



# Licensed Program Specifications

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## IBM® DATABASE 2™ Universal Database Server for OS/390™ and z/OS Version 7 Program Number 5675-DB2

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IBM DATABASE 2 Universal Database for OS/390 and z/OS is a relational database management system licensed program for the OS/390® environment.

In this document, IBM DATABASE 2 Universal Database for OS/390 and z/OS is referred to as "DB2® for OS/390 and z/OS." In cases where the context makes the meaning clear, DB2 for OS/390 and z/OS is referred to as "DB2."

### Highlights

DB2 is a licensed program that supports the relational data model with a high-level language to access DB2 data. DB2 offers many functions in support of traditional database application areas, e-business, and business intelligence. Specific highlights include:

*Relational data model:* DB2 provides a basic tabular data structure. Users view data as a series of rows and columns.

*Object-relational extenders:* DB2 enables you to store large multimedia objects in DB2 tables and use new and modified DB2 statements and functions to define and manipulate these large string values. DB2 includes support for the following object extensions:

- Large objects
- User-defined functions, called *distinct types*
- Built-in functions
- User-defined data types
- Triggers

*Structured query language (SQL):* SQL is a high-level language used for data manipulation, data definition, and control. It does not depend on data paths, placement, or order when accessing the relational databases.

*Continuous operations:* Data definitions can be dynamically changed without stopping DB2. You

can also run DB2 database utilities without stopping DB2.

*Concurrent access to data:* DB2 can be accessed concurrently by:

- The Information Management System/Enterprise Systems Architecture (IMS/ESA®) Transaction Manager
- Customer Information Control System/Enterprise Systems Architecture (CICS/ESA®) or CICS® Transaction Server
- Time Sharing Option (TSO) users
- e-business and distributed users
- WebSphere®
- Java™ applications
- Batch jobs

Additionally, application programs running under control of the IMS™ Transaction Manager or CICS can access DB2 data, IMS data, or both. The data sharing function makes it possible for a group of DB2 subsystems to have concurrent access to the same data without replication.

*Access to distributed data:* DB2 can access, or be accessed by, different instances of DB2, or by other database management systems that support the Distributed Relational Database Architecture™ (DRDA®) and that are connected to the local DB2 by TCP/IP or Advanced Communication Facility/Virtual Telecommunications Access Method (ACF/VTAM®). There can be up to 150,000 concurrent connections per data sharing member, 2000 of which can be active at one time. Data can be changed, as well as read, at more than one system in a single unit of work, with a coordinated commit of all data. Other programs can access the data at the same time.

*Application programming:* Users can access and manipulate DB2 data using SQL through application programs that are written in Java for OS/390, REXX, C, C++, COBOL, FORTRAN, PL/I, assembler language, IBM BASIC, ADA, Prolog, or APL2®.

Several possible ways to develop or run applications include:

- Run workloads in the UNIX®, Windows®, or Linux environments using DB2 Connect to interact with DB2 for OS/390 and z/OS
- Use Query Management Facility (QMF™), QMF High Performance Option, and QMF for Windows to develop applications
- Use VisualAge®, VisualGen®, and Data Interpretation System Host Client Services to develop applications.

*Support for Java:* Users can write applications in the Java Programming language that access DB2 for OS/390 and z/OS data or data on any DRDA server, either dynamically through JDBC or through static embedded SQL by using SQLJ.

*DB2 Interactive (DB2I):* DB2I is an interactive service within DB2 that allows users to take advantage of the capabilities of Interactive System Productivity Facility (ISPF). Users can access and manipulate DB2 data interactively through DB2I. Users can invoke other operations, such as DB2 database utilities, through DB2I.

*Standards compliance:* DB2 for OS/390 and z/OS is developed at a laboratory where the quality management system is certified under ISO 9001.

Version 7 of DB2 for OS/390 and z/OS conforms to the following national and international SQL standards:

- Federal Information Processing Standards (FIPS) publication 127-2, Database Language SQL. FIPS publication 127-2 announces ANSI (American National Standards Institute) X3.135-1992 as the standard for SQL, so conformance to FIPS publication 127-2 also means conformance to:
  - ANSI X3.135-1992, Database Language SQL
  - ISO 9075-1992, Database Language SQL

The preceding standards are referred to collectively as the SQL92 standard. DB2 for OS/390 and z/OS conforms to SQL92 Entry Level.

