

F05

Update on Using the DB2 Family in a Microsoft Client Environment

Brent Gross

gross@ca.ibm.com

A decorative graphic consisting of several green circles of varying sizes, some solid and some with a white outline, arranged in a horizontal line. A central green rounded rectangle with a purple border is overlaid on this graphic, containing the text "IBM Data Management Technical Conference".

IBM Data Management Technical Conference

Anaheim, CA

Sept 9 - 13, 2002

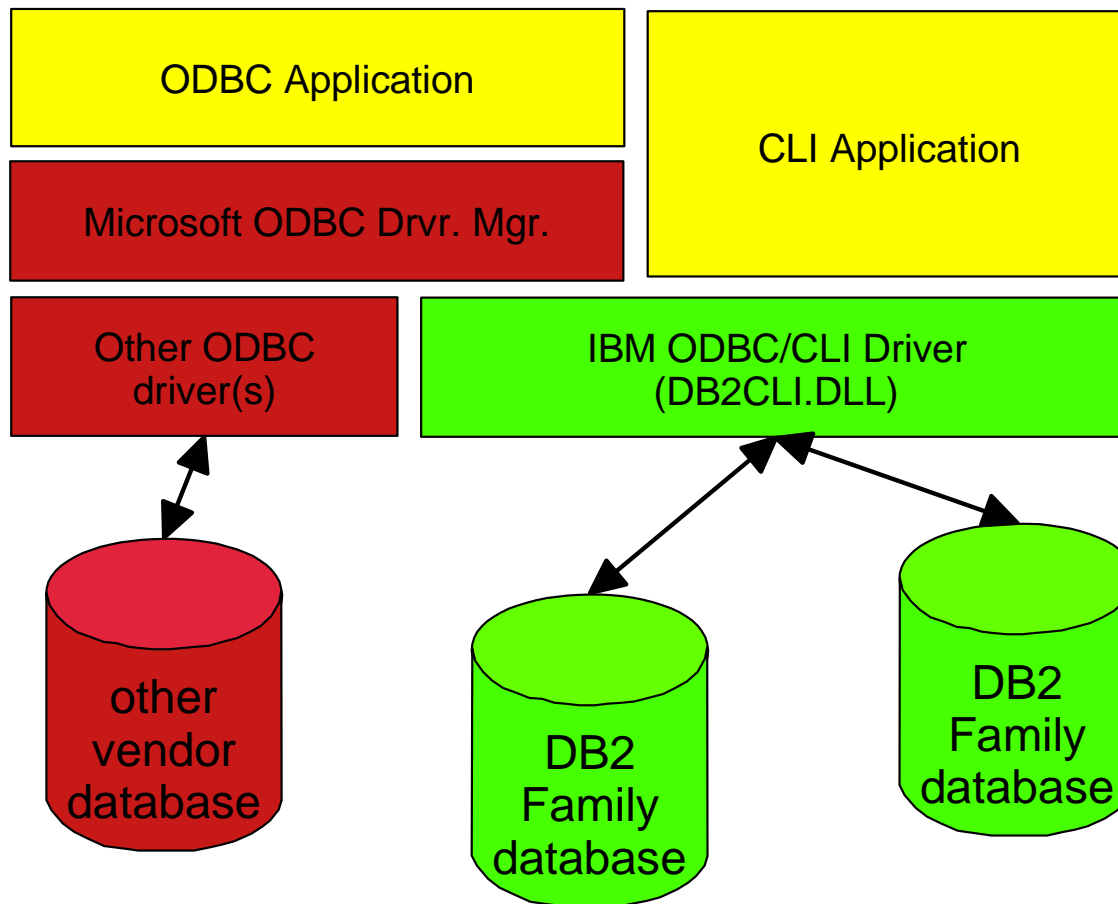
Agenda

- CLI/ODBC Interface
- OLE DB and ADO Interface
 - ▶ Scrollable Cursors
 - ▶ Data Type Issues
 - ▶ Native Provider
- MTS, COM+
- .NET
- Tools Integration
- Samples
- Summary

Notes

- The DB2 server assumed in these charts is DB2 for Linux, UNIX and Windows
- DB2 for OS/390 will be specifically identified
- The Client is running on Windows NT 4, Windows 2000 or Windows XP

