

Windows Integrity Application Development Environments

HP Integrity Servers with Microsoft Windows Server 2003 for Itanium-based systems
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Introduction

High-performance transaction-processing and scientific applications have long run on 64-bit servers based on proprietary processor architectures and specialized operating systems. Only recently has 64-bit computing come to Windows-compatible servers based on open processor architectures such as IA64. Today, with 2000 applications already available, the software ecosystem around Windows on IA64 has taken root and is beginning to sprout.

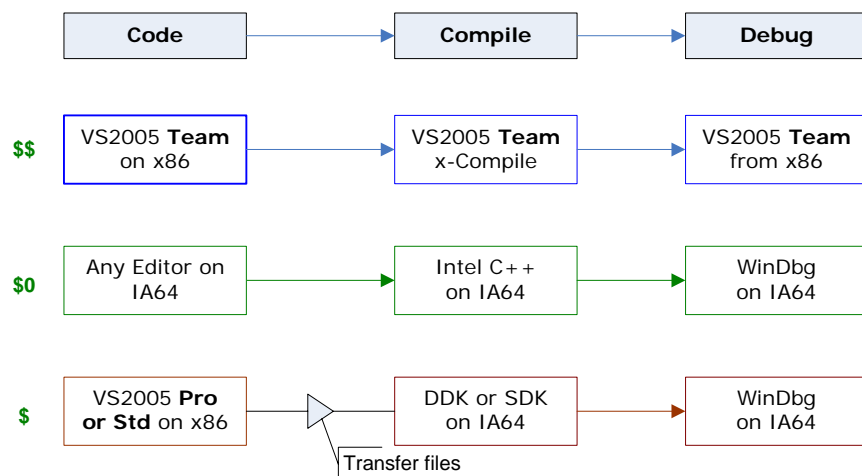
Many Windows applications are now created for x86 and then ported to the IA64 architecture. For such applications, software developers often build on x86, cross-compiling to the IA64 target, while others compile their code natively on Itanium-based systems. Developers also show a preference for either a GUI-based Integrated Development Environment or the command line. The development environment that suits you best depends on your project goals (synchronous or separate software releases on 32-bit and 64-bit) and environment preference (IDE or command-line).

Intel and Microsoft support both types of development efforts by offering compilers, development kits, and performance optimization utilities for developers who prefer the command-line and a selection of VisualStudio editions for those who prefer to build within an IDE. HP, Microsoft, and Intel also offer training at developer workshops with hands-on labs on HP Integrity servers.

As you plan the deployment of a Windows or SQL application on Itanium, note that Visual Studio 2005 does not run natively on Itanium-based systems. This technical brief provides a quick overview of the development environments that are available for porting Windows and SQL applications to Itanium-based systems.

	Cross-compile	Native-compile
IDE	VisualStudio 2005 Team	VisualStudio 2005 Pro, DDK/SDK, WinDbg
Command-line	Editor, DDK, WinDbg	Editor, DDK/SDK/Intel C++, WinDbg

This matrix essentially translates to one of the following tool chains:



The development environment that is easiest to set up involves using Visual Studio Team Edition on any supported platform (x86, x64) to cross-compile for IA64. You can transfer the executable to the Integrity server for testing. You can debug remotely using the remote debugger included in VS2005 Team Edition.

Alternatively, you can code in any IDE, such as VS2005 Professional or Standard Edition, on any supported platform (x86 or x64). You can then build for IA64 from the command line using SDK or

DDK on either the development machine (x86/x64) or the target machine (IA64). You can debug on the IA64 machine using the free WinDbg. This option is only as expensive as the IDE you buy.

Or, you could code, compile, and debug from the command line on IA64 without spending a cent on development tools.

The rest of this paper describes each development tool in detail.

Microsoft VisualStudio

VisualStudio is Microsoft's flagship software development environment. VS2005 now supports building on all architectures from within the IDE. There are two major variants of this product.

VisualStudio 2005 Team System

You can use the VisualStudio 2005 Team System to build for the IA64 target. VS2005 Team System runs on x86 and x64, but not on IA64. It does not run in emulation mode.

This product line includes:

- Team Edition for Software Architects
- Team Edition for Software developers
- Team Edition for Software testers
- Team Suite (which includes the broadest set of tools)

Each product is bundled with an MSDN subscription.

Visual Studio 2005 Standard and Professional

Visual Studio Standard and Visual Studio Professional do not include the IA64 compiler and you cannot use them to build an IA64 target. These editions make for a good editor and a sanity compilation test.

Visual Studio v6, v7 (.net or VS2003)

These older Visual Studio packages do not offer official IA64 support. There is a way to integrate an external compiler and invoke it from within the VisualStudio IDE, but we do not recommend this for anything other than the Intel compiler.