*Server solution:* The following features work directly with DB2 for OS/390 and z/OS:

- *Management Clients Package* provides help for installing and managing DB2.
  - *DB2 Universal Database™ Version 7 Control Center* is a Java-based tool. The Control Center allows you to manage DB2 Universal Databases on OS/390, Windows, UNIX, and OS/2 servers, by using a graphical user interface.
  - *DB2 Stored Procedures Builder* provides a single development environment for creating, installing, and testing stored procedures. DB2 Stored Procedures Builder supports AIX, Windows, OS/2, OS/400, OS/390, z/OS, and Sun Solaris environments.
  - *DB2 Installer* offers the option to install DB2 for OS/390 and z/OS, DB2 Performance Monitor, and DB2 DataPropagator™ from a Windows 2000®, Windows NT®, or an OS/2® environment by using a graphical interface.
  - *DB2 Visual Explain* lets users tune DB2 SQL statements and browse DB2 subsystem parameters from a Windows NT or an OS/2 environment.
  - *DB2 Estimator* enables users to estimate the performance of applications from a Windows or an OS/2 environment.

Because the Control Center requires DB2 Connect™, the Management Clients Package provides a restricted-use copy of DB2 Connect Version 7 to satisfy this functional dependency.

- *Net.Data® for OS/390* can access business data, including DB2 data, for the World Wide Web.
- *SQL Support for REXX* lets users issue SQL statements from within REXX programs.

The following priced optional features work directly with DB2 for OS/390 and z/OS.

- *Net Search Extender* delivers text search capability for text-intensive Web sites.

- The QMF family has several elements:
  - *QMF* lets users query and report data from DB2 databases.
  - *QMF High Performance Option* enables users to govern and manage DB2 objects.
  - *QMF for Windows* provides a Windows-based, point-and-click query tool.

**Compatibility:** Users can migrate to DB2 Version 7 from Version 5 or Version 6. The ability to fall back to Version 5 and Version 6 is provided. The installation, migration, and fallback between Version 7 and either Version 5 or Version 6 does not require movement of user or catalog data.

## Specified operating environment

DB2 for OS/390 and z/OS has the following requirements for the operating environment.

### Year 2000 readiness

This IBM Program, when used in accordance with its associated documentation, is capable of correctly processing, providing and/or receiving date data within and between the twentieth and twenty-first centuries, provided that all products (for example, hardware, software, and firmware) used with this IBM Program properly exchange accurate date data with it.

### Machine requirements

DB2 for OS/390 and z/OS Version 7 operates on any processor that OS/390 Version 2 Release 7 supports and that supports the architectural level set. In this version, DB2 for OS/390 and z/OS uses ESA/390 architectural enhancements that are implemented on selected IBM S/390® servers.

DB2 for OS/390 and z/OS Version 7 can run only on servers that implement the architectural enhancements and cannot run on any servers that have not implemented them.

DB2 for OS/390 and z/OS runs on the hardware listed below:

- zSeries 900
- Models of the S/390 Parallel Enterprise Servers™, except for Release 1 models
- All models of the S/390 Multiprise® and the S/390 Multiprise 3000
- All models of the S/390 Application StarterPak Type 3000
- All PC Server System/390 servers and RS/6000® with System/390 Server-on-Board models
- All S/390 Integrated Servers

DB2 for OS/390 and z/OS Version 7 cannot run on the following IBM servers because they do not implement the architectural enhancements:

- ES/9000® Processor Unit 9021, 9121, or 9221
- ES/3090™ models
- ES/4381 models
- S/390 Parallel Transaction Server 9672 E or P models
- S/390 Parallel Enterprise Server 9672 Release 1 models

The processor must have enough real storage to satisfy the combined requirements of DB2, OS/390 or z/OS, the appropriate Data Facility Product, appropriate access methods, telecommunications, batch requirements, and other specific user-required applications.

The configuration must include sufficient I/O devices to support the requirements for system output, system residence, and system data sets. Sufficient disk space must be available to satisfy the user's information storage requirements. Disk storage can consist of any direct-access facility that is supported by the system configuration and the programming system.

**Auxiliary storage:** DB2 is independent of both tape device type and disk storage facilities. You can use any magnetic or tape device that is supported by the data facilities component of DFSMS/MVS® for the DB2 data sets. See Table 1 for a list of device types that are supported for DB2 data sets.

Table 1. Auxiliary storage

Data set type	Device type
Active recovery log data sets	Disk
Archive recovery log data sets	Disk, tape
Image copy data sets	Disk, tape
Bootstrap data set	Disk
User data sets	Disk
DB2 catalog data sets	Disk
Work data sets (for utilities)	Disk, tape

If these data sets are on a disk that is shared with other OS/390 systems, you should use global resource serialization to prevent concurrent access by more than one OS/390 or z/OS system.

