

# Introduction to DB2 UDB

**D**ATABASE 2 (DB2) Universal Database (UDB) for Linux, UNIX, and Windows is a relational database management system (RDBMS) developed by IBM. Version 8.2, available since September 2004, is the most current version of the product, and the one discussed in this book.

In this chapter you will learn about:

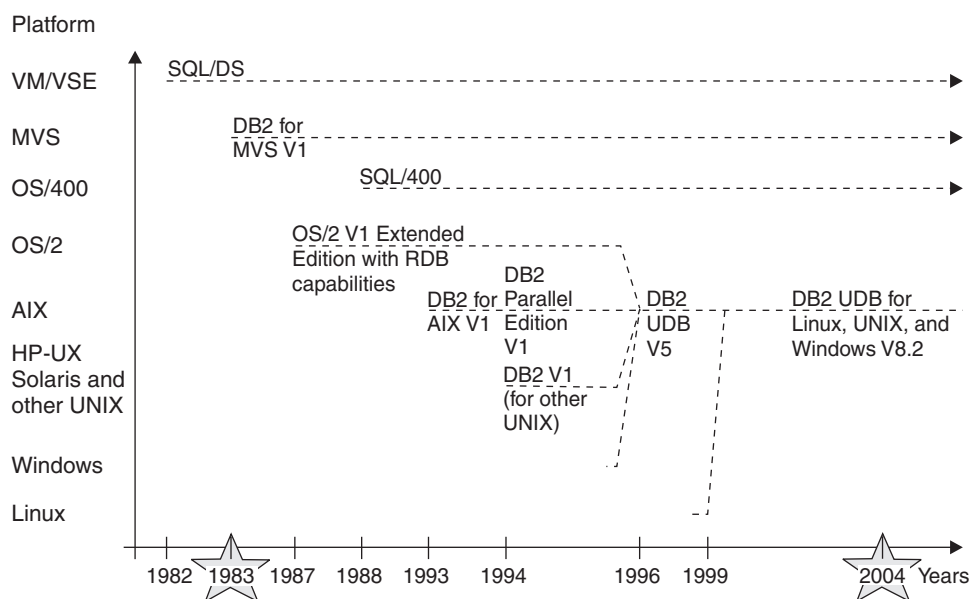
- The history of DB2
- The DB2 portfolio of information management products
- How DB2 is developed
- DB2 server editions and clients
- How DB2 is packaged for developers
- Syntax diagram conventions

## 1.1 A BRIEF HISTORY OF DB2

Since the 1970s, when IBM Research invented the Relational Model and the Structured Query Language (SQL), IBM has developed a complete family of RDBMS software. Development started on mainframe platforms such as Virtual Machine (VM), Virtual Storage Extended (VSE), and Multiple Virtual Storage (MVS). In 1983, DB2 for MVS Version 1 was born. “DB2” was used to indicate a shift from *hierarchical* databases—like the Information Management System (IMS) popular at the time—to the new *relational* databases. DB2 development continued on mainframe platforms as well as on distributed platforms.<sup>1</sup> Figure 1.1 shows some of the highlights of DB2 history.

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1. Distributed platforms, also referred to as **open system platforms**, include all platforms other than mainframe or midrange operating systems. Some examples are Linux, UNIX, and Windows.



**Figure 1.1** DB2 timeline

In 1996, IBM announced DB2 UDB Version 5 for distributed platforms. With this version, DB2 was able to store all kinds of electronic data, including traditional relational data, as well as audio, video, and text documents. It was the first version optimized for the Web, and it supported a range of distributed platforms—for example, OS/2, Windows, AIX, HP-UX, and Solaris—from multiple vendors. Moreover, this universal database was able to run on a variety of hardware, from uniprocessor systems and symmetric multiprocessor (SMP) systems to massively parallel processing (MPP) systems and clusters of SMP systems. IBM included the term “Universal” in the name to represent the new capabilities of this version. All versions of DB2 on distributed platforms and on MVS, AS/400, VM, and VSE have adopted the name DB2 UDB.

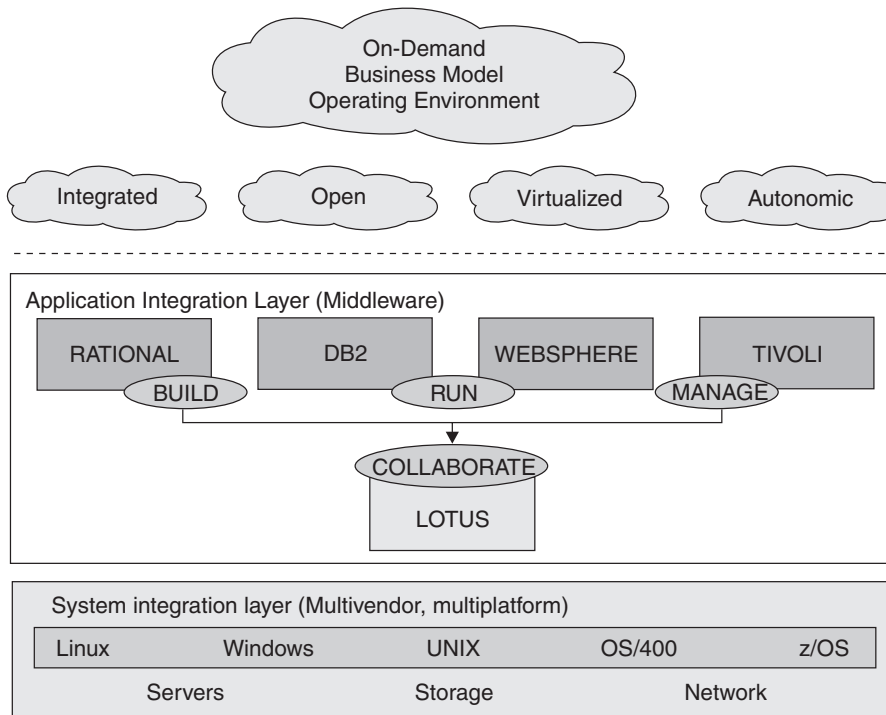
Today, DB2 represents a portfolio of information management products. Table 1.1 shows the DB2 Information Management portfolio and the product offerings under each classification. To specifically refer to database servers, “UDB” needs to be added to the name, as in **DB2 UDB**. In most books and documents, including this one, the terms “DB2” and “DB2 UDB” are used interchangeably. Unless otherwise noted, when we use any one of these terms in this book, we are referring to DB2 running on Linux, UNIX, or Windows.