The only safe way of using Visual Studio 6 is by taking advantage of its Makefile export feature. You can then use this Makefile in a separate SDK environment. This might be a good option for existing VS6 projects.

Advantages:

- Create Makefiles from Visual Studio 6 projects

Disadvantages:

- No IA64 support except with Intel C++ compiler

Microsoft Windows Driver Development Kit (DDK)

Microsoft Windows DDK, intended for developing Windows kernel-mode drivers, is a command-line interface and includes a compiler, linker, and everything needed to build a driver. DDK also includes everything needed to build almost any type of user-mode executable or dynamic link library. DDK is fully functional and runs natively on IA64. DDK also supports cross-compilation from other targets (for example, you can build on x86 for the IA64 target and vice versa). You can also build CLR and .Net applications in this environment.

DDK relies on Makefile-like files called “sources” files. The syntax of sources file is included in the online help reference. Anyone with prior driver building experience will be able to build using the DDK very quickly and easily.

Typically, there is a version of the DDK associated with a major release of the operating system. At the time of this writing, the latest DDK version is Windows Server 2003 DDK SP1. It is also frequently used in conjunction with the SDK to allow complete user-mode builds to succeed.

Advantages:

- Platform portable, and easily automatable
- Native IA64 build
- New releases much more frequent –faster compiler updates possible
- Free

Disadvantages:

- Learning curve for writing or porting existing apps to sources file
- No IDE; must use an external editor

Microsoft Windows Software Development Kit (SDK)

Microsoft Windows Platform SDK, like the DDK, includes everything needed to build user-mode applications. This environment is command-line driver but utilizes the Unix-style Makefiles. Anyone familiar with Makefiles and the traditional UNIX build environment will become accustomed to the SDK very quickly. The SDK includes other helpful tools to help debug and profile your application and is compatible with CLR/.Net applications.

Microsoft updates the SDK less frequently than the DDK, but the SDK includes many more header files and libraries, which you may need for a large application.

Advantages:

- Easily automatable
- Native IA64 build
- Free

Disadvantages:

- No GUI/IDE, have to use an external editor
- Some learning curve for Makefile conversion

Intel C++ Compiler 9.0

The Intel C++ compiler suite resembles the Microsoft SDK package. It is meant to be plugged into the older Visual Studio packages (v6, 7), but a new version allows integration into VS2005 as well.

Advantages:

- Different optimization capabilities
- Native Itanium/IA64 builds

Disadvantages:

- No native GUI support

Debug Tools

Windows Integrity developers have a choice of two debug utilities:

- Visual Studio contains an integrated debugger but the VisualStudio IDE does not run natively on IA64. VisualStudio Team packages include a new feature called Remote Debugger, which allows for remote execution of the debugger with respect to the debug target. The remote debugger is available for the Itanium platform. We recommend this for CLR/.Net applications.
- Or, you can use the free Microsoft debug suite. This suite contains a GUI application (WinDbg) as well as a command-line (KD) debugger, which you can use for both kernel and user-mode debugging. WinDbg has a native implementation for IA64 but does not handle CLR/.NET debugging very well. You must use this package for kernel-mode debugging.

Setting up the SQL development environment

As Visual Studio 2005 does not run natively on Itanium-based systems, tools such as SQL Business Intelligent Development Studio are not available on Itanium-based systems either. Also, scripts such as SQL Server Integration Services (SSIS) tasks cannot be compiled on Itanium-based systems because there is no runtime compile for Itanium. You must compile them on a 32-bit system before running the package on Itanium-based systems.

You must therefore set up a 32-bit development and test configuration for your SQL application that mirrors your Itanium production environment. You will need 64-bit drivers for all data sources. Not all 64-bit OLE/DB drivers are available in 32-bit, so debugging against production driver equivalents may not always be possible. You should plan to test against 64-bit driver integration in any project that involves moving SQL applications to Itanium-based systems.

Also, you must configure Visual Studio for remote debugging, where Visual Studio running on a 32-bit system connects to the Integrity server set up as the debug target. Some debugging tools do not operate in the remote debugging configuration that Itanium is forced to use. Specifically, SQL Server Integration Services (SSIS) cannot be debugged using the remote interface. Also, you must develop and debug BI application extensions for Analysis Services (AS), Reporting Services (RS), and similar items on 32-bit systems.

