on AMD64

Three main ways to get more performance:

• Multi-threading
  – Take advantage of multi-core systems

• Large memory in 64-bit mode
  – Virtually unlimited address space (256TB)

• Extra benefits of 64-bit mode
  – Improved x64 compiler and libraries
  – Twice as many General Purpose Registers (GPRs)
  – Twice as many SSE/SSE2 Registers
AMD64: What to Port

- Large memory requirements
  - Essentially unlimited virtual address space
  - Physical memory only limited by platform capability
  - >=16GB per server CPU is now possible this year
- More registers and “big number” math
  - Codecs, simulation, 3D, games
  - Compression, encryption, finance
- Drivers
  - Device drivers must “match the OS”
  - 64-bit OS requires 64-bit drivers
  - There is a lot of documentation focused on drivers
- Code libraries and dynamic libraries (ex: .dll’s)
  - 64-bit applications will require 64-bit version
- You can’t mix 32 and 64-bit application code
AMD64: Visual Studio® 2005

• The VS 2005 x64 compiler generates great code
  – Whole Program Optimization
  – Profile Guided Optimization
  – /fp:fast mode for improved floating point performance
  – _restrict keyword: hint to compiler about pointer aliasing
  – Intrinsic functions: data prefetch, streaming store, SSE, ...
  – Optimized libc functions like memcpy, memset, strcmp, etc.
  – Try /O1 to minimize code size, especially for 64-bit
  – Use the /Wp64 flag for checking your 32-bit code for 64-bit readiness
NUMA Architecture (Non-Uniform Memory Access)

Provides applications with performance and scalability

Software accesses data belonging to any processor via the global address space

Memory is initialized into globally addressable physical memory space with processors maintaining cache coherency across this space

NUMA-aware OS assigns threads from same process to the same NUMA node

Each processor has local memory and uses HyperTransport™ technology for high-speed access to non-local memory
Windows® x64 Edition: NUMA

Every Microsoft x64 OS fully supports the AMD ccNUMA system architecture.

- Memory affinity is optimized
  - Just allocate memory while running on the CPU that will be using the memory block, and initialize it

- Processes/threads are “sticky” on the CPU

- Application can set processor affinity, test carefully though!
  - SetThreadAffinityMask, etc.

- ccNUMA APIs can be used for additional control by the application
  - GetNumaProcessorNode, etc.

- Never assume any particular NUMA structure!
  - Always use the APIs to check
4-Socket NUMA OS Scheduling Example

Example of an OS optimized for dual core running on an AMD Opteron™ system with 4 dual core processors

- OS distributes threads across processors first to minimize contention between threads
- OS attempts to map a thread’s memory requests to the local memory of the node (Threads A, B, C, D, E)
- If no memory is left on the current node, OS will use memory of other nodes (Thread F)
# The Transition to Parallel Applications

<table>
<thead>
<tr>
<th>Single-threaded Applications</th>
<th>Parallel Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Most of today’s applications</td>
<td>• Small number of applications (worked by experts for 10+ yrs)</td>
</tr>
<tr>
<td>• Well understood optimization techniques</td>
<td>• Awkward development, analysis and debug environments</td>
</tr>
<tr>
<td>• Advanced development, analysis and debug tools</td>
<td>• Parallel programming is hard!</td>
</tr>
<tr>
<td>• Conceptually, easy to think about</td>
<td>• Amdahl’s law is still a law</td>
</tr>
<tr>
<td></td>
<td>• SW productivity is already in a crisis → this worsens the problem!</td>
</tr>
</tbody>
</table>

Understanding the *appropriate rate of transition* is what will be important to real customers.
Multi-threading (1)

- Good design is critical and is generally not easy
- Bad multi-threading could be worse than single-threaded performance
  - Deadlocks, synchronization bugs, threading overhead, etc.

- Two main options:
  1. Windows Threading API
     - `CreateThread`, `WaitForMultipleObjects`, `CriticalSection`, `InterlockedExchangeAdd`, etc.
  2. OpenMP
     - Easy API for threaded code
     - You can multi-thread a loop with a single pragma
       ```
       #pragma omp parallel for
       ```
Multi-threading (2)

- General rules for good multi-threading:
  - Minimize data sharing between threads
  - Synchronize rarely
  - Hold locks briefly

- Two different high-level types of threading
  - Functional Threading
    Different threads perform different tasks
    Example:
    Thread #1 does audio decode
    Thread #2 performs image/video decode
    Thread #3 handles user input
  - Data-parallel Threading: The preferred method, scales to N-cores!
    Threads do the same thing with different data
    Example:
    Thread #1 encodes the top half of an image
    Thread #2 encodes the bottom half of an image
Multi-threading: Tools

• Visual Studio® 2005
  – Full compiler support for 32-bit and 64-bit
  – OpenMP support
  – Uses newer VS.NET lib APIs: MFC, STL

• DirectX® SDK includes full 64-bit support
  – Direct3D is not currently optimized with multi-threading
  – DX 10 should be more multi-core friendly than DX9
Use AMD CodeAnalyst, profile your 32 and 64-bit code!