**Table 1.1** DB2 Information Management Products

<b>Information Management Products</b>	<b>Description</b>	<b>Product Offerings</b>
<b>Database Servers</b>	Store electronic data and enable the sharing of information across multiple platforms.	IBM DB2 UDB IBM Informix IBM IMS IBM Red Brick Warehouse IBM U2 IBM Cloudscape
<b>DB2 Business Intelligence</b>	Help customers collect, prepare, manage, analyze, and extract valuable information from all data types to help them make more insightful business decisions faster.	DB2 Warehouse Manager IBM DB2 Information Integrator DB2 OLAP Server DB2 Intelligent Miner DB2 Text Miner DB2 Search Extender DB2 UDB Data Warehouse Edition DB2 Cube Views Query Patroller
<b>DB2 Content Management</b>	Manage content (unstructured data) such as images, digital media, word processing documents, and Web content.	IBM DB2 Content Manager IBM DB2 CommonStore IBM DB2 CM OnDemand IBM DB2 Document Manager IBM DB2 Records Manager
<b>DB2 Information Integration</b>	Bring together distributed information from heterogeneous environments. Companies view their information as if it was all residing in one place.	IBM DB2 Information Integrator IBM DiscoveryLink for Life Sciences
<b>DB2 and IMS Tools</b>	Automate functions to help companies reduce administrative costs.	IMS & DB2 Tools & Utilities DB2 Multiplatform Tools

## 1.2 DB2 SOFTWARE AND THE IBM E-BUSINESS ON-DEMAND MODEL

IBM's on-demand business model is based on the definition of an on-demand business. An **on-demand business**, as indicated on the IBM on-demand Web site, is “an enterprise whose business processes—integrated end to-end across the company and with key partners, suppliers and customers—can respond with speed to any customer demand, market opportunity, or external threat.” To support the on-demand model, IBM uses the e-business framework shown in Figure 1.2.



**Figure 1.2** The IBM e-business framework

In Figure 1.2 the dotted line divides the logical concepts at the top with the physical implementation at the bottom. Conceptually, the IBM e-business framework is based on the on-demand business model operating environment, which has four essential characteristics: it is integrated, open, virtualized, and autonomic. These characteristics are explained later in this section.

Below the dotted line shows how this environment is implemented by the suite of IBM software products.

- Rational is the “build” brand; it is used to develop software.
- DB2 and WebSphere are the “run” brands; they store and manipulate your data and manage your applications.

- Tivoli is the “manage” brand; it integrates, provides security, and manages your overall systems.
- Lotus is the “collaborate” brand used for integration, messaging, and collaboration across all the other brands.

The IBM DB2 software brand plays a critical role in the on-demand operating environment. All elements of the DB2 portfolio are developed with the four essential characteristics of the on-demand business model in mind.

- **Integrated:** DB2 software has built-in support for both Microsoft and Java development environments. It is also integrated into WebSphere, Tivoli, Lotus, and Rational products. In addition, the DB2 family has cross-platform capabilities and can be integrated natively with Web services and message-queuing technologies. It also provides support for heterogeneous data sources for both structured and unstructured information.
- **Open:** DB2 software allows for different technologies to connect and integrate by following standards. Thus, it provides strong support for the Linux operating system and for Java, XML, Web services, grid computing, and other major industry applications.
- **Virtualized:** Grid computing technology, a type of distributed computing, collects and shares resources in a large network to simulate one large, virtual computer. DB2 software products support grid computing technology through federation and integration technologies. Both of these are discussed in more detail later in this chapter.
- **Autonomic:** An autonomic computing system manages, repairs, and protects itself. As systems become more complex, autonomic computing systems will likely become essential. DB2 software provides self-tuning capabilities, dynamic adjustment and tuning, simple and silent installation processes, and integration with Tivoli for system security and management.

The bottom of Figure 1.2 shows the operating systems in which the IBM software suite can operate: Linux, UNIX, Windows, OS/400<sup>2</sup>, and z/OS; and below that, the servers, storage, and network represent the actual hardware used to support the framework.

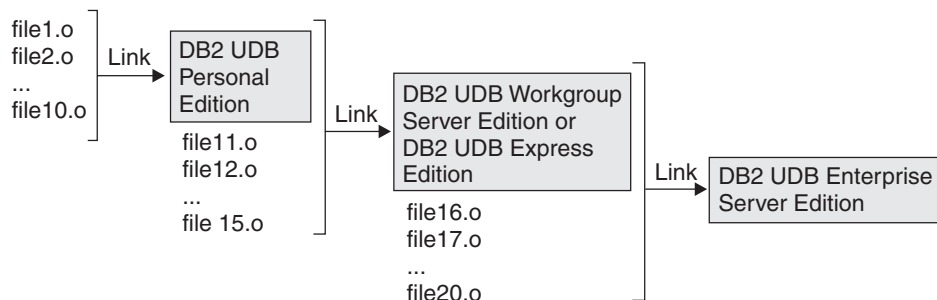
### 1.3 DB2 UDB EDITIONS

DB2 UDB for Linux, UNIX, and Windows (sometimes referred to as **LUW**) is developed using the C/C++ language; more than ninety percent of the code is common among these platforms. The remaining code is unique to take full advantage of the underlying platform architecture; however, the database functionality on all of these platforms is the same.

Like any other C/C++ application, DB2 is written in separate modules—.c/.C source files—that have been separately compiled to obtain object files (.o files). These object files are later linked to obtain an executable file. Figure 1.3 shows a *simplified* view of how each edition is built.

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2. The next generation of OS/400 is called IBM i5/OS.



**Figure 1.3** How DB2 editions build on top of each other

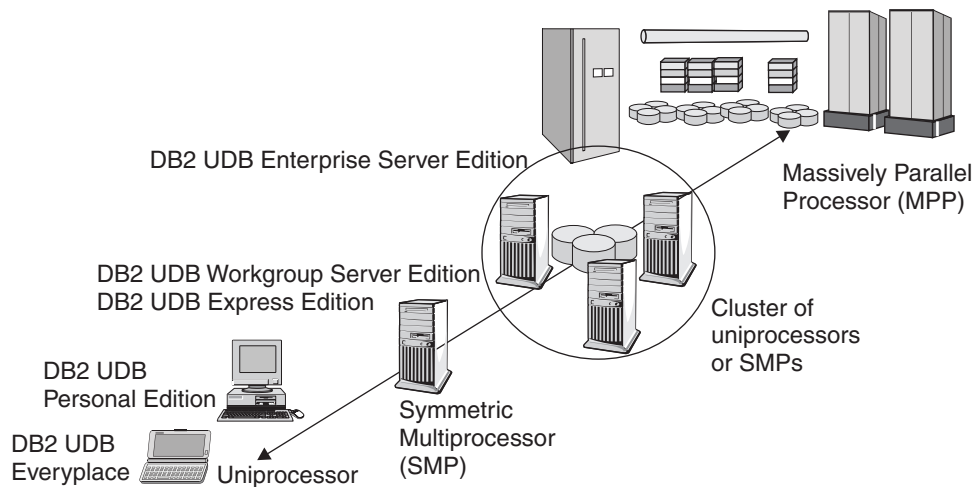
As you can see in Figure 1.3, each edition (other than DB2 UDB Everyplace, which is not shown in the figure) builds on top of the other by linking modules or object files that contain additional functionality. The core of the DB2 UDB code is common across all editions, which greatly benefits application development. For example, if you are developing an application for the DB2 UDB Personal Edition, this application will also work on the DB2 UDB Workgroup Server Edition, the DB2 UDB Express Edition, and the DB2 UDB Enterprise Server Edition on any of the supported platforms.