Set up Remote Debugging

First, copy the correct version of the "Visual Studio Remote Debugging Monitor" to the remote Itanium target. If you enabled Itanium compilation support during Visual Studio installation, the IA64 version is available at the following location:

Program Files\Microsoft Visual Studio 8\Common7\IDE\Remote Debugger\ia64

After you copy these files, start the remote debugger on the IA64 target by running "msvcmmon.exe". This displays a GUI interface for the Visual Studio Remote Debugging Monitor. We recommend running in **Using Native – No Authentication** initially to allow all debugging users to connect. Although this is an unsecured option, it is a good initial choice to avoid domain and local security policy issues. You can set this under the **Tools->Options** menu from the Visual Studio Remote Debugging Monitor.

Set up your VS system on the same subnet as your Itanium target because the development activity loads the network with heavy traffic. Set the timeout to 9999999 to avoid resetting these options repeatedly.

After the Visual Studio Remote Debugging Monitor is running, specify how the Visual Studio project on the 32-bit system should connect to the Itanium-based target:

1. Go to your project properties in Visual Studio 2005
2. Click **Configuration Properties > Debugging**
3. Change the type from **Debugger To Launch** to "Remote Windows Debugger"
4. Change **Connection** to "Remote with no authentication (Native only)"
5. Set **Remote Server Name** to the name or IP of the Itanium target
6. Set **Remote Command** to the path and executable on IPF target:
7. The command is c:\mytestprogram\debugme.exe or similar
8. Hit F5 to start debugging.

Automate Building and Copying

With the settings above, you must copy your executable and symbols to the Itanium target after each build. Rather than repeating this tedious step, you can change the project settings to deliver these objects directly to the Itanium target:

1. On the VS2005 system, add a net share to your Itanium target drive
net use z: [\\itanium-target.hp.com\c\\$](http://itanium-target.hp.com) /u:administrator /p:hprules
2. Go to your project properties in Visual Studio 2005.
3. Click **Configuration Properties > General**.
4. Change **Output Directory** to the Itanium target share
z:\mytestprogram

Henceforth, whenever you build the project, it is placed in the right directory. You can make changes, hit F5, and VS2005 will build, copy, and start the debugger for you.

Performance Implications

In general, .Net CLR integration is the preferred method for SQL application deployment. Note that the Itanium .Net CLR has a different performance profile than either the x86 or the x64 .NET CLR. The .Net CLR components may operate significantly slower or faster than expected and can affect expected behavior and overall system performance.

Note also that neither Analysis Services nor SSIS are aware of the NUMA memory architecture used by Itanium. There can be memory contention with large application deployment and debugging when using these services on large cellular Integrity platforms.

Appendix A: VisualStudio 2005 Product Pricing ¹

Individual Purchases with MSDN Subscription	Renewal *	New
■ Visual Studio 2005 Team Suite with MSDN Premium Subscription**	\$3,499.00	\$10,939.00
■ Visual Studio 2005 Team Edition for Software Architects with MSDN Premium Subscription**	\$2,299.00	\$5,469.00
■ Visual Studio 2005 Team Edition for Software Developers with MSDN Premium Subscription**	\$2,299.00	\$5,469.00
■ Visual Studio 2005 Team Edition for Software Testers with MSDN Premium Subscription**	\$2,299.00	\$5,469.00
■ Visual Studio 2005 Professional Edition with MSDN Premium Subscription	\$1,999.00	\$2,499.00
■ Visual Studio 2005 Professional Edition with MSDN Professional Subscription	\$799.00	\$1,199.00

¹ Pricing as of March 2006

Appendix B: VisualStudio 2005 Product Overview

Feature	Express Products	Visual Studio Standard Edition	Visual Studio Professional Edition	Visual Studio Tools For Office	<u>Visual Studio Team System</u>
IntelliSense	Yes	Yes	Yes	Yes	Yes
Code editor	Yes	Yes	Yes	Yes	Yes
Code snippets	Yes	Yes	Yes	Yes	Yes
Programming languages included	VB, VC#, VC++, and VJ# are single language. Visual Web Developer includes VC# and VB	All	All	VB and VC#	All
Office development support	No	No	No	Support for Excel 2003, Word 2003, InfoPath 2003 and Outlook 2003	Support for Excel 2003, Word 2003, InfoPath 2003 and Outlook 2003
User experience	Simplified menu options and defaults	Simplified menu options and defaults	Full	Full	Full
Windows Forms designer	VB, VC#, VC++, VJ#	Yes	Yes	Yes	Yes
Web Forms designer	Visual Web Developer	Yes	Yes	Yes	Yes
Mobile Device Support	No	Yes	Yes	No	Yes
Database design tools (create/modify tables and stored procedures)	Local	Local and remote	Local and remote	Local and remote	Local and remote
Data Access Designers	VB, VC#, VC++, VJ#:local, Visual Web Developer: local	Local and remote	Local and remote	Local and remote	Local and remote