DB2 Call Level Interface

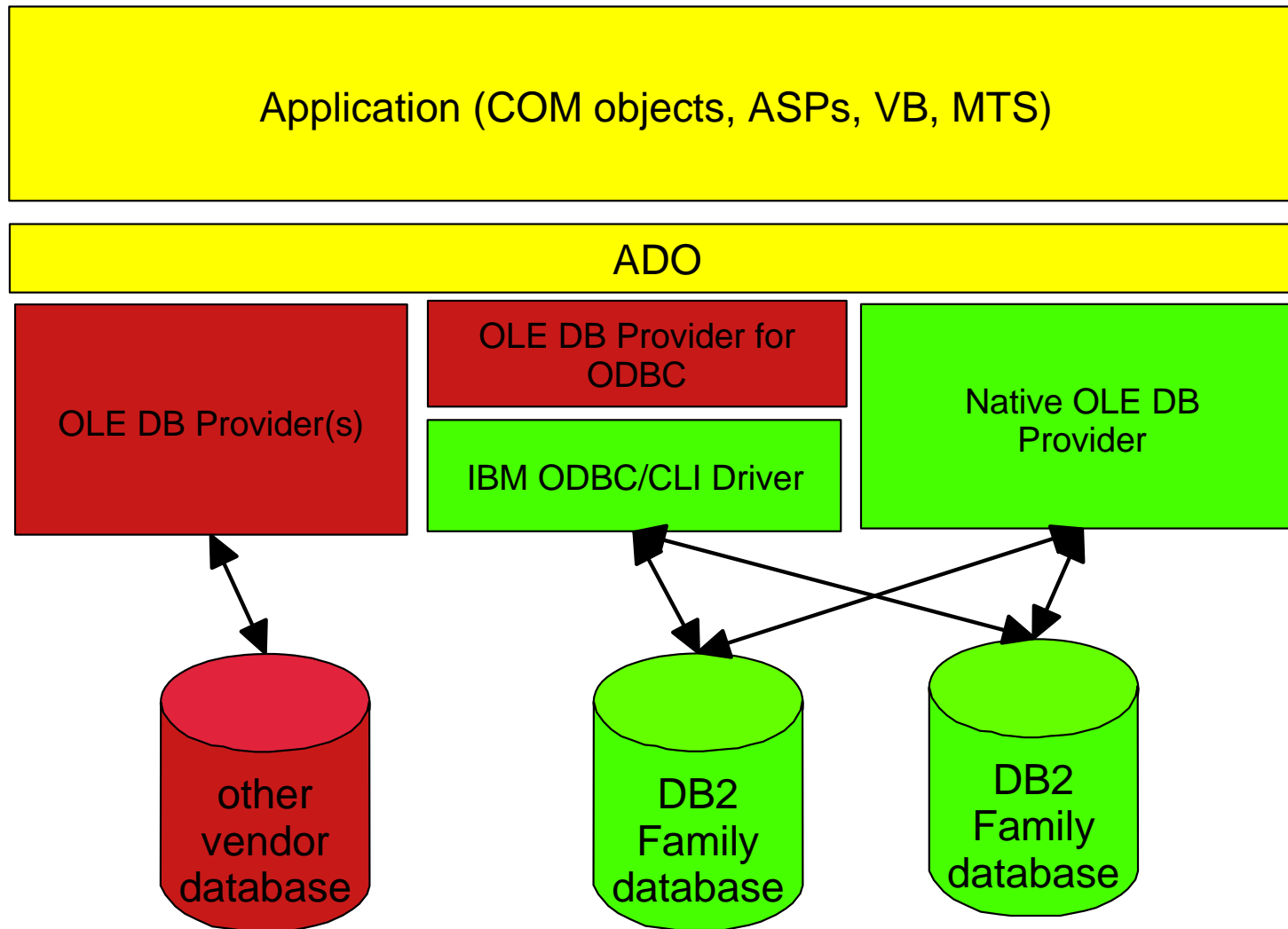


DB2 Call Level Interface

- ODBC Applications:
 - ▶ DBMS specific drivers loaded by ODBC Driver manager
 - ▶ Applications are linked with ODBC libraries
- CLI Applications
 - ▶ 100% ODBC compatible
 - ▶ Applications are linked with DB2 libraries
- Full Unicode support in V7.1 FP 2
- Significant performance improvements in V8

OLE DB and ADO

OLE DB and ADO



Supporting ADO

- Does DB2 CLI driver support ADO ?
 - ▶ Yes, of course
- Exploit key ADO features
 - ▶ Scrollable cursors
 - ▶ Updateable cursors
 - ▶ Connection pooling
 - ▶ MTS, COM+

ADO Scrollable Cursors

- Client Cursor
 - ▶ Cursor managed within ADO
 - ▶ Scrollable, updateable cursor
 - ▶ Bookmark support
 - ▶ Multirow result set
 - ▶ Uses server side forward only cursor and caches results inside ADO
 - ▶ Builds updates using separate statement and WHERE clause to identify the row

ADO Scrollable Cursors

- Server Static
 - ▶ Scrollable, read only cursor
 - ▶ Bookmark support
 - ▶ Multirow result set
 - ▶ Maps to server side static cursor on DB2
 - ▶ Maps to server side static, insensitive cursor on DB2 for OS/390 V7 with DB2 Connect V7.1 FP 2

