AberdeenGroup

Executive Summary

Intel's Itanium: Who Benefits from Early Adoption?

An Executive White Paper

October 2000

Aberdeen Group, Inc.
One Boston Place
Boston, Massachusetts 02108 USA
Telephone: 617 723 7890
Fax: 617 723 7897
www.aberdeen.com

Intel's Itanium: Who Benefits from Early Adoption?

Preface

Internet commerce and large database applications are dealing with ever-increasing quantities of data, and demands placed on both server and workstation resources are increasing correspondingly. One demand is for more memory than the 4 GB provided by today's 32-bit computer architectures. But the huge memory addressability provided by 64-bit architectures is only one of the requirements imposed by today's power-hungry applications. These applications also need a processor architecture that provides high performance across a broad range of application types together with a long-term roadmap for future enhancements.

Itanium will be Intel's first 64-bit processor, but it is significantly more than a simple extension to Intel's continuing product line of 32-bit processors. Instead, it is based on a new, explicitly parallel instruction set architecture — an architecture designed to deliver sustainable increases in application throughput by changing the way in which the processor hardware interacts with code.

Itanium is now the name for the new architecture formerly known as IA-64. Intel is extending a branding strategy begun with Pentium to encompass not only the first processor based on the new architecture, but also the family of follow-on processors and even the architecture itself. By extending the Itanium brand's umbrella over the architecture as well as the specific processor implementations, Intel is clearly positioning the new architecture as being about much more than just 64 bits. Such positioning is not new, but the past "IA-64" terminology inevitably focused attention on the 64-bit nature of the architecture while relegating other new architectural features enhancing scalability, platform longevity, and high availability to secondary roles.

For Information Systems (IS) executives deploying high-end enterprise applications on Intel platforms, the question is not if but rather when they should adopt the Itanium architecture. But is the first Itanium processor the right choice for early adopters? The Itanium processor is expected to begin shipping in end-user pilot systems in late 2000. Intel intends to follow Itanium with additional processors in the Itanium family: McKinley in 2001, and Madison and Deerfield in 2002. Should IS buyers base 64-bit Intel architecture deployments on one of these later processors rather than Itanium?

From Aberdeen's perspective, answering the question of when IS executives should deploy a given application on the Itanium architecture depends on carefully matching Itanium features and capabilities to IS buyer and application characteristics. This executive summary of the Aberdeen *Executive White Paper, Intel's Itanium: Who Benefits from Early Adoption?*, presents Aberdeen's findings about Itanium early adoption, including an analysis of the application types that most directly benefit from Itanium and the set of early adopter buyer classes that most directly map to those application types.

Itanium: A New Architecture

Itanium's ability to address a flat 64-bit memory address space in the millions of gigabytes has been the focus of attention. Beyond very large memory (VLM) support, however, other traits, including a new Explicitly Parallel Instruction Computing (EPIC) design philosophy that will handle parallel processing differently than previous architectures, differentiate Itanium from other architectures.

EPIC, developed by Intel jointly with Hewlett-Packard, changes how the microprocessor interacts with software by allowing compilers to specify precisely the manner in which instructions are executed on a processor. This design philosophy is intended to address issues that other architectures — most of them originally designed 10 to 20 years ago — have not yet fully overcome, including achieving maximum instruction level parallelism (ILP) with complex code, as well as reducing microprocessor hardware complexity to better enable processor speed upgrades. Itanium processors also contain massive chip execution resources including registers, functional units, and caches, all of which have the potential to translate into processing power beyond what is available today on other processors.

When Will Itanium Make its Debut?

As of today, Intel has delivered over 6,000 prototype Itanium systems to operating system vendors (OSVs) and independent software vendors (ISVs) for use as development platforms with the goal of enabling platform and operating system qualification simultaneously with targeted end-user pilots during Q4 2000. Beta versions of the operating systems for Itanium — Windows 2000 64-bit Edition, IA-64 Linux, AIX 5L (Monterey/64), HP/UX, and Novell's Modesto — are also available.