From the above explanation, it should be clear that the DB2 LUW editions are mainly packaging and licensing distinctions that let you choose the appropriate features or functions you need for the right price. The underlying technology is always DB2, so choose the appropriate edition based on the features and functions you need and which server(s) DB2 will be running.

**NOTE** DB2 UDB for OS/390 and z/OS, DB2 UDB for VM/VSE, and DB2 UDB for iSeries use a different code base than DB2 LUW. Note, however, that the Linux operating system extends across all of IBM's servers: xSeries, eSeries, pSeries, iSeries, and zSeries. DB2 UDB for Linux on all of these server platforms is the same. Thus, DB2 UDB for Linux on zSeries uses the same code base and is licensed in the same way as DB2 UDB for Linux on an xSeries (Intel) platform.

**NOTE** Refer to Appendix C, IBM Servers, for a description of the xSeries, eSeries, pSeries, iSeries, and zSeries servers.

Figure 1.4 illustrates the different editions and the types of servers they typically run on. DB2 takes advantage of all the processing power it is given, and the figure also shows that DB2 is a scalable product. With the exception of DB2 UDB Everyplace, the functions, features, and benefits of an edition shown on the bottom of the figure are included in each subsequent edition as you move up the figure. The following sections provide more detail on the functionality of each edition.



**Figure 1.4** DB2 UDB editions

### 1.3.1 Everyplace Edition

As its name implies, the DB2 UDB Everyplace edition can run anywhere, anytime, in all kinds of small devices like personal digital assistants (PDAs), handheld computers, embedded devices, and laptops. DB2 UDB Everyplace, though only about 200K in size, is a true RDBMS that uses a subset of the DB2 UDB server SQL functionality. While database maintenance operations and some specific features like triggers are not supported, DB2 UDB Everyplace does include the DB2 UDB Everyplace Mobile Application Builder tool to develop, deploy, and support e-business applications. If you know how to code an application for a DB2 UDB server edition, you know how to code for DB2 UDB Everyplace. Applications can be developed using ODBC, CLI, JDBC, and .NET.

Typically, users of DB2 UDB Everyplace store information in the mobile database and later replicate it to a back-end database server using the DB2 UDB Everyplace Sync Server installed on another machine.

This edition supports operating systems that run on mobile devices.

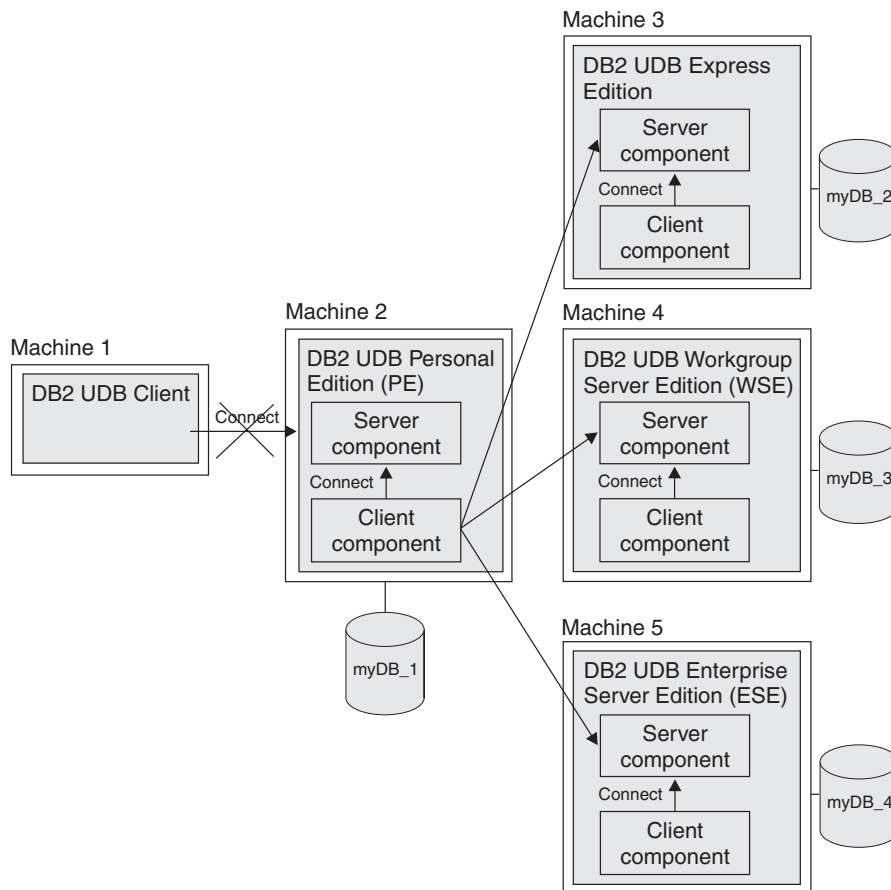
- Embedded Linux
- Java 2 Micro Edition (J2ME) devices
- Microsoft Windows CE/PocketPC
- Palm OS
- QNX Neutrino
- Symbian
- Windows 32-bit operating systems

DB2 UDB Everyplace can be licensed as a fully synchronized environment or as a standalone embedded database.

### 1.3.2 Personal Edition

The DB2 UDB Personal Edition (PE) is a complete product for a single user. It has all the functionality of a database server, including the administration graphical tools, as well as audio, image, spatial, and video extenders. While this edition can also be used as a client to connect to other DB2 servers, it does not support database connections from other computers. Only Windows and Linux operating systems, which are the most commonly used platforms in *personal* computers, support the DB2 UDB Personal Edition.

Figure 1.5 shows the DB2 UDB PE installed on Machine 2. The local DB2 client (the client component of Machine 2) can connect to the DB2 UDB PE server on Machine 2, but the remote DB2 client in Machine 1 cannot connect to the server on Machine 2 because DB2 UDB PE does not accept remote (inbound) connections. The figure also shows the DB2 UDB PE on Machine 2 as the remote client to other DB2 UDB server editions installed on machines 3, 4, and 5.