ADO Scrollable Cursors

- Server Keyset
 - ▶ Scrollable, updateable cursor
 - ▶ Bookmark support
 - ▶ Multirow result set
 - ▶ Values concurrency for updates
 - ▶ Maps to CLI keyset cursor for DB2 (V7)
 - ▶ Maps to server side keyset cursor in V8
 - ▶ Maps to server side static, sensitive cursor for DB2 for OS/390 V7 with DB2 Connect V7.1 FP 2

ADO Issues

- There are differences between ADO expectation and server-specific functionality and data:
 - ▶ Updatable Cursors
 - ▶ Timestamp Data
- Reasons:
 - ▶ Definition of updatability
 - ▶ Expectation differences between ADO and DBMS

ADO Issues: Updateable Cursors

- Most common problem:
 - ▶ ADO Recordset object using client cursor cannot be updated
 - ▶ Method such as AddNew, Update or Delete fails for some Recordset
- Reason 1: Underlying SELECT statement refers to a view which contains a join
 - ▶ DB2 does not allow the Recordset to be updateable whereas other DBMS may allow it
 - ▶ This problem does not go away with server side cursors

ADO Issues: Updateable Cursors

- Reason 2: There are computed columns in the SELECT statement
 - ▶ ADO will generate an update statement with the computed columns in the where clause and fails
 - ▶ Workaround: Create a view and name the computed columns
 - ▶ This problem may go away with server side cursors
 - Depends on existence and select list of primary key

ADO Issues: Updateable Cursors

- Reason 3: ADO Client cursor library generates a delimited lower case table name when the correct table name is in upper case:
 - ▶ Usually error SQL204N (table not found) is returned
 - ▶ Code your table and user name in Upper case
 - ▶ This problem will go away with server side cursors

ADO Issues: Timestamp Columns

- Common problem:
 - ▶ Query/Update against table containing Timestamp columns fails
- Reasons:
 - ▶ DB2 Timestamp Columns contain 6 digits for milliseconds (SQL standard)
 - ▶ ODBC defines only 3 digits
 - ▶ If the same data is fetched and used in WHERE clause, no data will be found

ADO Issues: Timestamp Columns

- Solution:
 - ▶ Use CLI keyword PATCH2=24
 - CLI will map Timestamp column to CHAR datatype
 - ▶ This problem may go away for server side cursors
 - If DB2 driver generates the WHERE clause it will go away
 - Problem still exists for application generated WHERE clause

OLE DB Native Provider

- New with V7.1 FP 1
- Advantages
 - ▶ 10 - 20 % overall performance improvement (V7)
 - ▶ Improvement can be over 200 % in V8 compared to V7 with OLE DB - ODBC Bridge
 - ▶ Application benefit will depend on specific calls and database execution time
- Specify provider = IBMDADB2

OLE DB Native Provider

- Current Limitations
 - ▶ Must use ADO client side cursors for scrollable and updateable
 - ▶ Client side buffering and locking issues same as with the Microsoft OLE DB Bridge
 - Bridge maps to CLI keyset cursor
 - Both cursors use server forward only cursor and buffer data on client side

OLE DB Native Provider

- Current Limitations (continued)
 - ▶ MTS, COM+ support (V7 only)
 - ▶ LOB data types (V7 only)