- Timer-based & event-based profiler
- Integrates with the VS2005 IDE

- **Thread Profiler** shows a thread execution timeline
Multi-threading: Performance Analysis Pitfalls

Timestamp counter on dual-core and multiprocessor platforms

- “RDTSC” instruction works just the same as always
  - But each core has its own timestamp counter...
  - ... and they are *not* guaranteed to be in sync...
  - ... therefore comparing two values from RDTSC can be dangerous.

- Windows will move your process between cores

- Use `timeGetTime()` instead, whenever possible

- Or use `QueryPerformanceCounter()` and `QueryPerformanceFrequency()`

Multi-threading: Benchmarking

Handy benchmarking tricks for threaded code

1. Use this option in your boot.ini file `/numproc=1`
   - Windows will only use 1 of the cores

2. Set process affinity in Task Manager to only one processor

   - Useful techniques on a multi-core machines
   - Easily benchmark single-core vs. dual-core performance
   - All other system components & config. remain constant
Cache Performance (1)

- Each core has its own L1 cache, and its own L2 cache
- Greater parallelism enables added performance:
  - L2 cache latency does not increase for dual-core vs. single-core
  - Total cache bandwidth scales up linearly with the number of cores
  - Threads cannot evict another thread’s data from other L2
Cache Impact on Threading Architecture

- Avoid “cache thrashing” between cores
  - Avoid multiple threads writing to the same variables (of course)
  - Also avoid one thread frequently writing what another is reading
    This is just a standard rule of threaded programming
  - Beware of false sharing which can cause thrashing:
    Two threads modifying different variables which occupy the same cache line
    Can happen in heap data or in global variables
    One safe approach: _aligned_malloc for 64-byte aligned heap chunks
    Another handy alignment trick: __declspec(align(64))
    See MSDN for complete details on managing alignment

- Use AMD CodeAnalyst™ profiler to examine threads and cache events
  - Thrashing would appear as excessive cache refill events
  - Just one way AMD CodeAnalyst can help you build faster code
  - Available at http://developer.amd.com/
AMD Desktop Platforms
### Desktop platform guidance: 2006

<table>
<thead>
<tr>
<th>TARGET MARKETS</th>
<th>COMMERCIAL CLIENT</th>
<th>ENTHUSIAST</th>
<th>AMD LIVE!™</th>
<th>MAINSTREAM CONSUMER</th>
<th>VALUE CONSUMER/ HIGH GROWTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socket AM2 Compatible Processor</td>
<td><img src="image" alt="AMD Athlon 64" /></td>
<td><img src="image" alt="AMD Athlon 64" /></td>
<td><img src="image" alt="AMD Athlon 64" /></td>
<td><img src="image" alt="AMD Athlon 64" /></td>
<td><img src="image" alt="AMD Athlon 64" /></td>
</tr>
<tr>
<td>Core Logic</td>
<td>• PCI Express™</td>
<td>• Dual PCI Express</td>
<td>• PCI Express</td>
<td>• PCI Express</td>
<td>• PCI Express</td>
</tr>
<tr>
<td>Graphics</td>
<td>• Integrated graphics</td>
<td>• Dual GPU capable</td>
<td>• Meets Windows Vista Premium requirements</td>
<td>• Windows Vista capable</td>
<td>• Integrated graphics</td>
</tr>
<tr>
<td>Storage</td>
<td>• SATA</td>
<td>• SATA (300 Mbps)</td>
<td>• RAID</td>
<td>• SATA</td>
<td>• SATA</td>
</tr>
<tr>
<td>Audio</td>
<td>• 2-channel sound</td>
<td>• 7.1-channel surround sound</td>
<td>• 5.1 or greater</td>
<td>• 5.1-channel sound</td>
<td>• 2-channel sound</td>
</tr>
<tr>
<td>LAN</td>
<td>• 10/100/Gigabit Ethernet LOM</td>
<td>• 10/100/Gigabit Ethernet LOM</td>
<td>• 10/100/Gigabit Ethernet LOM</td>
<td>• 10/100/Gigabit Ethernet LOM</td>
<td>• 10/100/Gigabit Ethernet LOM</td>
</tr>
<tr>
<td>Additional Features Supported</td>
<td>• Cool’n’Quiet™</td>
<td>• Cool’n’Quiet</td>
<td>• Cool’n’Quiet</td>
<td>• Cool’n’Quiet</td>
<td>• Cool’n’Quiet</td>
</tr>
<tr>
<td></td>
<td>• 15-month stability period</td>
<td>• User-selectable BIOS settings</td>
<td>• Windows Vista starter edition</td>
<td></td>
<td>• Windows Vista starter edition</td>
</tr>
<tr>
<td></td>
<td>• TPM 1.2</td>
<td></td>
<td>• TV tuner and remote optional</td>
<td></td>
<td>• Low cost motherboards</td>
</tr>
<tr>
<td></td>
<td>• ASF 2.0</td>
<td></td>
<td>• IEEE 1394 optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Manageability</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Not required in SFF systems that fit only 1 HDD*
Future AMD Technology Directions
# AMD Technologies Roadmap