**Figure 1.5** DB2 Personal Edition as a (local) server and a remote client



**NOTE** A DB2 UDB database is considered a server when it can accept inbound client connections for data retrieval purposes. Hence, DB2 UDB Personal Edition is not considered a DB2 UDB server.

### 1.3.3 Workgroup Server Edition

The DB2 UDB Workgroup Server Edition (WSE) is a full-function database server designed for deployment in a department or small business environment. Linux, UNIX, and Windows platforms support the DB2 UDB WSE running on at most four CPU servers with a 32-bit operating system. It comes under two licensing models.

1. Licensing per user (ideal for applications with just a few users)
2. Licensing per processor (ideal for applications with many users, like a Web application)

This edition is referred to as Workgroup Server Unlimited Edition (WSUE) when using the per-processor licensing model because an unlimited number of users are allowed.

### 1.3.4 Express Edition

The DB2 UDB Express Edition, a low-cost, full-function database server, is ideal for a business that requires a database, but has minimal in-house database skills. This edition provides the same support as DB2 UDB WSE, but it also features one-click installation, enhanced self-management, and other ease-of-use features. Businesses developing applications that require a database can embed DB2 UDB Express Edition as part of their solution.

The supported operating systems for this edition are Windows and Linux (on Intel and AMD), running at most on two CPU 32-bit SMP hardware computers.

### 1.3.5 Enterprise Server Edition

The Enterprise Server Edition (ESE) is the most complete database server offering. It provides unparalleled scalability, accessibility, and extensibility features, as well as full 64-bit support, and is the edition of choice for most enterprises. It provides the same functionality as DB2 UDB WSE, but also includes DB2 Connect functionality, which provides licensed access for a single user to connect to host systems like DB2 UDB for iSeries or DB2 UDB for OS/390 and z/OS (zSeries).

DB2 UDB ESE includes the database partitioning feature (DPF), which allows you to partition your data within a single server or across multiple servers running the same operating system. This means that your databases can grow to sizes that are limited only by the number of servers available. DPF can be used when you buy the corresponding DPF license.

You can use DB2 UDB ESE in SMP systems, and DB2 UDB ESE with DPF can be used in either SMP or clustered server systems. The supported operating system platforms are Linux, UNIX, and Windows. Figure 1.6 summarizes all the DB2 editions and features.

**DB2 UDB Enterprise Server Edition (ESE)**

- Supported platforms: Linux, UNIX, and Windows
- Supported users: Ideal for large enterprise environments
- Supported hardware: uniprocessors, SMP, cluster of uniprocessor/SMP, and MPP systems
- Fully functional RDBMS
- As a server, accepts remote and local client connections
- Comes with the Administration Client
- Can work as a remote client to other servers
- Can work as a client to most systems (DB2 for z/OS and OS/390, DB2 for iSeries, DB2 for VM/SE) as it includes DB2 Connect capability
- Comes with audio, image, and video extenders
- Optional:
  - Net Search and Spatial extenders
  - Data Links Manager
  - Warehouse Manager
  - Intelligent Miner
  - Database Partitioning Feature (DPF)
- Supports applications written in ODBC, CLI, JDBC, .NET

**DB2 UDB Workgroup Server Edition (WSE)**

- Supported platforms: Linux, UNIX, and Windows
- Supported users: Ideal for a departmental or small business environments
- Supported hardware: Up to 4-way 32-bit SMP systems
- Fully functional RDBMS
- As a server, accepts remote and local client connections
- Comes with the Administration Client
- Can work as a remote client to other servers
- Comes with audio, image, and video extenders
- Optional
  - Net Search
  - Spatial extenders
- Supports applications written in ODBC, CLI, JDBC, .NET

**DB2 UDB Express Edition**

- Supported platforms: Linux and Windows
- Supported users: Ideal for companies with 100 to 1,000 employees
- Supported hardware: Up to 2-way 32-bit SMP systems
- Fully functional RDBMS
- As a server, accepts remote and local client connections
- Comes with the Administration Client
- Can work as a remote client to other servers
- Comes with audio, image, spatial, and video extenders
- Includes easy to use features:
  - One-click installation
  - Self managing features
  - Minimal maintenance
- Supports applications written in ODBC, CLI, JDBC, .NET

**DB2 UDB Personal Edition (PE)**

- Supported platforms: Linux and Windows
- Supported users: 1 user
- Supported hardware: uniprocessors
- Fully functional RDBMS
- Does not accept remote client connections, only local
- Comes with the Administration Client
- Can work as a remote client to other servers
- Comes with audio, image, spatial, and video extenders for a single user
- Supports applications written in ODBC, CLI, JDBC, .NET

**DB2 UDB Everyplace**

- Supported platforms: Palm OS, J2ME, Symbian, Windows, CE/Pocket PC, any 32-bit operating system, Neutrino, Embedded Linux
- True RDBMS, mainly for mobile users
- Supports applications written in ODBC, CLI, JDBC, .NET

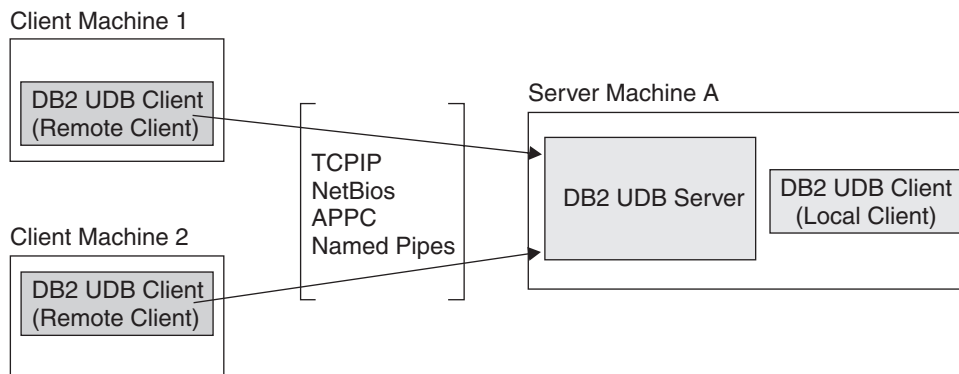
**Figure 1.6** Summary of DB2 editions and features

## 1.4 DB2 UDB CLIENTS

To connect from a client machine to a DB2 UDB database server machine, you usually need to install DB2 UDB client software on the client machine. This isn't always required; for example, this isn't necessary for a JDBC application using the type 4 driver running on the client machine. We provide more detail about connectivity scenarios in Chapter 6, Configuring Client and Server Connectivity.