OLE DB Native Provider

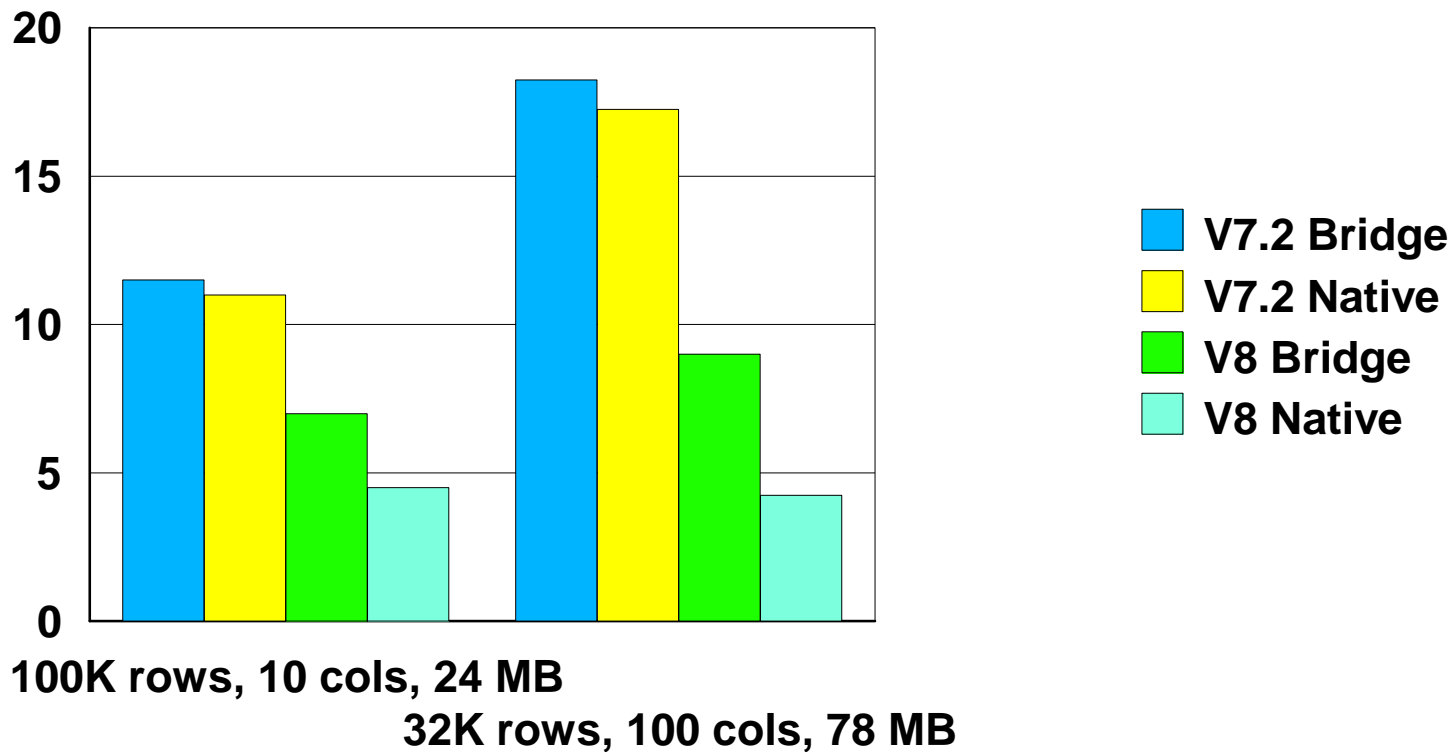
- New in V8
 - ▶ MTS, COM+ support
 - ▶ LOB data types
 - ▶ 64 bit native provider (including 64 bit ODBC driver)
 - ▶ Enumerator
 - ▶ Data Link Dialog
 - Direct specification of OLE DB data sources without ODBC
 - ▶ Integration within VS.NET server explorer

OLE DB Native Provider

- Looking forward
 - ▶ MTS, COM+ - full support for loosely coupled
 - ▶ Server side scrollable cursors
 - ▶ More integration within VS.NET