	and remote				
Documentation	10mb "Getting Started"; Starter Kits targeted at first-time programmers; 200mb optional MSDN Express	MSDN	MSDN	MSDN	MSDN
Class Designer / Object Test Bench	No	Yes	Yes	Yes	Yes
XML Editor Support	No	No	Full XML/XSLT	Full XML/XSLT	Full XML/XSLT
Deployment Tools	ClickOnce	Click Once	Yes	Yes	Yes
Extensibility	Use 3rd party controls and content. No Macros, Add-ins or Packages	Write, record, run macros, Write and consume Add-ins, Install Packages (partner products)	Write, record, run macros, Write and consume Add-ins, Install Packages (partner products)	Write, record, run macros, Write and consume Add-ins, Install Packages (partner products)	Write, record, run macros, Write and consume Add-ins, Install Packages (partner products)
Reporting	Visual Web Developer: SQL Server Reporting Services Add-in	SQL Server Reporting Services	SQL Server Reporting Services / Crystal Reports	SQL Server Reporting Services	SQL Server Reporting Services / Crystal Reports
Source Code Control	No	MSSCCI-compatible (Visual SourceSafe sold separately)	MSSCCI-compatible (Visual SourceSafe sold separately)	MSSCCI-compatible (Visual SourceSafe sold separately)	MSSCCI-compatible (includes Visual SourceSafe, Visual Studio Team Foundation Server sold separately)
Debugging	Local	Local	Local / remote	Local	Local / remote
64-bit Compiler Support (Itanium)	No	No	No	No	Yes

64-bit Compiler Support (x64)	No	Yes	Yes	No	Yes
Server explorer "Servers" Node	No	No	All	All	All
SQL Server 2005 Integration	No	No	Yes	Yes	Yes
Code Profiling	No	No	No	No	Yes
Static Analysis	No	No	No	No	Yes
Unit Testing	No	No	No	No	Yes
Code Coverage	No	No	No	No	Yes
Project Management	No	No	No	No	Yes
Test Case Management	No	No	No	No	Yes
Size	80mb (Express + SQL Express + .NET Framework Redist)	Single CD	Multiple CDs	Multiple CDs	Multiple CDs
Additional Tools Included	SQL Server 2005 Express Edition	SQL Server 2005 Express Edition	SQL Server 2005 Developer Edition	SQL Server 2005 Developer Edition; Microsoft Office Access 2003 Developer Extensions; Access 2003 Runtime license	SQL Server 2005 Developer Edition (included with client products only)
Feature	Express Products	Visual Studio Standard Edition	Visual Studio Professional Edition	Visual Studio Tools For Office	Visual Studio Team System

Appendix C: VisualStudio Team System Differences

MULTI-LANGUAGE DEVELOPMENT ENVIRONMENT FOR THE PROFESSIONAL DEVELOPER	Visual Studio Team Edition for Software Architects w/ MSDN Premium Subscription	Visual Studio Team Edition for Software Developers w/ MSDN Premium Subscription	Visual Studio Team Edition for Software Testers w/ MSDN Premium Subscription	Visual Studio Team Suite w/ MSDN Premium Subscription
Visual Studio Team Edition for Software Architects	■			■
Visual Studio Team Edition for Software Developers		■		■
Visual Studio Team Edition for Software Testers			■	■
Unit Testing, Code Coverage		■	■	■
Dynamic Code Analyzer, Static Code Analyzer, Code Profiler		■		■
Application Designer, Logical Infrastructure Designer, Deployment Designer	■			■
Load Testing, Manual Testing, Test Case Management, and Web Testing			■	■

For more information

www.hp.com/go/integrity

Call to action

Microsoft DDK

Order from Microsoft, free plus S&H or via MSDN:

<http://www.microsoft.com/whdc/devtools/ddk/orderddkcd.msp>

Microsoft Platform SDK

Order from MSFT, free plus S&H or download:

<http://www.microsoft.com/downloads/details.aspx?FamilyId=A55B6B43-E24F-4EA3-A93E-40COEC4F68E5&displaylang=en>

Microsoft Visual Studio 2005 Team Editions

Evaluation version: <http://msdn.microsoft.com/trial> or

Buy from Microsoft for \$5K minimum to be Itanium build-ready:

<http://msdn.microsoft.com/vstudio/howtobuy/>

Intel C++ Compiler

Evaluation version:

<http://www.intel.com/cd/software/products/asmo-na/eng/compilers/219690.htm>

Buy for \$400:

<http://www.shop-intel.com/shop/product.asp?pid=SISW3237>

Microsoft debugger package

Free Download: <http://www.microsoft.com/whdc/devtools/debugging/default.msp>

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