A DB2 UDB client installed on a different machine than the DB2 UDB server is known as a **remote client**. A remote client can establish communication to the server using any of these supported communication protocols: TCP/IP, NetBIOS (Windows only), APPC (IBM environments only), and Named Pipes (Windows only).

If the DB2 UDB client is installed on the same machine as a DB2 UDB server, then it is known as a **local client** and it connects to the server using inter-process communication (IPC) on the same machine. Note that since all DB2 UDB servers come with a local client component, you don't need to install the DB2 UDB client separately after installing a DB2 UDB server. Figure 1.7 shows local and remote clients. Client Machine 1 and 2 are remote clients with the DB2 UDB client code installed and are accessing Server Machine A, which has a DB2 UDB server installed. The DB2 UDB server has a client component that is the local client.

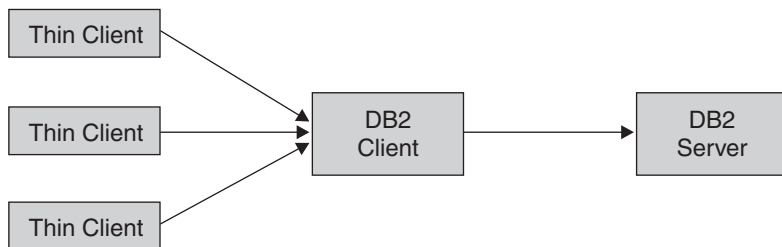


**Figure 1.7** Local and remote DB2 UDB clients

There are four types of DB2 UDB clients:

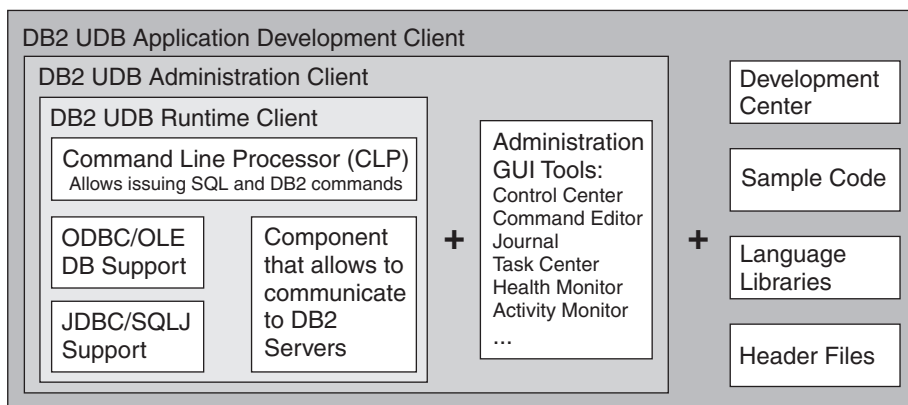
- Thin clients
- Runtime clients
- Administration clients
- Application development clients

A **thin client**, also known as a **dumb terminal**, is a machine with no operating system or DB2 client code. All libraries and modules required to fulfill a request are loaded from a server having this code, including the DB2 client code. Figure 1.8 shows an example of thin clients. The DB2 client box represents the runtime, administration, or application development client.



**Figure 1.8** A thin client

Each DB2 client, other than the thin client, is built on top of the other types of clients. A **runtime client** has the minimum basic requirements to connect to DB2 servers and to provide basic client functionality. The **administration client** comes with everything the runtime client has, plus graphical administration tools. The **application development client** includes all of the functionality of the administration client, plus development tools and libraries. Figure 1.9 illustrates this client progression.



**Figure 1.9** The DB2 Clients

## **V8.2** 1.5 “TRY AND BUY” VERSIONS

Prior to Version 8.2, most Try and Buy versions of any of the DB2 UDB editions had a 90-day evaluation period. With Version 8.2, a new educational Try and Buy version provides a six-month evaluation period. The CD-ROM provided with this book includes the DB2 UDB ESE six-month Try and Buy version. Other than this time limitation, the Try and Buy version contains all the features of a fully licensed version. During or after the Try and Buy period you can buy a permanent license by calling 1-800-IBM-SERV. An IBM representative will direct you to the License Key Center. After the purchase, when you receive the license file, you can use it to upgrade the Try and Buy version to the fully licensed product level without reinstalling it. Use the following command from a Command Line Processor window to install the license file:

```
db2licm -a file_name
```

where *file\_name* stands for the name of the license file, which normally has a .lic extension.

Issuing the `db2licm -l` command lists the software products installed in your machine and the current license. After adding the license, the Expiry Date field will have a value of *Permanent*. Chapter 3, Installing DB2, discusses more about the `db2licm` command and the License Center.

**NOTE** Licensing policies, as well as the evaluation period, are subject to change. The information in this section is accurate as of the time this book was written.

## 1.6 HOST CONNECTIVITY

**DB2 Connect** is the software product containing the licensed files required to communicate from a DB2 distributed client, also known as the **DRDA Application Requester**, to a host DB2 server, a **DRDA Application Server**. (DRDA—Distributed Relational Database Architecture—is the standard that defines formats and protocols for providing transparent access to remote data.) Host DB2 servers include DB2 UDB for z/OS and OS/390, DB2 UDB for VM/VSE, and DB2 UDB for iSeries. DB2 Connect also includes a DB2 runtime client.

As indicated earlier, if you install DB2 UDB ESE there is no need to install DB2 Connect since DB2 UDB ESE comes with a DB2 Connect component.

**NOTE** DB2 Connect software is only required when communicating from a workstation to a host; it is *not* required in the other direction (from a host to a workstation).

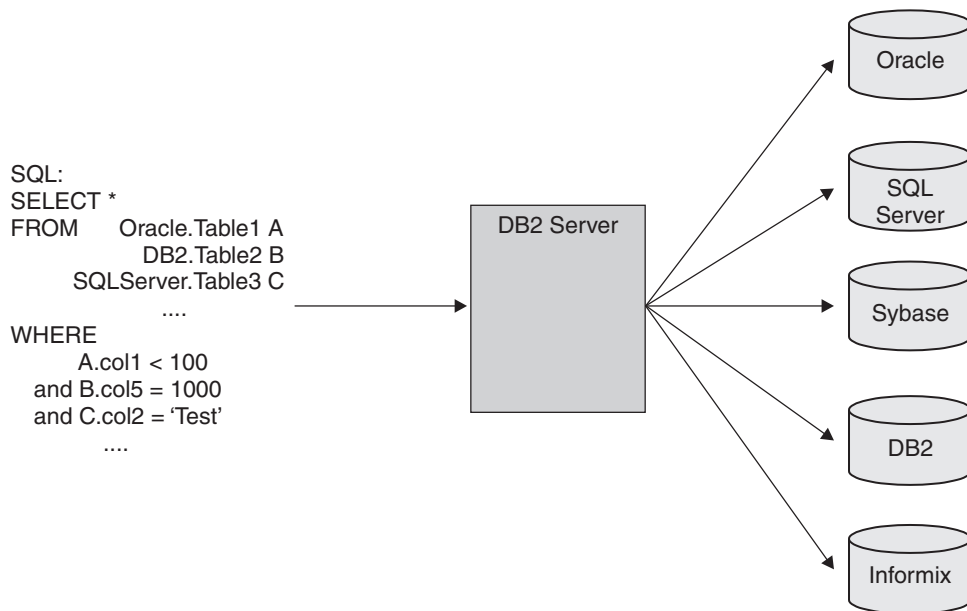
DB2 Connect comes in two main flavors.