The minimum disk space requirement (based on installing DB2 using the panel default values) is approximately 600 MB. Users need additional disk space for their data. For information on estimating the disk storage that DB2 needs, see *DB2 UDB for OS/390 and z/OS Version 7 Installation Guide*.

If you use dual logging and you use tape for the log archiving device, you need at least two tape drives.

**Data communications devices:** You can control DB2 for OS/390 and z/OS operations from:

- The system console
- Authorized IMS/ESA Transaction Manager terminals
- Authorized CICS terminals
- TSO terminals by authorized users

For information about the data communication devices that are supported by IMS/ESA Transaction Manager, CICS, and TSO, see the documentation for these products.

### Function-dependent hardware requirements

DB2 has the following function-dependent program requirements.

**Group buffer pool duplexing:** Group buffer pool duplexing requires a minimum coupling facility architectural level of CFLEVEL=5.

### FLOAT IEEE option of the UNLOAD utility:

Use of the FLOAT IEEE option of the UNLOAD utility requires the basic floating-point extensions facility. The facility is available on the following servers: zSeries 900, S/390 Parallel Enterprise Servers, Multiprise® 3000 Enterprise Server, G5, or G6 processor or above.

### Programming requirements

This section lists licensed programs that are required in the DB2 for OS/390 and z/OS environment. You can use subsequent versions or releases of these programs, unless the description for a given program states otherwise. Check the RETAIN® Preventative Service Planning (PSP) Facility for the most current information about APARs you must install to run DB2 for OS/390 and z/OS and its optional features.

This section also identifies the requirements associated with specific DB2 capabilities, as well as optional programs that you can use with DB2 for OS/390 and z/OS Version 7.

**Code:** The language for the few modules that are distributed as source code is assembler. Sample programs are provided in C, COBOL, FORTRAN, PL/I, or assembler. Some functions are provided by TSO CLISTs and Interactive System Productivity Facility (ISPF) panels.

**Operating system and support programs:** For an OS/390 or z/OS environments, DB2 requires the function that is provided by the following licensed programs or their equivalent; subsequent versions or releases of any product are acceptable.

- One of the following:
  - Z/OS Release 1 (5694-A01)
  - OS/390 Version 2 Release 7 System Services (5647-A01), with service applied
- DFSORT™, part of the Application Enablement Services optional feature of z/OS and OS/390

### Virtual storage requirements

The amount of space needed for the common service area (CSA) below the 16 MB line is less than 40 KB for each DB2 subsystem and 24 KB for each IRLM. High concurrent activity, parallelism, or high contention can require more CSA.

Most of the DB2 common data resides in the extended common service area (ECSA). Most modules, control blocks, and buffers reside in the extended private area. A DB2 subsystem with 200 concurrent users and 2000 open data sets should need less than 2 MB of virtual storage below the 16 MB line, but needs may vary. For information on estimating the virtual storage that DB2 needs, see *DB2 UDB for OS/390 and z/OS Version 7 Installation Guide*.

### Function-dependent program requirements

DB2 for OS/390 and z/OS has the following function-specific program requirements. For specific software requirements for the required products, refer to the respective product announcements.

**User-defined functions:** User-defined functions require that you include Language Environment® mapping macros and macros that generate a Language Environment-conforming prolog and epilog. User-defined functions that are written in Assembler require the Application Enablement Services element of OS/390 and z/OS to meet this requirement. User-defined functions that are written in COBOL, C, or C++ require that you use a compiler that is compliant with Language Environment.

**Language Environment character conversion:** Use of Language Environment character conversions requires OS/390 Version 2 Release 9.

**Application execution:** Applications written for open database connectivity have special requirements:

- Applications written in high-level programming languages, such as applications or stored procedures written in the C language and using the Open Database Connectivity (ODBC) or CLI interfaces to DB2, require the Application Enablement Services element of OS/390 and z/OS at run time.
- Applications or stored procedures written in Java, such as those using the JDBC or SQLJ interfaces to DB2, Java for OS/390 (5655-A46) at run time. Applications written in Java are supported on OS/390 Version 2 Release 8 or later.

**Migration, fallback, and coexistence:** Before migrating from DB2 for OS/390 Version 5 or Version 6, APAR PQ34467 must be installed to enable support for fallback or coexistence with Version 7.

**Java Database Connectivity:** Java Database Connectivity (JDBC) requires Java for OS/390 (5655-A46).

**DB2 Extenders™:** DB2 Extenders have special requirements.

**Audio, Image, Video, and Net Search Extenders:** Use of these extenders requires Language Environment, which is part of the Application Enablement Services element of OS/390 and z/OS.

