Session 023

Windows Server 2003 64- Bit Systems

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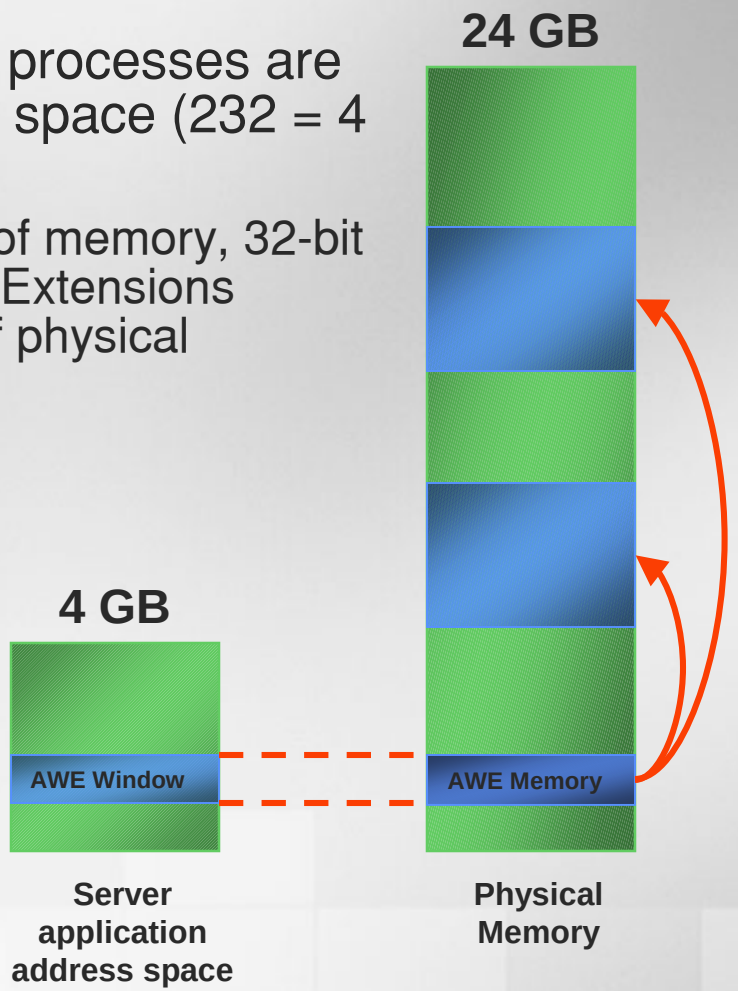
Why 64-bit Addressing Helps

It Eliminates the 4GB Memory Barrier

- With 32-bit operating systems, user processes are limited to a flat 4 GB virtual address space (232 = 4 GB)
  - In order to address larger amounts of memory, 32-bit Windows uses Address Windowing Extensions (AWE) to map to larger quantities of physical memory
  - The extra effort required to translate between virtual and physical memory impacts performance
- 64-bit Systems eliminate the 4 GB memory barrier



Source: Solomon & Russinovich, "Inside Microsoft Windows 2000," 3rd ed., ©2000

Target 64-bit Workloads

- **Databases** (MS SQL Server, Oracle, DB2), especially:
  - Customers using SQL Server Analysis Services, where 64-bit enables:
    - loading of extremely large dimensions into memory
    - faster processing of cubes
    - significantly larger query cache
    - support for many concurrent users
    - large dimension level security
    - processing very large dimensions or large partitions
  - Data warehouses, especially those that are large or complex
  - Consolidation of SQL Servers
  - Customers with many databases per instance
  - Customers with a large number of connected users
  - Customers with a large number of active stored procedures
- **Business Applications**
  - SAP, Siebel, PeopleSoft, SAS, and custom LOB where memory and computational requirements are high
- **Active Directory**
  - Customers with data stores >2GB will get better performance and scalability from a 64-bit system, since the entire data set can reside in memory
- **Terminal Server**
  - Uniquely suited for 64-bit extended systems with 32-bit client applications running on 64-bit Windows. The OS resolves bottlenecks with kernel address space; internal tests with a workload that mimics MS Office on TS showed 64-bit extended systems can support 50% more users per server