- The Personal Edition supports the direct connection of one DB2 client to multiple host DB2 servers.
- The Enterprise Edition supports the connection of multiple DB2 clients to multiple host DB2 servers via a DB2 Connect server.

## 1.7 FEDERATED SUPPORT

**Federation** allows you to query and manipulate data stored on other servers and in other RDBMSs. When you issue an SQL statement in a federated environment, you may actually be accessing information from multiple databases and potentially multiple RDBMSs (see Figure 1.10).

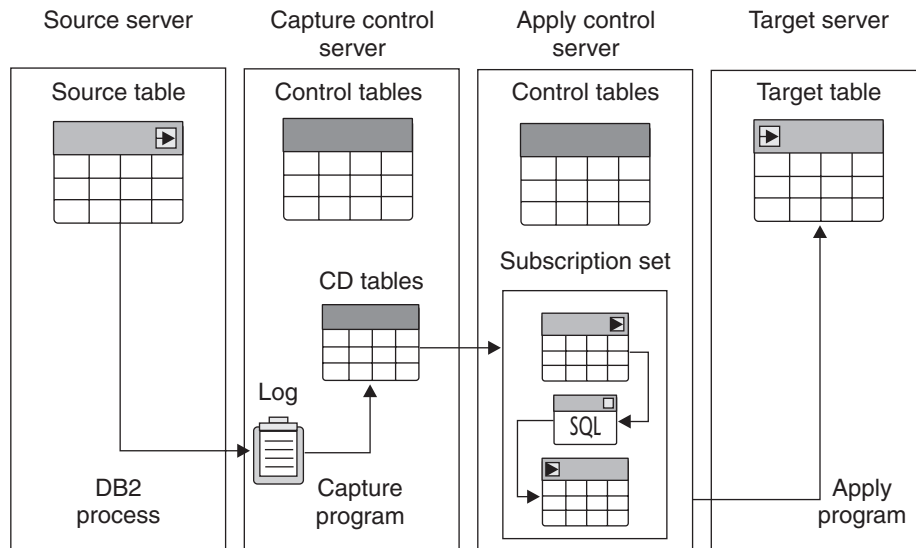
Federated support is included in DB2 when the other databases being accessed are part of the IBM DB2 family, that is, another DB2 database or an Informix database. For accessing databases from other vendors, refer to the IBM DB2 Information Integrator product described in section 1.9.



**Figure 1.10** DB2 federation

## 1.8 REPLICATION SUPPORT

**Replication** lets you propagate data to different servers to keep different databases synchronized. Data changes captured at one server are later applied to another (target) server, as illustrated in Figure 1.11. In the figure, the first box shows the source server and the fourth box



**Figure 1.11** DB2 replication environment

shows the target server. The second and third boxes contain the “capture” and “apply” components, respectively.

DB2 UDB has built-in support for replication when source and target databases are part of the IBM family, which includes Informix. For databases from other vendors, such as Oracle or SQL Server, the IBM DB2 Information Integrator software is required.

## 1.9 IBM DB2 INFORMATION INTEGRATOR

The IBM DB2 **Information Integrator (II)** provides federated support by masking databases from IBM or different vendors as if they were part of the same database. The II uses wrappers to communicate with and retrieve data from these other data sources; II encapsulates any conversions required from the source database and presents them to the target database as tables.

The Replication Edition of IBM DB2 Information Integrator supports the propagation of data between DB2 UDB, Microsoft SQL Server, Oracle, and others.

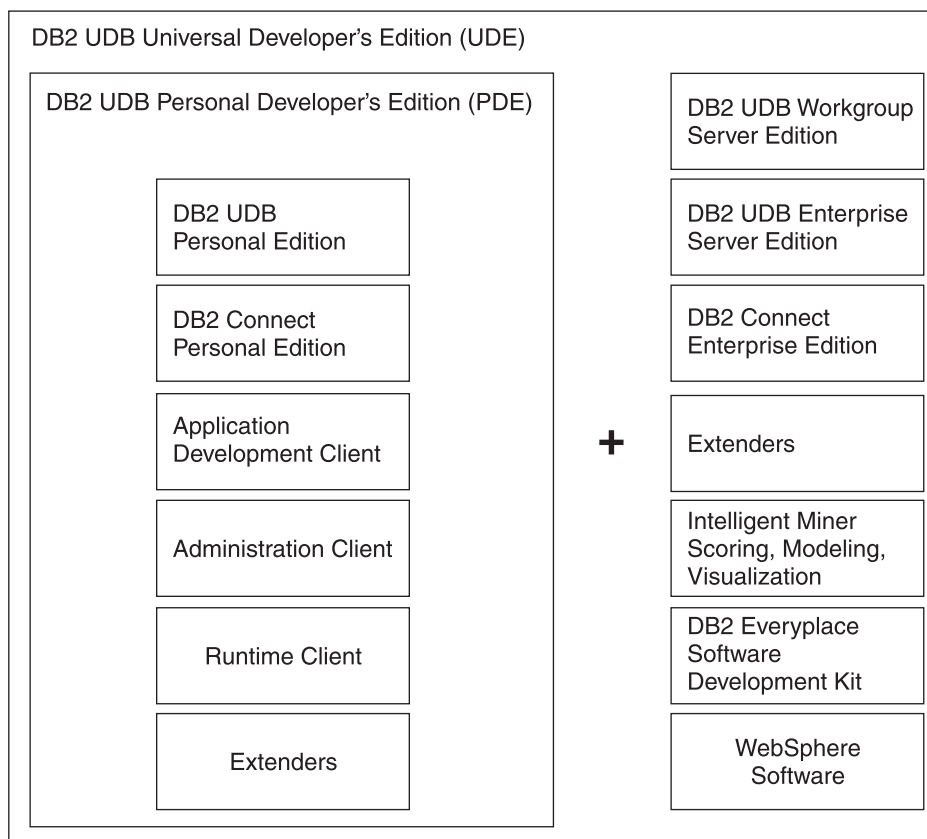
## 1.10 SPECIAL PACKAGE OFFERINGS FOR DEVELOPERS

Two special offerings are available for application developers.