**Text Extender:** Use of the Text Extender requires the following:

- The IBM Text Search Engine which is part of the e-business Services element of OS/390 Version 2 Release 7 or later
- Language Environment, which is part of the Application Enablement Server element of OS/390 and z/OS

Specifically, the following functions require OS/390 Version 2 Release 9 or higher and the associated Text Search Engine:

- XML support
- The ability to specify multiple document model files for structured documents
- Support for CCSIDs 13488 (Unicode UCS2), and 1208 (Unicode UTF8), except for NGRAM indexes

DB2 Connect provides the Text Extender client, which optionally can be used with the DB2 for OS/390 Text Extender for administrative tasks. Use of DB2 Connect requires a license for one of the following products:

- IBM DB2 Connect Personal Edition, Version 7.1 (11K7622)
- IBM DB2 Connect Enterprise Edition, Version 7.1 (41L2987)

**XML Extender:** Use of the XML Extender requires:

- Language Environment, which is part of the Application Enablement Services element of OS/390 and z/OS

- The IBM XML Parser for OS/390, C++ Edition to be available at run time

Release 2 of the IBM XML Toolkit for OS/390 (5655-D44) provides the parser. Use of either the XMLFile type or the *Getting Started* material requires the UNIX System Services element of OS/390 and z/OS.

**Support for Unicode:** Use of Unicode data storage and manipulation capabilities requires OS/390 Version 2 Release 8, or later releases. OS/390 Version 2 Release 9 or later complements this capability with the Language Environment support in the Application Enablement Services element of OS/390 and z/OS.

**Support for DB2 Precompiler Services:** Use of the DB2 Precompiler Services requires the DB2 coprocessor that is provided with IBM COBOL for OS/390 & VM (5648-A25) Version 2 Release 2.

**Windows Kerberos security:** Version 7 supports authentication using Kerberos in conjunction with the following required software:

- Server support: DB2 requires the SecureWay Security Server®, an optional feature of OS/390 Version 2 Release 10, which includes the Network Authentication and Privacy Service based on MIT Kerberos Version 5, and RACF® Program Control enhancements
- Client support: Version 7 requires a client able to perform Kerberos authentication over DRDA, such as DB2 Connect Version 7 for Windows. The client must provide support for single sign-on using Kerberos security in Windows 2000.

**RACF access control:** Using RACF for access control requires the optional security server available with OS/390 and z/OS.

**Stored procedures and user-defined functions:** RACF® environments for selected stored procedures require the OS/390 or z/OS optional feature, security server, or RACF Version 2 Release 2 with APAR OW15720.

Protection for Workload Manager environments for stored procedures and user-defined functions require security server, an optional feature of OS/390 and z/OS.

## Specified operating environment of elements of DB2 for OS/390 and z/OS

DB2 for OS/390 and z/OS Version 7 includes many elements some of which have requirements, above and beyond what DB2 for OS/390 and z/OS Version 7 requires. This section identifies the requirements for using these elements with DB2 for OS/390 and z/OS Version 7, but it does not repeat those DB2 for OS/390 and z/OS requirements that apply to the elements.

You can use subsequent versions or releases of the products mentioned in this section, unless otherwise noted.

For specific software requirements for the required products, refer to the respective product announcements.

**DB2 Installer requirements:** DB2 Installer has hardware and program requirements.

**Hardware requirements:** DB2 Installer requires:

- A workstation that is capable of running Windows or OS/2
- A monitor that is capable of displaying 1024-by-768 resolution
- 24 MB disk memory on the target drive and 2 MB of disk space for each subsystem that is defined

**Program requirements:** DB2 Installer can run in either of the following environments, each of which has its own requirements:

- Microsoft® Windows 2000, Windows NT Version 4.0, or Windows 95
- OS/2 Warp 4, optionally with either TCP/IP for OS/2 Version 3.0, or OS/2 Warp Connect

Both environments require TCP/IP in any of the following circumstances:

- To run jobs from the workstation
- To use the copy-jobs-to-host function from the workstation
- To use all the functions of DB2 Installer

If you do not have TCP/IP, you can use DB2 Installer to customize your installation jobs, but you need to use a method outside of DB2 Installer to move jobs from the workstation to OS/390 for execution.