Target 64-bit Verticals

- Financial Services
  - Financial Services companies tend to have large amounts of data and do a lot of number crunching—modeling, forecasting, risk analysis (e.g., Monte Carlo simulations), etc.
  - 64-bit Windows can dramatically reduce processing time for them:
    - They can pull large data sets entirely into memory so they don't have to read from disk, which greatly improves performance
    - They can process twice as much data per clock cycle than 32-bit systems, which improves performance of complex calculations
    - They can take advantage of the additional floating-point and integer registers on 64-bit processors that speed numeric calculations
  - These companies also write a lot of custom applications tailored to their large data sets; using 64-bit Windows spares them from coding complex workarounds to the 4GB memory limit on 32-bit systems
    - When combined with the familiar Windows development environment, this means less time spent writing code, greater agility, and faster time-to-market
- Scientific/Technical Computing
  - Like Financial Services companies, these customers work with lots of data and crunch lots of numbers
  - High-Performance Computing (HPC) clusters figure prominently in this industry, where the familiarity of Windows combined with commodity hardware delivers platform value
- Manufacturing/Engineering
  - These firms tend to do a lot of complex modeling that combines server-side computations with high-powered workstations for CAD/CAM/CAE. End users can run Windows XP Professional 64-bit on their workstations and use their Microsoft Office applications side-by-side with their powerful engineering applications.
- Oil/Gas Exploration
  - Involves complex calculations of geological data, i.e., lots of data, lots of number crunching, where 64-bit provides maximum benefit