- The DB2 Personal Developer’s Edition (PDE), for Linux and Windows platforms, comes with DB2 UDB Personal Edition, DB2 Connect Personal Edition, and all the DB2 clients.

- The DB2 Universal Developer's Edition (UDE), for Linux, UNIX, and Windows platforms, comes with all server editions, with the exception of the database partitioning feature and optional extenders. In addition, all the DB2 clients are also provided.

Both editions come at a reduced price, and are restricted to the development, evaluation, demonstration, and testing of application programs. Figure 1.12 shows most of the software provided with each offering. For a detailed listing of the features included with each offering, refer to the DB2 for Linux, UNIX, and Windows main Web page at <http://www.ibm.com/software/data/db2/udb/>.

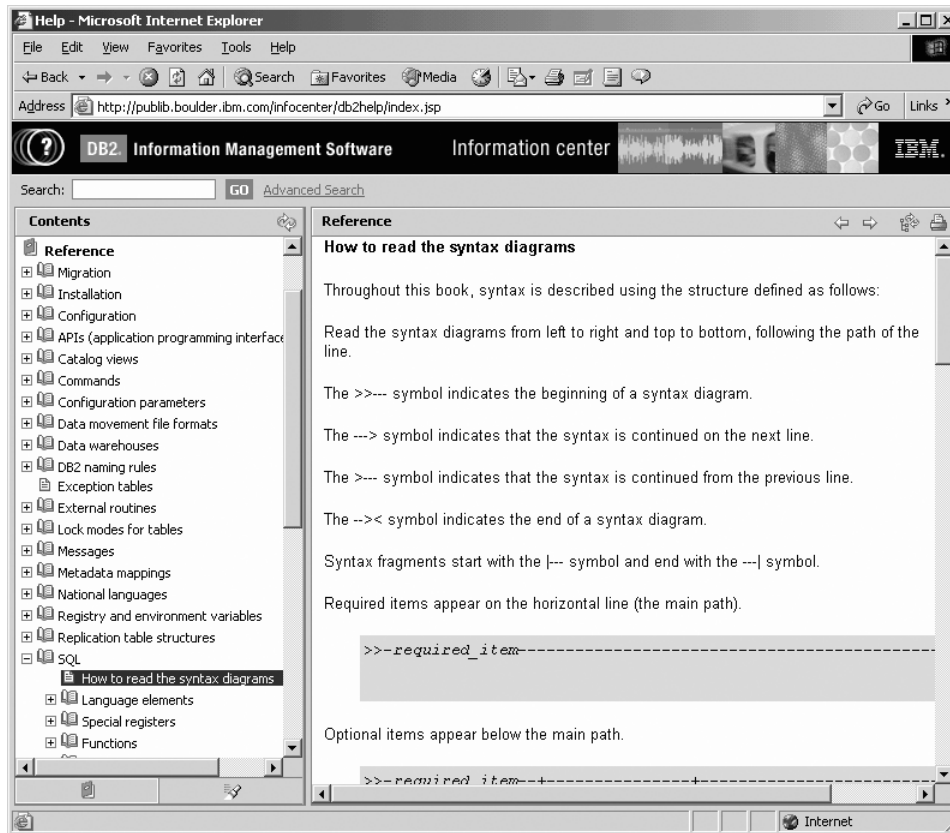


**Figure 1.12** Special package offerings for application developers



## 1.11 DB2 SYNTAX DIAGRAM CONVENTIONS

DB2 supports a comprehensive set of statements for data access and manipulation. These statements are documented online in the DB2 Information Center, which gives you access to all information about DB2 UDB as well as major DB2 features and components. It can be conveniently accessed by using a browser, as shown in Figure 1.13. The DB2 Information Center is also available through the Internet at <http://publib.boulder.ibm.com/infocenter/db2help>.



**Figure 1.13** The DB2 Information Center

You can find the syntax of the statements we introduce in this book in the DB2 Information Center. Understanding how to read the syntax diagrams will help you use the numerous options available with many of the statements.

Syntax diagrams are all read from left to right and top to bottom following the path of each line. Table 1.2 summarizes a few of the most commonly used symbols in a syntax diagram.

**Table 1.2** Summary of Some Symbols Used in Syntax Diagrams

Symbol	Description
>>---	Indicates the beginning of a syntax diagram.
--->	Indicates that the syntax is continued on the next line.
>---	Indicates that the syntax is continued from the previous line.
---><	Indicates the end of a syntax diagram.

When a mandatory field is required, it appears on the horizontal line (the main path) like this.

```
>>-mandatory_field-----><
```

Optional fields appear below the main path.

```
>>-mandatory_field-+-----+-----><
                    '-optional_field-'
```

If an optional field appears above the main path, it means that it is the default option.

```
                    .-default_field-.
>>-mandatory_field-+-----+-----><
                    '-optional_field-'
```

If two or more mandatory choices are available, one of the mandatory choices will appear in the main path, and the rest will appear in a stack. You must choose one of these options.

```
>>-mandatory_field-+-mandatory_choice1+-----><
                    '-mandatory_choice2-'
```

An arrow returning to the left, above the main line, indicates an option can be repeated. In this example, repeated options are separated by one or more blanks.

```
                    .-----
                    v           |
>>-mandatory_field---repeatable_field+-----><
```

If the repeat arrow contains a comma, you must separate repeated items with a comma.

```
                    .-,-----
                    v           |
>>-mandatory_field---repeatable_field+-----><
```

You now know how to read syntax diagrams in the DB2 manuals. Browse through the DB2 online documentation and review some examples there.

## 1.12 CASE STUDY

John recently graduated from Pennsylvania State University, where he learned DB2 UDB as part of the IBM Scholars' program, a program that provides DB2 UDB for free to teach database skills.

While at school, he worked with the DB2 UDB Enterprise Server Edition installed in a pSeries machine at the university computer lab. He was given SYSADM authority, and he was able to see connections from many different clients to all created databases using the **list applications** command. John wanted to develop a Java application using the JDBC type 2 application driver, so he downloaded and installed the six-month Try and Buy version of DB2 UDB Personal Edition. After he installed this edition, he realized that only the Administration client was included, but that he needed the application development (AD) client for some library and header files to develop the program. Fortunately, all DB2 UDB clients are free of charge, so he downloaded the AD client from the IBM DB2 support Web site (see the Resources section at the end of this book), and he was then able to build, test, and run his application against the DB2 UDB Personal Edition on his laptop. Since the client and database server were both on his laptop, he was dealing with a local client connection.

John wanted to test whether his application would work as a remote client, so he used the client software that comes with DB2 UDB Personal Edition to test his application against the database he had created earlier on the university's pSeries computer. This also worked, and John was feeling like a DB2 guru.