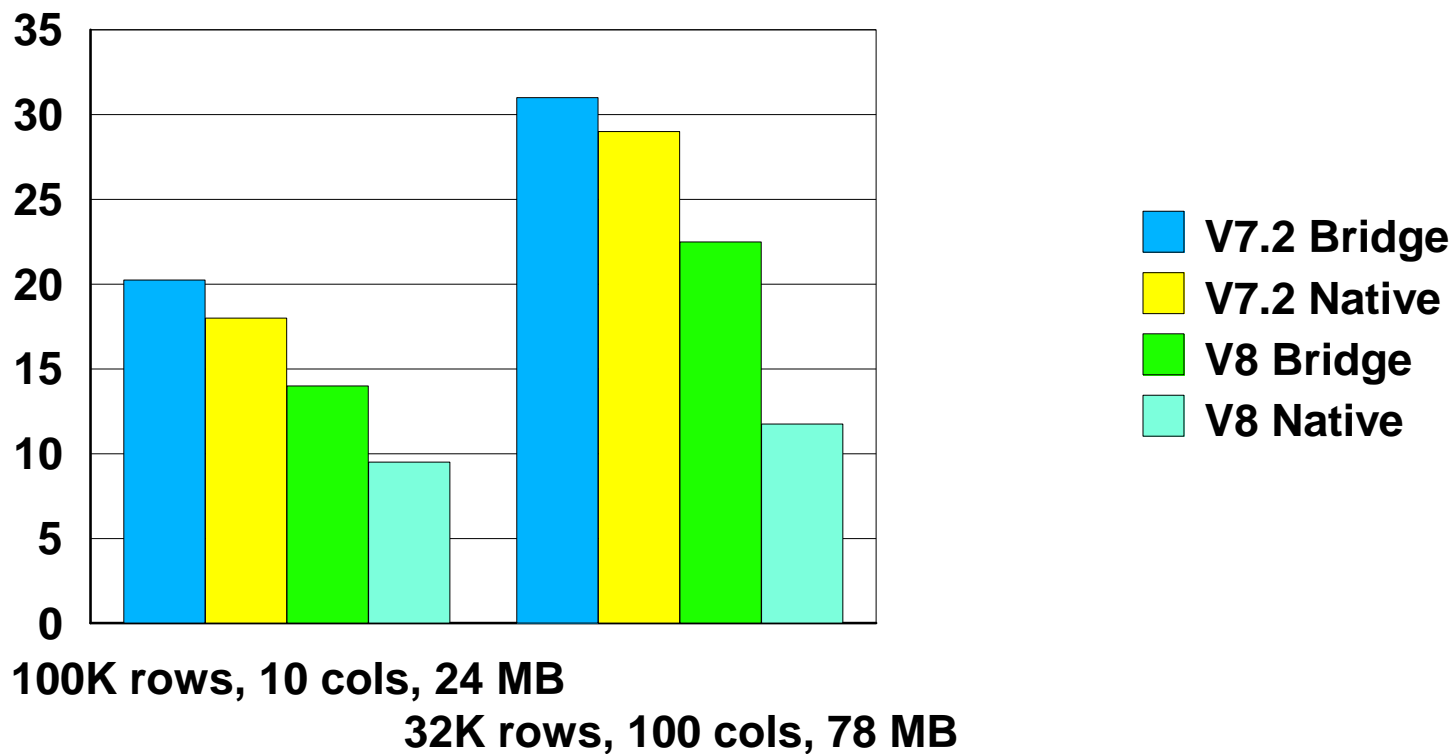
OLE DB Native Provider

V8 OLE DB Preliminary Performance DB2 UDB for Linux, UNIX and Windows Server



OLE DB Native Provider

V8 OLE DB Preliminary Performance DB2 UDB for OS/390 Server



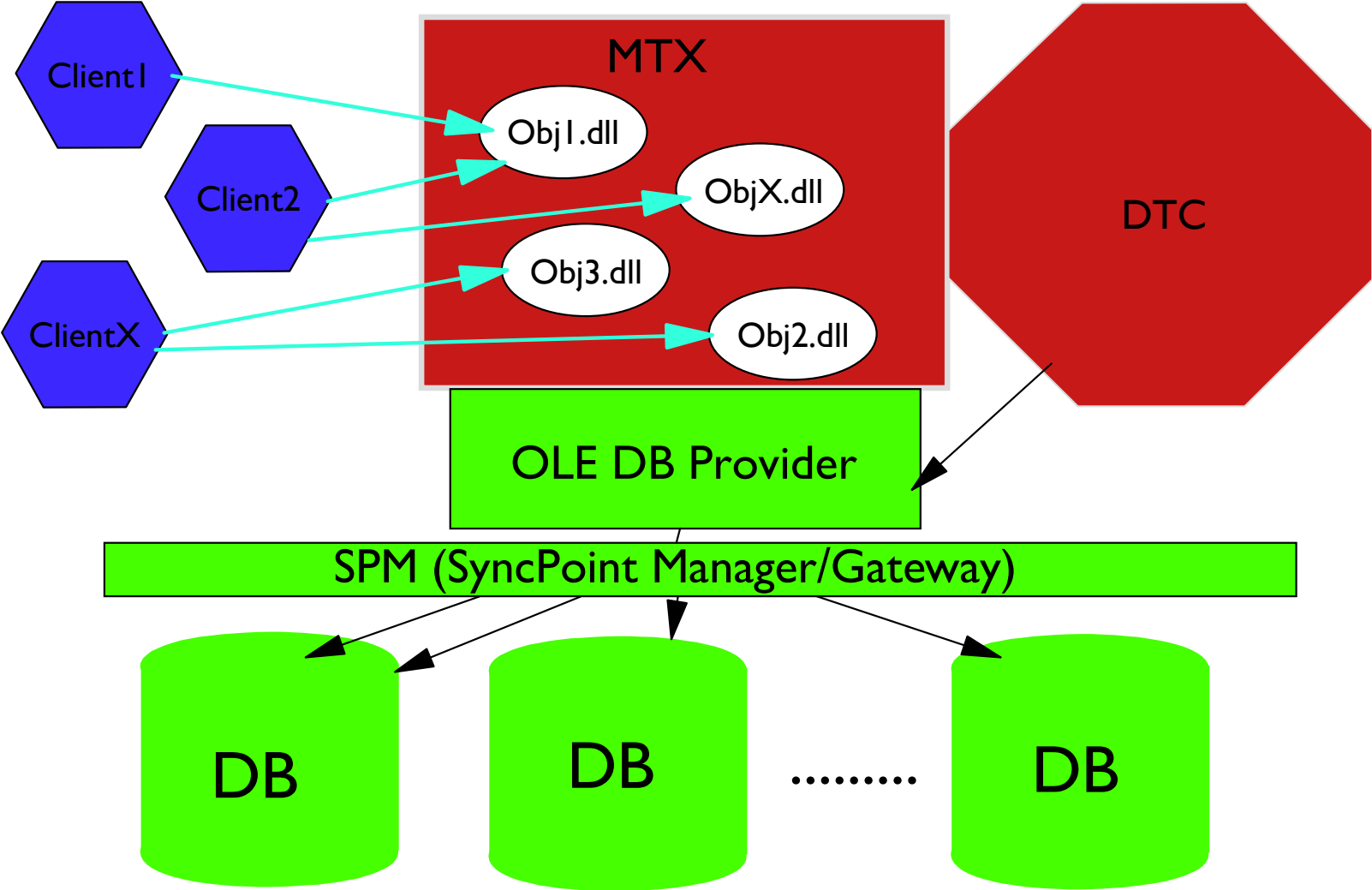
Microsoft Transaction Server (MTS)



MTS

- XA transaction coordinator
- For Windows 2000 and later, part of COM+ (no longer called MTS)
- Provides the ability for applications to update data in multiple databases with guaranteed integrity.
- Also span transactions across multiple connections.
- Used to manage/coordinate transactions.