<table>
<thead>
<tr>
<th>Processors</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mainstream</strong></td>
<td>AMD Virtualization and Security, DDR2 Energy Efficient 90nm → 65nm</td>
<td>Next-generation Core Larger Caches HyperTransport™ 3.0</td>
<td>Core Update Larger Caches HyperTransport 3.0</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>4x4 Dual-processor Dual-core Multi-card Graphics</td>
<td>4x4+ Dual-processor Quad-core Multi-card Graphics</td>
<td>4x4++ Dual-processor Quad-core, DDR3 Multi-card Graphics</td>
</tr>
<tr>
<td><strong>Stable Platform</strong></td>
<td>Dual-core, DDR2 AMD Virtualization and Security Vista® capable</td>
<td>Quad-core HyperTransport 3.0 Vista® ready</td>
<td>Quad-core, DDR3 HyperTransport 3.0 PCIe Gen II</td>
</tr>
<tr>
<td><strong>Blade PCs, Thin Clients, Small Form Factor</strong></td>
<td>CSIP Managed Platform</td>
<td>Dual-core HyperTransport 3.0 Vista® ready</td>
<td>Dual-core, DDR3 HyperTransport 3.0 PCIe Gen II</td>
</tr>
<tr>
<td></td>
<td>Energy Efficient DDR2 AMD Virtualization and Security</td>
<td>HyperTransport 3.0</td>
<td>HyperTransport 3.0 DDR3</td>
</tr>
</tbody>
</table>
A Closer Look at AMD’s Quad-Core CPU for ‘07

- True quad core die
- Expandable shared L3 cache
- IPC enhanced CPU cores
- 32B instruction fetch
- Enhanced branch prediction
- Out-of-order load execution
- Up to 4 DP FLOPS/cycle
- Dual 128-bit SSE dataflow
- Dual 128-bit loads per cycle
- Bit Manipulation extensions (LZCNT/POPCNT)
- SSE extensions (EXTRQ/INSERTQ, MOVNTSD/MOVNTSS)
- Optimized for 65nm SOI and beyond
- Enhanced Direct Connect Architecture and Northbridge
- HT-1/3 links (Up to 5.2GT/sec)
- Enhanced crossbar
- DDR2 with migration path to DDR3
- FBDIMM when appropriate
- Enhanced power management
- Enhanced RAS
AMD Developer Resources
AMD Developer Central

**Join now for access to:**

- AMD Developer Tools
  - AMD Core Math Library
  - AMD CodeAnalyst™ Profiler
  - AMD SimNow™ Simulator
- Discount Hardware Program
  - Custom order development systems at a 15% discount
- Technical Documentation
  - How-to’s, manuals, tutorials, etc.
- Developer ToyBox
  - Links to fun games and downloads
- Developer Spotlight
  - A section to feature you and your work!
- Developer Forums
  - Learn from your peers
- Developer support via email

[http://developer.amd.com](http://developer.amd.com)
Call to Action
Call to Action!

- Multi-thread your software to take advantage of multi-core processors

- Start planning your application transition to native 64-bit running on Windows x64 Edition, Vista and XP Pro

- Test and develop on AMD64 systems to ensure your customers get the best experience on their AMD systems

- Develop on AMD, run everywhere!