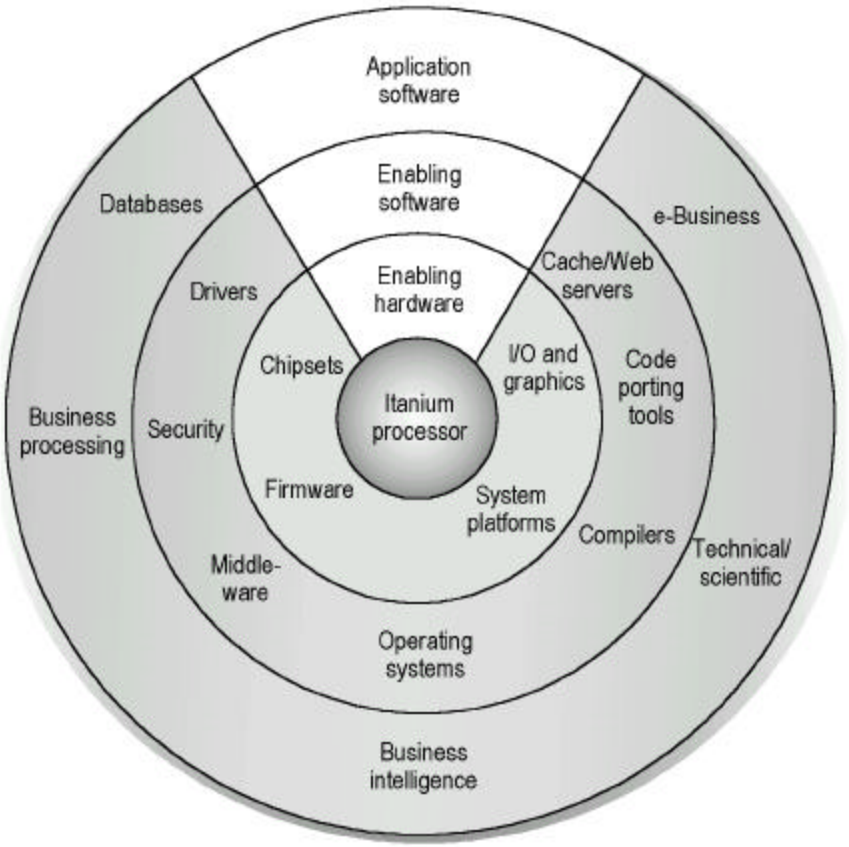
Intel expects to continue expanding the large pool of ISVs that have already compiled their applications to run on the Itanium platform. Working with key vendors, Intel has provided Itanium transition tools to a broad ISV community to assist developers with application ports. Major ISVs tell Aberdeen that they are finding the available tools, such as compilers, to be reasonably robust and functional and, therefore, not an impediment to moving applications to the Itanium platform.

Key Ingredients of an Itanium-Based System

IS executives anticipating the availability of new processors and new processor architectures often focus on the physical parameters and availability of the processors themselves to the exclusion of the surrounding hardware and software infrastructure. Yet, in Aberdeen's experience, this infrastructure often plays the critical role in the usability of or value proposition provided by a processor especially when it is the first implementation of a new architecture. The total Itanium environment includes multiple levels of hardware and software components comprising the complete processor infrastructure or ecosystem (Figure 1) including application and operating system software, system platforms, and supporting hardware components at all levels including Input/Output (I/O) and firmware.

Figure 1: Itanium Solution Stack Components

Telephone: 617 723 7890
One Boston Place
Fax: 617 723 7897
Boston, Massachusetts 02108
www.aberdeen.com



Source: Aberdeen Group, October 2000

How Itanium Will Perform on Key Application Types

A 64-bit flat memory space, hardware resources such as a large register set, a new floating point architecture, and explicitly parallel code generation enable Itanium to most directly benefit specific classes of applications: databases, business processing and e-Business, business intelligence (BI), technical and scientific, and security.

Databases

As database sizes have grown rapidly, the need for larger memory buffers has grown correspondingly as has the performance needed to manage the buffers. A new type of database is also emerging, the In-Memory Database (IMDB), which takes a more direct approach to the use of large quantities of physical memory by optimizing for main-memory data management rather than disk-based management. Mission-critical database applications will also benefit from advanced Itanium reliability features that detect errors and minimize the scope of their effects.

Business Processing and e-Business

One Boston Place
Boston, Massachusetts 02108
Telephone: 617 723 7890
Fax: 617 723 7897
www.aberdeen.com

The large size and scope and high transaction throughput of many line-of-business (LOB) applications, ranging from traditional enterprise resource planning (ERP) to recently developed e-Commerce stacks, underlies their ability to benefit from the large memory support and transaction processing performance of an architecture such as Itanium. Itanium's instruction pipelining and large register set also allow for more efficient processing of structured integer data.

Business Intelligence
Itanium's 64-bit VLM support directly benefits multi-terabyte data warehousing and data mining, while other Itanium architecture techniques — such as predication — improve parallel transaction code execution even in the face of unpredictable control flows. Itanium's floating-point performance is also significant for software performing complex numerical analyses of large data sets, as is the ability to explicitly specify code execution order in well understood algorithms.

Technical and Scientific
Performance is a primary driver in electronic design automation (EDA), mechanical design automation (MDA), digital content creation (DCC), financial services, and scientific application purchases. Itanium's floating-point features, large memory addressability for large data sets, and increased parallelism for complex processes combine to deliver new performance and scalability benefits to a market that is already highly receptive to the price/performance delivered by Intel architectures.

Security
The performance of encryption and decryption operations limits the scope of security system deployment because encrypting all network traffic from a client or a server requires 10 to 20 times the processor resources of unencrypted traffic. At a minimum, Itanium security performance is likely to benefit those e-Business applications that make some use of security protocols but are not dedicated to security operations.

