

IBM White Paper

**Solutions for Common Source and
Multiple Platform Development
Overview**

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Introduction

The right tools make even the most difficult job much easier. IBM is expanding its arsenal of OS/2* Warp development tools to help application developers create the right applications for today's complex computing environment.

Today, IBM announces a way to reduce code development costs while reaching all the major 32-bit platforms. By expanding OS/2 Warp with the IBM Developer API Extensions, IBM enables developers to create common code for OS/2 Warp, Windows** NT, and Windows 95 operating systems. In addition, these extensions to OS/2 Warp will simplify migration from existing Windows applications to the OS/2 Warp environment. This paper provides an overview of IBM's solutions for common source and multiple platform development.

Current Environment

Several factors that complicate the already difficult task of developing applications in today's environment are the:

- Move from 16-bit applications to 32-bit applications
- Emergence of object-oriented development tools and components
- High cost of developing and maintaining code

Application development companies have several options. They can develop applications for one operating system. While this decision minimizes development and maintenance costs, it limits the market opportunity. This choice also affects the consumer because it limits the choices the consumer has when considering a computing environment. Another choice developers can make is to support multiple platforms. While this choice is safe because the company is not depending on the success of any one platform, it takes more resource to develop and maintain code for multiple platforms.

IBM offers a better solution.

IBM's Solutions for Common Source and Multiple Platform Development

IBM's solutions make it more cost effective to develop applications on multiple platforms allowing developers to expand their markets rather than choose one operating system over another. Additionally, IBM's solutions make it easier for developers to migrate Windows applications to OS/2 Warp and take advantage of OS/2 Warp's Workplace Shell object advantages, small footprint, sophisticated multitasking, multithreading, and advanced technologies.

The objectives of IBM's solutions for application developers are to:

- Provide tools and system components that reduce development and maintenance costs
- Leverage a common code base across multiple platforms
- Develop on open industry standard libraries, parts, and architectures
- Build upon advanced technologies

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** Windows is a registered trademark of the Microsoft Corporation.

To accomplish these objectives, IBM provides the following components:

- VisualAge* C++ product suite, a multiple platform tool set for C and C++ development including visual construction from parts
- VisualAge C++ Open Class Library, a cross platform class library providing a wide range of reusable classes from which objects can be created and manipulated
- OpenDoc**, a multiple platform compound document architecture that enables the development of object-oriented multiple platform application components called OpenDoc parts
- IBM Developer API Extensions, extensions that expand and modify OS/2 Warp to provide greater commonality between the OS/2 Warp and the 32-bit Windows procedural API and message set
- Source Migration Analysis Reporting Toolset (SMART***) tools that automate many of the tasks in migrating procedural 16/32-bit Windows code as well as 16-bit OS/2 code to 32-bit OS/2 code.
- Hyperwise, a what-you-see-is-what-you-get (WYSIWYG) editor that enables authoring of hypertext online information and application help for OS/2 Warp and Windows.

Both the tremendous potential provided by object-oriented technology for design and component reuse, and the emergence of extensive parts catalogs create a compelling reason to invest in object-oriented tools and development. The dramatic growth forecast for object technology will firmly establish it as a key part of the software market by 1997. IBM's solutions provide the multiple platform tools and components to enable application developers to move from the traditional programming paradigm to object-oriented development through the VisualAge C++ family of tools, IBM Open Class, and OpenDoc.

While object-oriented development is where the industry is going, IBM recognizes that application developers have a significant investment in procedural applications and development tools. Thus, key parts of IBM's solutions are tools and components such as Developer API Extensions, SMART, and Hyperwise that enable a common source solution for procedural-based applications. This allows application developers to begin realizing the benefits of common source and multiple platform development now.

VisualAge C++ Product Suite Overview

The VisualAge C++ product suite enables application developers to leverage the power of clients and servers by providing development tools targeting a variety of client and server platforms. At the core of IBM's solutions are optimizing C and C++ compilers, along with the IBM Open Class Library, a set of C++ classes that form a base on which applications can be developed.

The compilers and class libraries support a range of platforms so that code can be ported across them. Today, these platforms include:

- OS2 Version 2.11
- OS/2 Warp Version 3.0
- AIX Version 3.2
- AIX Version 4.1
- MVS Version 4.2 and higher
- Sun Solaris Version 2.4 and higher

* VisualAge is a trademark of the IBM Corporation.