MTS and DB2



MTS and DB2

- For control of multiple COM objects to DB2
 - ▶ Referred to as loosely coupled transaction support
- For DB2 Servers
 - ▶ Synchronize COM object database access
 - MTS will reuse the same DB2 connection for each COM object
- Using the OLE DB to ODBC Bridge
 - ▶ ODBC connection pooling enabled
 - ▶ ADO session pooling disabled

MTS and DB2

- Loosely coupled transactions - Native Provider
 - ▶ ADO session pooling enabled
 - ▶ Session pooling Holders set to 1
 - ▶ Session pooling may still use the incorrect connection under high load
- Looking forward
 - ▶ Full support for loosely coupled transactions to DB2 server
 - ▶ Will relax session pooling restrictions

MTS and DB2

- Loosely coupled transactions - DB2 for OS/390
 - ▶ DB2 Connect V7.1 FP1 and DB2 for OS/390 V6 with APAR fixes permit use of multiple COM objects to DB2 for OS/390 without the need for COM object synchronization
 - ▶ DB2 for OS/390 server performance implications
 - ▶ see V7.1 FP 1 readme for details

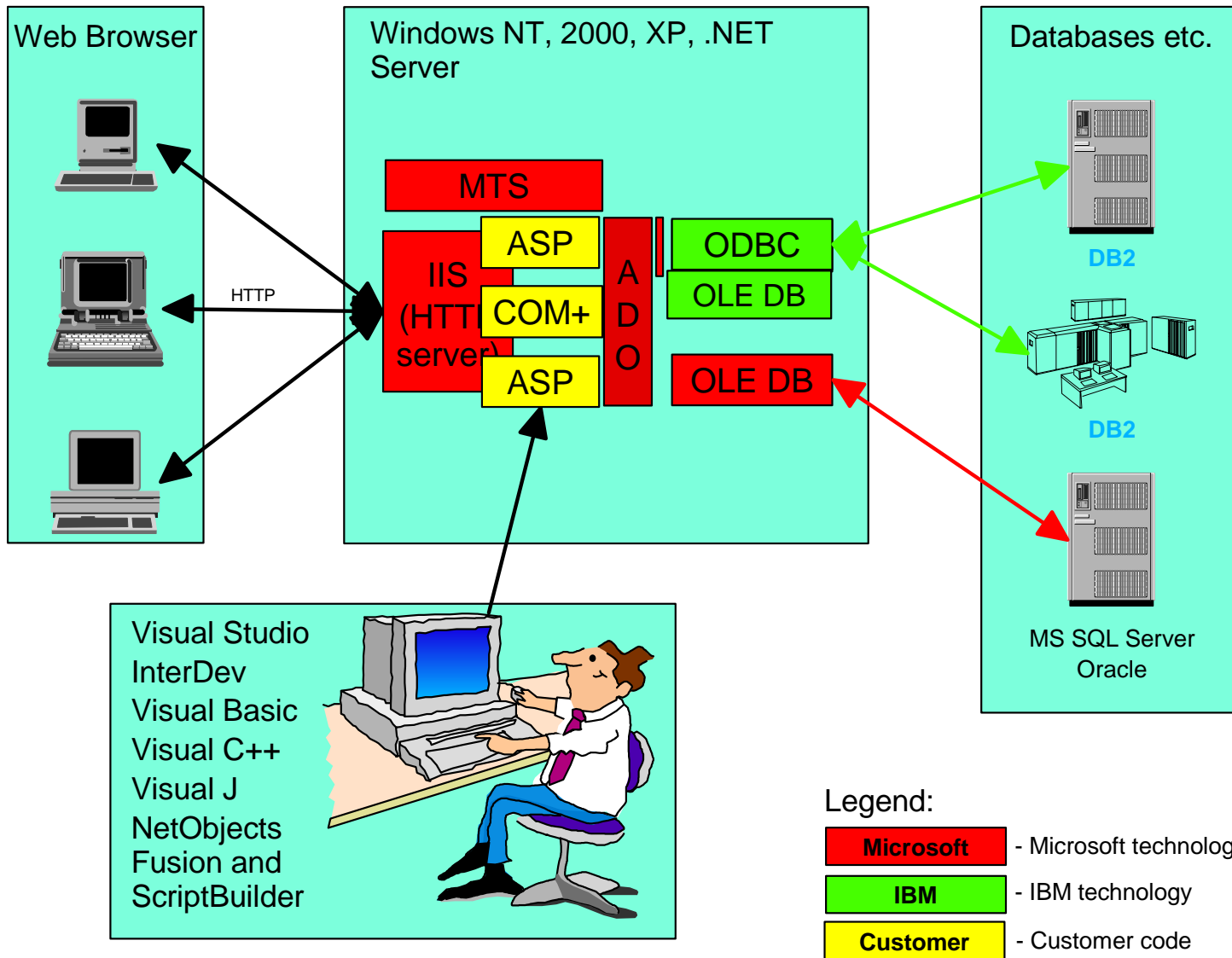
MTS Problem Determination

- Deadlocks - verify connection pooling is operational and application is handling database connections properly.
 - ▶ Connection pooling can be verified by Windows performance monitor or by comparing number of connects/disconnects in Microsoft ODBC trace vs. DB2 CLI trace
 - Applies to MTS and OLE DB to ODBC Bridge

Microsoft Active Server Pages

- Microsoft ASP pages are simply HTML pages with blocks of server-side script imbedded in them
- When a user loads an ASP page IIS server processes server-side script and sends HTML in the ASP page + new HTML created by the server-side script to the browser

ASP Solution Components



Microsoft Active Server Pages

- ADO is used for accessing DB2 and other data sources. ADO uses OLE DB - ODBC support i.e. ODBC data source has to be configured for each DB2 that will be accessed by the ASPs
- Can use native provider with V7.1 or later
- V8 allows direct specification of OEL DB data source without ODBC catalog entry

Microsoft Active Server Pages

- ASP pages can participate in distributed transactions coordinated by MTS. DB2 servers can participate in these transactions
- .NET is the next generation of this configuration