- Optimize for AMD processors to ensure top performance for your users
Recommended Articles & Presentations

- “Optimizing Games for AMD Athlon™ 64 Processors in 2006 and Beyond” by Mike Wall (AMD) at GDC ’06

- “x64 Primer: Everything You Need To Know To Start Programming 64-Bit Windows Systems” by Matt Pietrek (Microsoft) at MSDN
  - http://msdn.microsoft.com/windowsvista/default.aspx?pull=/msdnmag/issues/06/05/x64/default.aspx

- “GDC 2006: Coding for Multiple Cores” by Bruce Dawson & Chuck Walbourn (Microsoft) at GDC ’06
  - http://download.microsoft.com/download/5/b/e/5bec52bd-8f96-4137-a2ab-df6c7a2580b9/Coding_for_Multiple_Cores.ppt

- “OpenMP and C++” by Kang Su Gatlin and Pete Isensee (Microsoft) at MSDN
  - http://msdn.microsoft.com/msdnmag/issues/05/10/OpenMP/
Glossary
## Desktop Technologies Glossary (1)

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>FUNCTION</th>
<th>END USER BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Connect Architecture</td>
<td>Designed to eliminate the real challenges and reduce bottlenecks of traditional front-side bus architectures through the use of separate, dedicated high-speed links between the processor and main memory between the processor and I/O between CPU cores within the same processor</td>
<td>Leading-edge performance Helps avoid delays caused when multiple components compete for access to the same common bus Competing x86 architectures use a common front-side bus (FSB)</td>
</tr>
<tr>
<td>Multi-core optimized</td>
<td>The extensive AMD64 architectural optimizations and features enable thorough integration of multiple cores within the same processor, with each core having its own L1 and L2 caches</td>
<td>Provides true implementation of multiple processor cores</td>
</tr>
<tr>
<td>Simultaneous 32-bit and 64-bit computing</td>
<td>AMD64 technology enables a breakthrough approach to 64-bit computing that doubles the number of registers in the processor, and offers leading-edge performance on today’s 32-bit software applications while enabling a seamless migration to the 64-bit computing future</td>
<td>Can support both 32-bit and 64-bit applications Permits continued use of 32-bit software until the end user decides to transition to 64-bit software</td>
</tr>
<tr>
<td>HyperTransport™ technology</td>
<td>A high-speed, low latency, point-to-point communication link, providing outstanding bandwidth between system components</td>
<td>Provides incredible system agility and graphics performance capability</td>
</tr>
<tr>
<td>Integrated Memory Controller</td>
<td>Directly connects CPUs to memory, for industry-leading memory performance and bandwidth per CPU</td>
<td>Enhances performance as memory access latency is dramatically reduced</td>
</tr>
</tbody>
</table>
## Desktop Technologies Glossary (2)

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>FUNCTION</th>
<th>END USER BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMD Digital Media XPress™</td>
<td>Provides support for SSE, SSE2, SSE3 and MMX instructions</td>
<td>Takes 3-D and graphics to new levels in games, video, DVDs, and more</td>
</tr>
<tr>
<td>DDR2 Memory</td>
<td>2nd generation DDR memory designed to improve overall memory performance through increased bandwidth and larger densities</td>
<td>Memory performance</td>
</tr>
<tr>
<td>AMD Cool’n’Quiet™ Technology</td>
<td>Dynamically switches performance states (processor core voltage and operating frequency) based on processor performance requirements</td>
<td>Power management to limit heat and noise without hindering performance, making a more pleasant and comfortable home or work environment</td>
</tr>
<tr>
<td>AMD Virtualization™ (AMD-V™)</td>
<td>Silicon feature-set enhancements designed to improve the performance, reliability, and security of existing and future virtualization environments</td>
<td>Get the most out of your hardware by “co-locating” legacy and modern operating systems, installing trusted and untrusted partitions on the same hard-disk or using the same machine for both client-facing and business-facing applications.</td>
</tr>
<tr>
<td>Enhanced Virus Protection (EVP)</td>
<td>Sets part of system memory aside as ‘data only’ so resident code cannot be executed, only read from or written to</td>
<td>To safeguard music, pictures, video and other important data.</td>
</tr>
<tr>
<td>Silicon-on-Insulator (SOI) Technology</td>
<td>SOI technology is used to minimize substrate capacitive effects and leakage current for each of the millions of transistors within each AMD64 processor</td>
<td>AMD64 processors provide leading-edge performance while also using less power when compared to competing processor designs</td>
</tr>
</tbody>
</table>

* Enhanced Virus Protection (EVP) is only enabled by certain operating systems including the current versions of Microsoft® Windows®, Linux®, Solaris™ and BSD Unix. After properly installing the appropriate operating system, users must enable the protection of their applications and associated files from buffer overrun attacks. Contact your application software vendor for information regarding use of the application in conjunction with EVP. AMD strongly recommends that users continue to use third party anti-virus software as part of their security strategy.
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