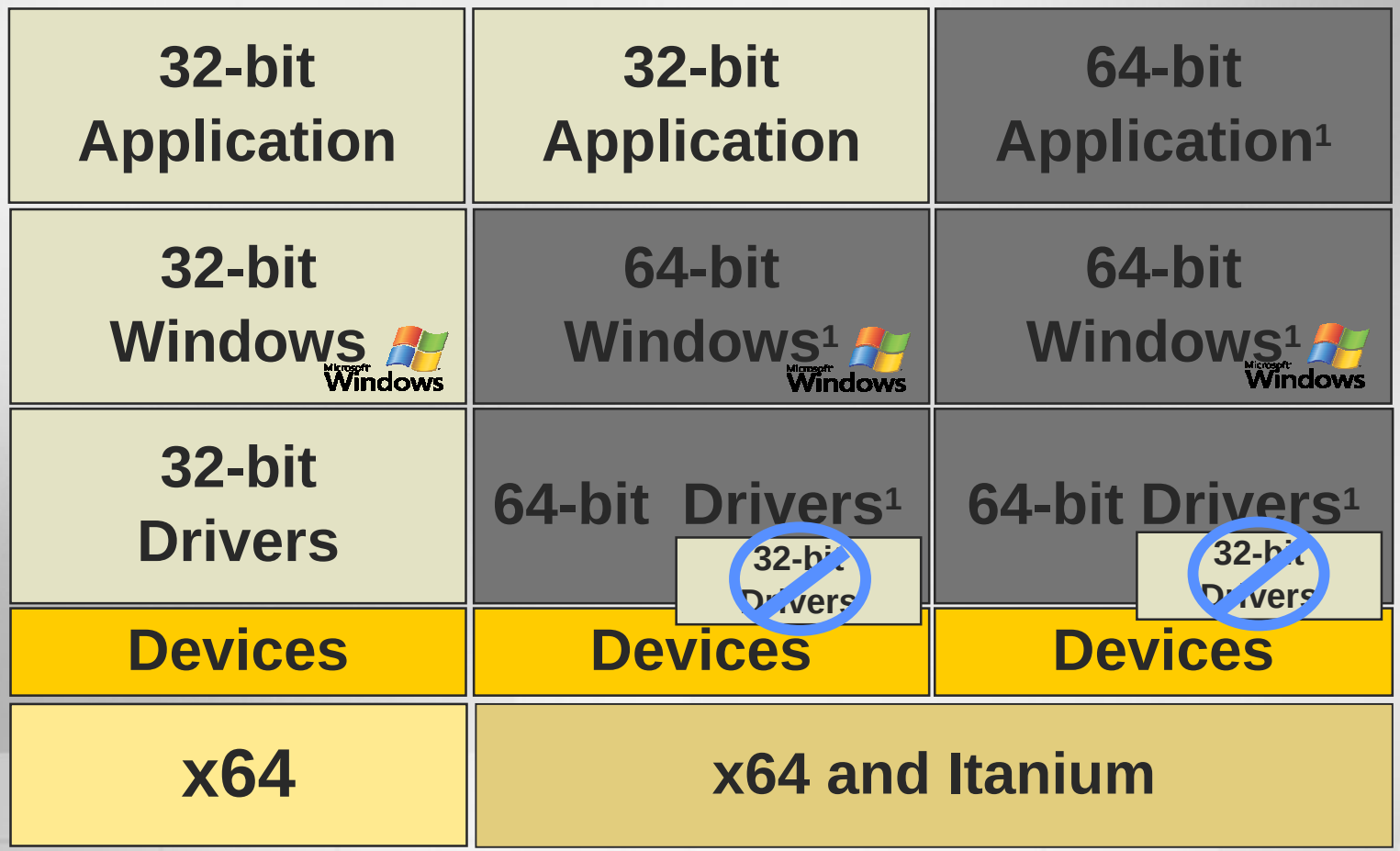
Supported Architectures

- 64-bit extensions
  - Based on 64-bit extensions to the x86 instruction set, this version of Windows supports both AMD Opteron and Intel Xeon with 64-bit extension technology.
  - Lets customers take advantage of their investment in 32-bit Windows applications, while also powering the latest 64-bit technology.
  - Microsoft.com: Windows Server 2003 for 64-Bit Extended Systems.
- Itanium Processor Family (IPF)
  - Based on Explicitly Parallel Instruction Computing (EPIC) architecture.
  - Gives customers the highest levels of scalability on the Windows platform, and the best price-performance of any platform for large scale-up servers.
  - Microsoft.com: Windows Server 2003 for 64-Bit Itanium-based Systems.

Relative Positioning

Windows Server 2003 family (Top-Line Positioning)		
The Windows Server operating system is the most productive platform for delivering connected applications, networks and Web services from the workgroup to the data center.		
Mainstream (32-bit x86)	**Versatile (64-bit Extended)**	**Most Scalable (64-bit Itanium)**
• Windows Server 2003 for 32-bit systems is the best platform for **mainstream** deployments because it has the largest ecosystem of partners and solutions delivering the best business value and most choice.	• Windows Server 2003 for 64-bit Extended Systems delivers the most **versatile** platform for performance-critical applications by providing high-performance operation of both 32-bit and 64-bit applications.	• Windows Server 2003 for 64-bit Itanium-based systems is the most cost-effective platform for highly **scalable** applications because it delivers the highest levels of scalability with the lowest costs of development, deployment, and management.

Applications and Drivers



(1) x64 and Itanium systems each require a different binary version of 64-bit software (Windows, applications and drivers). 64-bit applications and drivers written for x64 should run on both AMD's AMD64 and Intel's EM64T systems.

Product Roadmap

		32-bit	64-bit	
OS	**Product SKU**	**x86**	**Itanium**	**64-bit Extended**
Windows XP	64-bit Edition	n/a	X	Y
Windows Server 2003	Web Edition	X	-	-
	Standard Edition	X	Y	Y
	Enterprise Edition	X	X	Y
	Datacenter Edition	X	X	TBD

X indicates products in market today;
Y indicates products that will be available coincident with Windows Server 2003 SP1 (2H04)

Memory and CPU Limits

General Memory Limits	32-bit	64-bit
Total Virtual Address Space	4 GB	16 TB
Virtual Address Space per 32-bit process	2GB (3 GB if system is booted with `/3gb` switch)	4GB if compiled with `/LARGEADDRESSAWARE` 2GB otherwise
Virtual Address Space per 64-bit process	Not applicable	8 TB
Paged Pool	470 MB	128 GB
Non-Paged Pool	256 MB	128 GB
System Cache	1 GB	1 TB
Physical Memory and CPU Limits[1]	**32-bit**	**64-bit**
Windows XP Professional	4 GB / 1-2 CPUs	32 GB / 1-2 CPUs
Windows Server 2003 Standard Edition	4 GB / 1-4 CPUs	32 GB / 1-4 CPUs
Windows Server 2003 Enterprise Edition	64 GB / 1-8 CPUs	1 TB / 1-8 CPUs
Windows Server 2003 Datacenter Edition	64 GB / 1-32 CPUs	1 TB / 1-64 CPUs

SQL Server Support

- Native 64-bit Releases
  - SQL Server 2000 64 Bit for Itanium – Released in 2003
    - Enterprise Edition
    - Developer Edition
  - SQL Server 2005 (“Yukon”) for x64 and Itanium
    - Standard Edition
    - Enterprise Edition
    - Developer Edition
    - Evaluation Edition
- 32-bit Releases Supported via WOW64 under 64-bit Windows
  - Supported for Windows Server x64 only
  - SQL Server 2000 Service Pack 4
    - Standard Edition
    - Enterprise Edition
    - Developer Edition
    - Evaluation Edition
    - Workgroup

Features not supported in any 64-bit Windows (client or server)

- Subsystems
  - Microsoft DOS
  - 16-bit
  - OS/2 subsystem
  - Portable Operating System Interface for UNIX (POSIX)
- Legacy Transport Protocols

Resources

- Assistance with porting Windows software to 64-bit
  - Microsoft Software Porting Labs in Redmond, WA - contact 64bitrdy@microsoft.com to request a visit
  - Seminars and training events in North America, Europe and Asia – see http://www.route64.net
- 64-bit Windows Development
  - Consult the Platform SDK and Driver Development Kits
  - Visit msdn.microsoft.com and search on “64-bit”
- Windows Server 2003 SP1 and Windows for x64 Technical Beta Program
  - Provides access to pre-release versions of Windows for 64-bit Extended `Systems and development kits

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