** OpenDoc is a registered trademark of Apple Computer, Inc..

*** SMART is a registered trademark of the One Up Corporation.

In the future, supported platforms will include:

- OS/2 Warp for the PowerPC
- Windows NT
- Windows 95
- OS/400
- Apple PowerMac

IBM is aggressively working to put VisualAge C++ on Windows in 1995.

IBM VisualAge C++ offers the following benefits:

- Visual application construction. Visual construction from parts reduces the learning curve for object technology. The developer visually manipulates prefabricated parts to assemble application logic and then generates the C++ code. It is the fastest way to be productive with C++. Looking at the generated code also helps developers understand C++ coding.
- True object-oriented technology. Object technology improves developer productivity and application quality. The IBM Open Class Library consists of a well-designed set of class libraries that have been thoroughly tested and used by IBM developers and customers over time, providing a proven level of quality.
- Open systems. IBM VisualAge C++ compilers and IBM Open Class are delivering on the promise of open systems. Customers can choose among supported execution platforms, significantly reducing portability costs. Inside IBM, developers use these compilers and classes to develop multiple platform support, ensuring a higher degree of portability and performance on each platform.
- Enterprise applications. IBM C++ family offerings support a wide range of platforms, from low-end clients to high-end mainframes.

The IBM VisualAge C++ for OS/2 Warp was unveiled at ObjectWorld, to much acclaim, winning the "Attendees Choice for Best New Overall Object Technology Product," and tying for the industry judges' choice as "Best New OT Development Product" in Computerworld's Second Annual Technology Product Awards at ObjectWorld.

VisualAge C++ IBM Open Class Library Overview

IBM Open Class includes classes for user interface, collections, and application support. The user interface classes provide comprehensive support for programming graphical user interfaces (GUI) on multiple operating systems. This support simplifies coding of GUI applications and provides a consistent way to write user interface code without having to program to the low-level system APIs.

The collection classes are a complete set of abstract data types such as sequences, sets, bags, and queues with consistent interfaces and a choice of several underlying implementations for application performance tuning.

Finally, the application support classes provide various basic abstractions needed for the creation of general purpose C++ applications; support for string manipulation, date and time, error handling, and trace classes. The standard I/O streams and complex classes are provided as well.

To work with a relational database, application developers can use IBM's Data Access Builder to create new object-oriented applications to work with DB2* more quickly and reliably. Data Access Builder automatically generates the source code for C++ classes that work with a relational database. The add,

* DB2 is a registered trademark of the IBM Corporation.

update, delete, and retrieve methods and the services for database operations like commit, rollback, connect, and disconnect are provided. A Quick Map feature allows column-to-attribute mapping and graphical display of the mapping of database tables to objects.

Many of the classes in IBM Open Class, including those generated from the Data Access Builder, have been integrated as parts for use in the visual builder. Application developers can use visual programming to construct an application using the class library parts, even for applications that do not include a GUI.

As IBM makes support for Windows available, IBM will help developers move to the VisualAge C++ product suite and IBM Open Class. IBM understands the challenges application developers face in going across multiple platforms, while reducing development costs. VisualAge C++ assists developers in creating such applications.

OpenDoc Overview

OpenDoc is an open industry standard architecture for building reusable, distributed, cross-platform software components. OpenDoc, developed jointly by IBM, Apple, and Novell, is both a specification and a set of technologies used to build components. Developers who build their applications consistent with the OpenDoc architecture will be providing software that integrates and cooperates with other OpenDoc software, and with an application linking architecture such as Microsoft's Object Linking and Embedding.

OpenDoc is an important part of IBM's plans for providing customers with objects. OpenDoc and its supporting tools provide an easy way to create business objects, which are common application functions such as a simple report or note writer. OpenDoc's structure allows for suites of functions or components to become more usable and fully self-contained. It provides the essential glue that allows a developer, power user, or end user to connect these components.

OpenDoc's compound document technology provides the following benefits to the end user:

- Different information types that make up the document can be edited in place
- Presents a single user interface
- Reduces the task of managing files
- Allows different users to work on different parts of the document at the same time; changes are tracked by drafts

These end user benefits are provided by OpenDoc parts developed by IBM and independent software vendors (ISV).