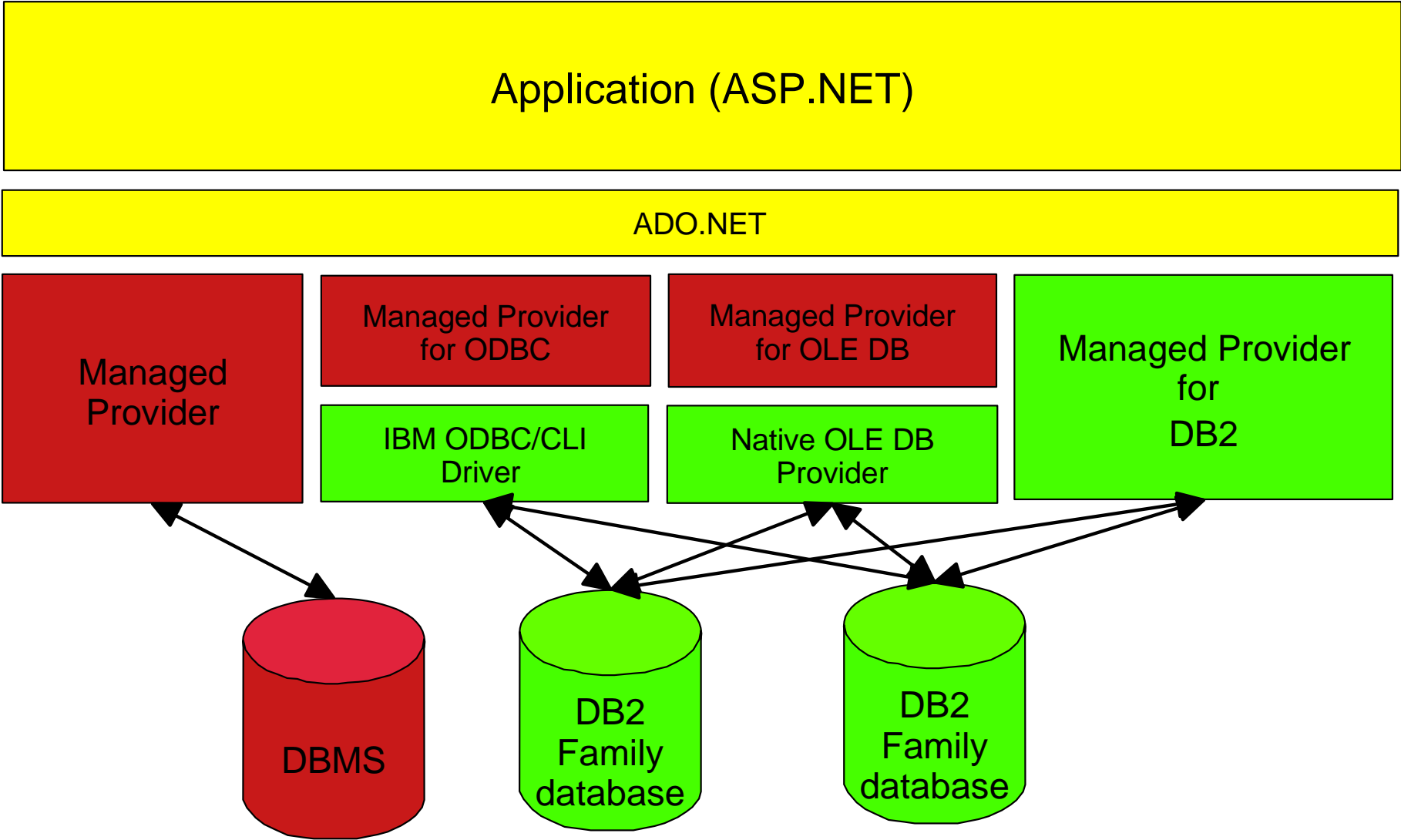
.NET



.NET

- .NET is really 3 parts:
 - ▶ .NET Server - operating system
 - ▶ ADO.NET for runtime database access
 - ▶ Visual Studio.NET for application building

ADO.NET



ADO.NET

- Managed Provider is the latest interface specification
 - ▶ Much simpler than OLE DB
 - OLE DB is interchange, not just ADO/ASP
 - ▶ Intent of function is better defined
 - ▶ Allows better internal optimization

ADO.NET

- Managed Provider provided by Microsoft to map to both OLE DB and ODBC interfaces
- Currently testing these against both our ODBC/CLI driver and OLE DB native provider
 - ▶ Have Microsoft test suite to accomplish this
 - ▶ Have demoed Microsoft IBuySpy sample to DB2
- Plan to have a native managed provider support in the future

Visual Studio.NET

- Development environment for .NET applications
- Managed provider for SQL Server and OLE DB fully integrated into VS.NET
 - ▶ GUI tool codegen will work with DB2 via OLE DB interface when native OLE DB provider certified with .NET
- DB2 add-ins being looked at for inclusion in future releases

Additional .NET

- Windows .NET Server
 - ▶ Windows XP Server
- Visual Studio .NET has a Common Language Runtime (CLR)
 - ▶ Single runtime supports all Visual Studio .NET source languages
 - ▶ Managed environment - similar to Java Virtual Machine
 - ▶ DB2 already supports OLE automation and Java stored procedures
 - ▶ Plan to support CLR procedures in the future

Tools Integration

Microsoft Development Tools Integration

- DB2 Stored Procedure Builder
- DB2 UDB Visual Studio 6.0 Tools Add-in
- DB2 UDB Visual Studio 6.0 Project Add-in
- Support stored procedures in any language that supports OLE automation e.g. VB

Visual Studio Tools Add-in

- Plugs into VC++ IDE
- Launches various DB2 Administrator tools (Control Center...)
- Provide DB2 Help and context sensitive SQL help
- Launches SQL Assistant for generating SQL statements