Early Adopter Profiles
Early adopters look to new technologies to deliver fundamental breakthroughs in the way that they do business. This behavior contrasts with that of the more pragmatic IS buyers, who make up the early majority of users looking to make incremental improvements to mission-critical systems while minimizing the risk to their companies' core business. From Aberdeen's perspective, Itanium best matches the needs of specific classes of early adopters by delivering significant enhancements to those critical business processes with unmet computational needs that correspond with Itanium's strengths and well-defined software stacks.

Pushing Database Performance to the Next Level

Telephone: 617 723 7890
One Boston Place
Fax: 617 723 7897
Boston, Massachusetts 02108
www.aberdeen.com

The first group of Itanium early adopters has been chartered with revamping a legacy database system that is increasingly incapable of handling the peak transaction loads generated by e-Commerce applications. IMDBs are the most direct approach to addressing critical database performance bottlenecks. IMDBs can be implemented in the form of either a newer specialized database like TimesTen, designed specifically for that purpose, or with large buffers and a more traditional database such as Oracle 8i. Many databases already exist quasi-independently of other system components and usually have well-defined interfaces that simplify integration into an application environment with minimal disruption to other components.

Expanding the Scope of Business Intelligence Deployments

Rapidly increasing quantities of data affect not only the ability of back-end database systems to process and store data, but also the ability of IS executives to wade through the data for the purpose of developing quantitative and qualitative business insights. This second group of early adopters hopes to enable groups within their organizations to make more informed business decisions more quickly by distributing quantitative analysis to the functional units. Itanium is likely to continue the commodity hardware pricing trend that Intel 32-bit architectures have helped to drive, but also combine this trend with a high level of floating-point performance not previously seen on Intel processors. BI applications have differing degrees of dependence on databases and other software stack components, typically through middleware that also performs various data cleansing and transformation functions.

Unifying Business and Technical Computing on Intel Architectures

Past technical and scientific computing deployments on Intel architecture desktops and servers have been limited by IA-32 floating-point performance relative to Reduced Instruction Set Computer (RISC) architectures. This disparity has led many enterprises to deploy Intel architecture systems for commercial applications and RISC/Unix systems for high-end technical applications. A third early adopter group has a vision of reducing costs and management efforts by standardizing on an Intel architecture platform across both commercial and technical applications. Performance that exceeds available RISC architectures would provide a compelling impetus to early adopters considering the Itanium processor, especially in DCC, MDA, and pure scientific applications where the porting and tuning of code for Itanium processors and planning for Itanium-based application pilots is farthest along. However, performance parity with leading RISC/Unix processors, if mated with the availability of the necessary software, would be enough to lead many IS buyers to consider Itanium to simplify their compute infrastructures.

Telephone: 617 723 7890
One Boston Place
Fax: 617 723 7897
Boston, Massachusetts 02108
www.aberdeen.com

Aberdeen's Conclusions

Intel's Itanium architecture is expected to help IS executives keep pace with user demands for more power, better response times, and a highly available core hardware platform based on both specific Itanium processor implementations and the underlying EPIC design philosophy. But Aberdeen suggests that hot technology is not enough to drive the success of the Itanium processor family. Industry support will be the key factor in its success. The original equipment manufacturer (OEM) and OSV support for Itanium is unprecedented. And, because of this level of support, system and software vendors, together with Intel, may be taking much of the burden of moving from 32-bit to 64-bit computing off of the shoulders of IS departments.

Challenges for Itanium remain. The greatest challenge is eliminating or minimizing further slips in the rollout of the first Itanium processor — fulfilling a schedule that requires consensus among the application suppliers, operating system suppliers, and system suppliers to build a strikingly different enterprise platform. The next challenge is making sure that EPIC compilers are optimized to handle key applications — and work closely with the microprocessor to provide the compelling performance that IS executives demand in enterprise environments. The third and final hurdle will be to continually grow interest and development among packaged-application ISVs that have not yet committed to Itanium, an issue with which Intel continues to grapple in 2000.

To Aberdeen, the initial Itanium processor is a necessary first step in a new computing architecture with the potential to cause significant shifts in enterprise system deployment over the next decade. Just because it is a first step, however, does not mean that it should be relegated to evaluations or pilot deployments. IS buyers with relatively static compute environments or without a near-term application match to Itanium capabilities such as large memory may indeed want to move cautiously into the Itanium platform. Early adopters with the right profiles, however, could find in Itanium the lever that helps deliver breakthrough business advantage as part of a new type or style of application deployment in their enterprises.

Aberdeen Group, Inc.
One Boston Place
Boston, Massachusetts
02108
USA

Telephone: 617 723 7890
Fax: 617 723 7897
www.aberdeen.com

Aberdeen Group is a computer and communications research and consulting organization closely monitoring enterprise-user needs, technological changes and market developments.

Based on a comprehensive analytical framework, Aberdeen provides fresh insights into the future of computing and networking and the implications for users and the industry.

Aberdeen Group performs specific projects for a select group of domestic and international clients requiring strategic and tactical advice and hard answers on how to manage computer and communications technology.