The current development paradigm is to create Suites (three or more programs packaged together and sold as a unit) or monolithic super applications (a single application with multiple functions like a word processor, spreadsheet, database, and charting and graphics built in). However, users increasingly demand flexibility in manipulating, combining and presenting data that is aligned to the task at hand rather than to the way data is stored in a computer database. OpenDoc changes the development paradigm to allow the user to do what he needs to do how he wants to do it. The OpenDoc parts structure provides a more modular way of developing and combining parts which have sets of routines that allow the user to edit and view a specific information type, example text, or spreadsheet.

OpenDoc parts enable a high degree of code reuse and allow the developer to offer solutions that could not be provided easily with monolithic programs. Parts are easy to create, combine, and distribute enabling developers to become more responsive to the market.

OLE parts from a Windows application running in a WINOS2 session can be part of an OpenDoc document, and OpenDoc parts can be part of a Windows OLE document. However, there is no source code migration from Windows OLE to OpenDoc. Because OpenDoc is a multiple platform technology, the

developer will have an OpenDoc Framework. IBM is extending IBM Open Class with a framework to help developers build OpenDoc parts easily. The visual builder in VisualAge C++ will also support OpenDoc-enabled parts. This enables portability of the OpenDoc source across platforms.

OpenDoc evolves desktop computing by providing an object-based framework for developing applications that are fully integrated and interoperable across platforms and distributed networks. It is an open architecture that reduces the complexity of computing today, while supporting the development of tomorrow's advanced flexible applications.

This summer, IBM will deliver the capability for developing OpenDoc applications in the OpenDoc Developer Toolkit 2. The ability to ship applications will be available in the fall.

IBM Developer API Extensions Overview

IBM Developer API Extensions expands the OS/2 Warp APIs and messages. Developer API Extensions let application developers maintain a common code base for 32-bit Windows and OS/2 Warp applications. Developer API Extensions provide over 700 new APIs that are consistent with Windows APIs. The subset was chosen based on analysis of more than nine million lines of code from a variety of applications. Application developers use Developer API Extensions to write portions of their code to be common between OS/2 Warp and Windows, while still exploiting OS/2 Warp's existing API set and advanced features.

Developer API Extensions enhance the OS/2 Warp operating system and tools. Windows applications that conform to Developer API Extensions can be recompiled to produce a functionally equivalent OS/2 Warp application. The application then runs on OS/2 Warp and has the OS/2 Warp look and feel.

Developer API Extensions simplify the migration for procedurally-based applications. Developer API Extensions is targeted at core operating system functions. Operating system extensions such as multimedia, pen, and OLE are not within the scope of Developer API Extensions.

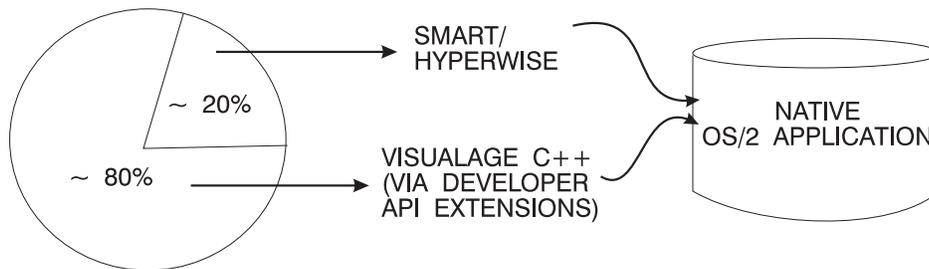
In addition to extensions to OS/2 Warp, IBM is working with One Up Corporation to enhance SMART with user-defined migration dictionaries (UDMD) specifically designed to exploit Developer API Extensions. SMART analyzes and migrates program code, resource files, and help files (see "Source Migration Analysis Reporting Toolset (SMART) Overview" on page 6).

Lotus Development has piloted the use of Developer API Extensions for portions of its OS/2 development and has achieved impressive results to date. Through the use of a common code base, Lotus has committed to providing OS/2 Warp applications that are functionally equivalent to their Windows 95 counterparts. These applications are targeted for delivery commencing in '95. Certain areas within these applications, when coupled with the maturity and robustness of OS/2 Warp, may very well outperform their Windows 95 counterparts.