- Launches Stored Procedure Builder

Visual Studio Project Add-in

- Plugs into VC++ IDE
- Create, configure, compile embedded SQL modules
- Manage stored procedures: libraries, parameters, data types
- Generate C/C++ function wrapper
- Build and deploy C/C++ stored procedures

Visual Studio Add-ins

- Tools and Project Add-ins downloadable from:
 - ▶ www.ibm.com/software/data/db2/udb/ide
- Shipped as part of UDB V7.1 and later

Samples

- Duwamish Books Phase 1 (OLE DB)
- IBuySpy ASP.NET (ODBC)

Duwamish Books

- Phase 1 - MS Access as the database
- Necessary changes
 - ▶ On dsn connect string - specify the IBM provider ibmdadb2
 - default would be OLE DB - ODBC bridge
 - ▶ use ADO client cursor - adUseClient
 - ▶ No Boolean type
 - ▶ Identity column - need to Requery after insert to get updated value in record set
 - ▶ DISTINCT vs DISTINCTROW on SELECT

Duwamish Books

- Have detailed instructions on AD web page
 - ▶ www.ibm.com/software/data/db2/udb/ad
- Have a utility to get data out of Access, and a list of instructions to update the sample source
- No reason why this would not also work with DB2 for OS/390

IBuySpy ASP.NET

- IBuySpy ASP.NET example
 - ▶ Demonstrated at MS Tech Ed 2002
- Necessary changes:
 - ▶ Change from the SQL Server managed provider to ODBC .NET managed provider
 - ▶ The method for invoking stored procedures is different from SQL Server to ODBC (need CALL)
 - ▶ Map SQL Server types to ODBC types (eg. Money to a decimal)

Summary

- CLI vs ODBC
 - ▶ CLI is ODBC plus extra APIs
- OLE DB and ADO
 - ▶ Server side scrollable cursor exploitation
 - ▶ Native provider has better performance than Bridge
 - Functional limitations being addressed
 - ▶ Client Cursor update issues
- MTS, COM +
- .NET Server, ASP.NET, Visual Studio.NET
 - ▶ Testing underway with MS certification suite
- Integrated within Microsoft environment and development tools
- Work with Microsoft's own examples