**Visual Explain requirements:** Visual Explain has hardware and program requirements.

**Hardware requirements:** Visual Explain requires:

- A workstation that is capable of running Windows or OS/2
- A monitor that is capable of displaying 1024-by-768 resolution
- Approximately 12 MB of hard disk space

**Program requirements:** Visual Explain can run in either of the following environments:

- Microsoft Windows 2000, Windows NT Version 4.0, or Windows 95
- OS/2 Warp 4

DB2 Connect Personal Edition Version 6, or later, must be installed on the DB2 for OS/390 Visual Explain workstation. In addition, DB2 for OS/390 Visual Explain requires one of the following communication protocols:

- TCP/IP, part of the Communications Server element of OS/390 and z/OS
- SNA communications using a product such as Communication Server 5.0, Server Version 4.0, or the integrated SNA support in DB2 Connect Personal Edition

Visual Explain includes a browser that lets users view current values of subsystem parameters. To use this browser, your DB2 subsystem must have the DSNWZP stored procedure enabled.

**DB2 Estimator requirements:** DB2 Estimator has hardware and program requirements.

**Hardware requirements:** DB2 Estimator requires:

- A workstation that is capable of running Windows
- A monitor capable of displaying 800-by-600 resolution
- Approximately 27 MB of hard disk space

**Program requirements:** The DB2 Estimator operates in the following environments:

- Microsoft Windows 2000
- Microsoft Windows NT Version 4.0
- Microsoft Windows 98
- Microsoft Windows 95

**Net.Data requirements:** Net.Data for OS/390 and z/OS requires an HTTP Web server that is installed on the same server as Net.Data and DB2 for OS/390 and z/OS. Net.Data requires the following additional products to run a Servlet:

- IBM WebSphere Application Server for OS/390 Version 3 Release 2 (5655-A98) or later releases
- Java Development Kit (JDK) for OS/390 Version 1.1.8 or later release

**QMF requirements:** QMF, QMF High Performance Option (HPO) and QMF for Windows are elements of the QMF family. These elements have hardware and program requirements.

**Hardware requirements:** The following QMF functions have hardware dependencies:

- QMF for OS/390 requires a display station that is supported by GDDM
- QMF High Performance Option (HPO) requires a display station that is supported by ISPF
- QMF for Windows requires a workstation that supports:
  - A workstation that is capable of running Windows
  - Network connectivity
  - Approximately 10 MB of disk space

**Program requirements:** The following QMF features have software program requirements:

- Use of QMF forms calculations requires a Windows 32-bit operating system and IBM Object REXX Interpreter Edition (5639-B73)
- QMF for Windows and the QMF for Windows Administrator module require a 32-bit Windows operating system. QMF for Windows requires network communication software on each user machine, plus one or both of the following programs:
  - An SNA product that provides a CPI-C interface
  - A TCP/IP product that provides a WinSock Version 1.1 interface

Use of QMF for Windows with English Wizard natural language query requires English Wizard Release 3.1, from Linguistic Technologies.

## Licensed program materials availability

Other than noted in this document, this licensed program is available without source licensed program materials. It is available in object code.

Some assembler language macros, designed for system tailoring and record mapping, are available with source licensed materials. In addition, sample programs written in C, COBOL, FORTRAN, PL/I, Java, and assembler language are available with source licensed materials. DB2 diagnosis information is in a licensed document that contains Restricted Materials of IBM.

## Supplemental terms

DB for OS/390 and z/OS has supplemental terms.

### Designated machine identification

- Designated Machine Identification Required

### Testing period

- Basic License: 2 months.
- DSLO License: Not applicable.

### Limited-use license for DB2 Connect

Because the Control Center requires DB2 Connect, the Management Clients Package provides a restricted-use copy of DB2 Connect Version 7 to satisfy this functional dependency. You are authorized to use this copy of DB2 Connect to enable access to DB2 for OS/390 and z/OS data by the following workstation tools only:

- DB2 UDB Control Center
- Visual Explain
- Stored Procedure Builder

For all other remote connections to DB2 for OS/390 and z/OS that are provided through DB2 Connect, you must obtain a separate license for DB2 Connect from IBM.

## Installation/location license

- Not applicable. A separate license is required for each machine on which the licensed program will be used.

## Usage restriction

- Not applicable.

## Type/duration of program services

- Central Service will be provided until discontinued by IBM with a minimum of six months written notice.

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CICS/ESA	Parallel Enterprise Server
DATABASE 2	OS/2
DataPropagator	OS/390
DB2	QMF
DB2 Connect	RACF
DB2 Universal Database	RETAIN
DFSMS/MVS	RS/6000
DFSORT	S/390
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ES/3090	VisualGen
ES/9000	WebSphere
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