The combination of Developer API Extensions and SMART enhancements enable migration to OS/2 Warp applications with significantly less effort. For new development projects, Developer API Extensions reduces the development, test, and maintenance costs for applications that are targeted at multiple platforms (OS/2 Warp, Windows NT, and Windows 95). IBM believes that most application developers will realize an 80% common code solution for Windows and OS/2 Warp, with the remaining 20% customized to exploit the unique features of each operating environment. See Figure 1 on page 6. By including Developer API Extensions in OS/2 Warp, IBM makes it easier for Windows application developers to capture the market opportunities of the ever-increasing OS/2 Warp install base.

LEVERAGING YOUR INVESTMENT: SUMMARY

EXISTING WINDOWS SOURCE/RESOURCES



NEW APPLICATIONS USING DEVELOPER API EXTENSIONS IN DESIGN

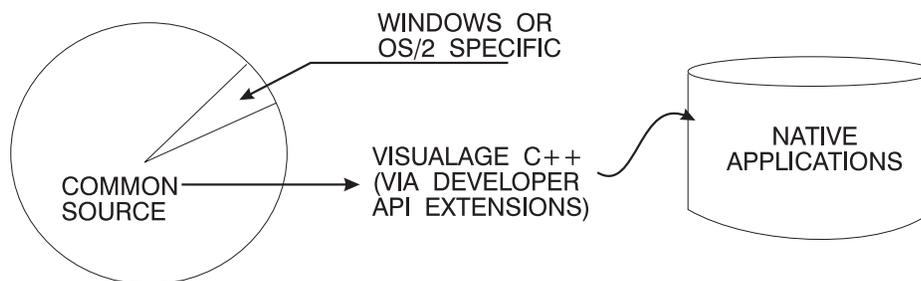


Figure 1. Leveraging your Investment

A beta level of Developer API Extensions will be available this summer. The final version will be available by the end of 1995.

Source Migration Analysis Reporting Toolset (SMART) Overview

SMART makes migrating code to OS/2 Warp easier than ever. This innovative tool set, developed by One Up Corporation, provides tools to migrate Windows code to OS/2 Warp code.

SMART assists in the migration of source code from:

- 16-bit OS/2 to 32-bit OS/2 code
- 16-bit Windows to 32-bit OS/2 code
- 32-bit Windows to 32-bit OS/2 code

SMART provides assistance through the following tools:

- **Analysis and Reporting Tool:** Analyzes the conversion effort and provides reports that are a migration road map.
- **Source Migration:** Allows migration of API and message code and provides progress reports and online references to assist in migration.
- **Resource Translator:** Takes Windows resources, including cursors and icons, and converts them to OS/2 Warp resources.
- **Viewer:** Provides context sensitive online help for the SMART code migration process.
- **SLink, the SMART editor:** Integrated with the complete SMART, SLink (SourceLink), the SMART editor provides both editing and hyperlinking to the key elements in code.

- **User-Defined Migration Dictionaries (UDMD) Library:** SMART has a library of UDMDs that ease the analysis and conversion of Windows help files, resources, and source code. UDMDs are available to target the following platforms:
 - OS/2 Warp
 - OS/2 Warp for the PowerPC

Developers can also create UDMDs to program or tailor the migration process for a particular environment. The migration command language (MiCL) is another programmable feature that provides the capability to prompt the user for data or processing options during the migration process.

SMART is available on The Developer Connection for OS/2. Extensive information is available about each SMART component in the online documentation found in the SMART folder once SMART is installed. It is IBM's intent to provide the Developer API Extensions UDMD on CompuServe and on the IBM Solution Developer Operations (SDO) home page on the Internet in the near future. See the SDO home page at:

<http://www.austin.ibm.com/developer>

Hyperwise Overview

Hyperwise is a productivity tool for application developers. Hyperwise enables what-you-see-is-what-you-get (WYSIWYG) authoring of hypertext online information and application help for OS/2 Warp and Windows. Hyperwise provides:

- Easy-to-use WYSIWYG editing
- Multiple imports including rich text format (RTF)
- Multiple exports including hypertext mark-up language (HTML)
- Improved user interface
- Improved productivity of 25% to 50%
- Drag-and-drop techniques to link text, audio, video, and graphics
- Multiple platform read capability
- Information Presentation Facility for Windows for common sourcing
- Compression of text and graphics of 50% to 80%

Hyperwise Version 2.0 provides enhanced developer support for moving Windows help to OS/2 Warp and supports WorldWide Web browsers on the Internet. Hyperwise also saves application developers time and resources--author text once and read it on OS/2 Warp, Windows 3.1, and the Internet. Future plans include support of Information Presentation Facility (IPF) for Windows NT and Windows 95.

Customer reuse of information is a key feature of Hyperwise. The IPF for Windows engine is packaged with Hyperwise, making Hyperwise a product that enables the multiple platform application and information development. Application developers are encouraged to use OS/2 Warp as their authoring and development platform. The IPF for Windows is packaged with Hyperwise 2.0, so the same information compiled for OS/2 IPF is viewable on Windows. This common sourcing increases productivity and enables developers to use OS/2 Warp for their development platform, regardless of the platform on which their applications run.

With Hyperwise, developers can use simple drag-and-drop techniques to link the following file types supported in OS/2 Warp:

- Animation (FLC and FLI file extensions)
- Audio (WAV and MID file extensions)
- Graphics
- Text
- Video (AVI file extension)

Where to Get More Information

For more information on the solution components, see:

- **Hyperwise:** On CompuServe, access the Hyperwise forum by typing:
GO PSPAPROD
Go to section 15 for the Hyperwise forum.
- **OpenDoc:** Visit the CIL home page on the WorldWide Web at:
<http://www.CIL.ORG>
- **Developer API Extensions:** See *IBM White Paper: IBM Developer API Extensions and Source Migration Analysis Reporting Toolset (SMART)*.
- **SMART:** See *IBM White Paper: IBM Developer API Extensions and Source Migration Analysis Reporting Toolset (SMART)*.
- **VisualAge C++:** To get the white papers online, visit the IBM C Set++ for OS/2 page on the WorldWide Web at:
<http://www.torolab.ibm.com/ap/cset/csetos2/dde4fx2.html>

For more information on other IBM C or C++ offerings, see the:

- IBM Workgroup C++ Solution page at:
<http://www.torolab.ibm.com/software/ad/adwgc.html>
- IBM C Set++ for AIX page at:
<http://www.torolab.ibm.com/ap/cset/csetaix/cxxfaix.html>
- IBM C or C++ for MVS/ESA page at:
<http://www.torolab.ibm.com/ap/c370/ccxxmvs.html>
- IBM AS/400 ILE C/400 page at:
<http://www.torolab.ibm.com/ap/as400/languages/ilec.html>

To get information on the VisualAge C++ and related betas, see these beta forums:

CompuServe: CSETBETA FORUM in PSPBETA
IBMLink/TalkLink: CSETBETA FORUM
EMEA DAP: CSETBETA Forum
Internet: csetbeta@vnet.ibm.com

Summary

Developer API Extensions and the other solution components provide an opportunity not available in the past: to develop a common code base containing the bulk of application code for 32-bit Windows and OS/2 Warp. With most source code in a common code base, application developers can spend their time making enhancements to areas specific to the respective platform, such as adding Workplace Shell features to the OS/2 Warp version. These platform-specific enhancements provide the opportunity to make each version more competitive for its respective market.

In addition to producing savings in the obvious areas of support, dual source maintenance, and reduced testing, Developer API Extensions also saves time in initial programmer training and even the skills and time application developers need to become productive. Windows application developers do not have to learn OS/2 Warp APIs, messages, or the operating system structure immediately. Of course, over time, these skills should be acquired so that applications can exploit the advantages provided by the OS/2 Warp platform. Skilled OS/2 Warp application developers can focus their attention on adding OS/2 Warp features that enhance an application's market appeal.

In addition, as with any 32-bit OS/2 Warp application, migration to PowerPC is only a recompile and test effort. The bottom line is that application developers will be able to add OS/2 Warp to their list of supported platforms with a relatively small increase over the 32-bit Windows investment while expanding revenue potential to include the rapidly growing OS/2 Warp install base.