Eager to show his program to his colleagues, he emailed the executable to his friend Peter, who had just bought a new laptop with Microsoft Windows XP Professional Edition installed. Peter detached the file and tried to run the application against John's database on the University's pSeries server. After spending a few hours trying to figure out why he couldn't, he dropped by John's place. John realized that Peter had to install a DB2 client, as this is a requirement for JDBC type 2 programs. Given that Peter was neither going to develop a new program nor administer a database, John asked Peter to download the runtime client from the IBM Web site. He also asked him to issue a few commands to set up the connectivity between the client and the server . . . and voila, the program successfully ran. Peter then asked John to perform the test from his laptop against the database on John's laptop, but John said it would not work because he had installed DB2 UDB Personal Edition, which is not a database server, and it cannot accept inbound remote client connections.

After the graduation ceremony, John received a PDA as a gift from his dad. His dad had heard John praise DB2, so he had had DB2 Everyplace installed on the PDA. Since John was going to take six months off to travel before looking for a job, John decided to take his PDA with him rather than his laptop. John's account at the university was going to be active for the next nine months, so while he was traveling he could connect to his "old" database on the pSeries and use his application (which he had installed on his PDA) to transfer information about all the friends he met and places he visited during his trip. This way he was able to save information in another place should he lose his PDA.

After his trip, John applied for a position at a medium-sized company in his hometown. To prepare for his interview, John again tested the program he had written against his laptop database, but the Try and Buy evaluation period had expired. John figured that he would always need DB2 UDB

on his laptop, so he decided to buy the permanent license. When John received the license file after the purchase, he installed it on his laptop with the command `db2licm -a filename`. Once this problem was resolved, John showed his program during the job interview and was immediately hired.

Company ABC, which was using DB2 UDB Workgroup Server Edition, asked John to modify his application so that it would connect to a DB2 UDB for z/OS host machine. John responded that he did not need to make any modifications, but since DB2 UDB Workgroup Server Edition does not come with the DB2 Connect software component, either the company needed to purchase this software, or obtain the DB2 UDB Enterprise Server Edition. Given that the ABC company was a software development company, John suggested purchasing the DB2 Universal Developer's Edition (UDE), as it would be cheaper and has all of the software for all DB2 UDB editions. If ABC company wanted to use DB2 in a production environment, they would not be able to use DB2 UDE, but would have to buy the appropriate license.

Company ABC was also interested in the DB2 UDB Express Edition, because one of their applications needs a database to be embedded as part of their solution. Other than John, there are not many skilled DB2 personnel in the company, so DB2 UDB Express is also ideal because of its ease-of-use features.

Three months after John was hired, he was promoted. John is well on his way to a very successful career with DB2 UDB!

### 1.13 SUMMARY

This chapter introduced DB2 and its history. IBM pioneered relational database management systems and invented SQL. IBM's technology in the relational management system area has been around for more than twenty years. Its legacy is visible in the DB2 product line, which now represents a portfolio of information management products: database management software, business intelligence software, content management software, information integrator software, and DB2 and IMS tools.

You also learned about the types of clients and servers available with DB2. Although different editions are available to provide varying functionality, the core DB2 product is the same; therefore, application development on any edition will work on all editions. The various editions allow you to choose the functions that best suit your needs.

The chapter also discussed federated support, replication, the IBM DB2 Information Integrator, and packaging options available for application developers. These packaging options allow developers to obtain DB2 software at a reduced price.

## 1.14 REVIEW QUESTIONS

1. IBM added the term “Universal” to the DB2 name with Version 5 of the product. Why was this term added?
2. Which five software brands support the IBM on-demand strategy?
3. Can an application developed for DB2 UDB Personal Edition work with DB2 UDB Enterprise Server Edition?
4. Is DB2 Connect required to connect from a DB2 for z/OS client to a DB2 for Linux, UNIX, and Windows server?
5. Why would DB2 UDB WSUE be more appropriate than DB2 UDB WSE for a Web application with an average of 1,000 users?
6. Is IBM DB2 Information Integrator required to set up a federation environment between a DB2 server and an Informix server?
7. Provide an example when replication support may be required.
8. Does DB2 for Linux, UNIX, and Windows have one single file that is used for installation in any of these platforms?
9. What does the database partitioning feature (DPF) allow you to do?
10. What should you do if your Try and Buy period expires and you would like to buy a permanent license?
11. Which of the following products is the minimum required on the Windows client to *run* a DB2 application accessing a DB2 database on UNIX?
  - A. DB2 ESE
  - B. DB2 Personal Edition
  - C. DB2 Connect
  - D. DB2 Runtime Client
12. Which of the following products is required to *write* a DB2 application using JDBC?
  - A. Thin Client
  - B. Runtime Client
  - C. Administration Client
  - D. Application Development Client
13. Which of the following products does not allow applications to connect to its databases from remote clients?
  - A. DB2 Express
  - B. DB2 Personal Edition
  - C. DB2 Enterprise Server Edition
  - D. DB2 Workgroup Server Edition
14. Which of the following products is *not* considered a DB2 server?
  - A. DB2 UDB Workgroup Server Edition
  - B. DB2 UDB Workgroup Server Unlimited Edition
  - C. DB2 UDB Personal Edition
  - D. DB2 UDB Enterprise Server Edition

15. Which of the following DB2 clients provide the DB2 graphical administration tools?
  - A. Thin client
  - B. Application Development client
  - C. Thick client
  - D. Runtime client
16. Which of the following DB2 editions is the most appropriate for sales personnel who need a basic database to store contacts and business leads made during business trips?
  - A. DB2 Everywhere
  - B. DB2 Satellite Edition
  - C. DB2 Everyplace
  - D. DB2 Personal Edition
17. A software development company would like to test an application that connects to both DB2 for LUW as well as DB2 for z/OS. Which of the following would suit its needs the best?
  - A. DB2 UDB Enterprise Server Edition
  - B. DB2 UDB Workgroup Server Edition
  - C. DB2 Connect Enterprise Edition
  - D. DB2 UDE
18. Which of the following products can run on a zSeries server?
  - A. DB2 UDB for Linux, UNIX, and Windows
  - B. DB2 UDB for iSeries
  - C. DB2 Connect
  - D. IBM DB2 Information Integrator
19. Which of the following products allows ten clients to connect from DB2 LUW to DB2 for z/OS?
  - A. DB2 UDE
  - B. DB2 PDE
  - C. DB2 UDB
  - D. DB2 LUW
20. Which of the following products can be used to collect, prepare, and analyze your data to allow you to make better business decisions?
  - A. DB2 Content Manager
  - B. DB2 Warehouse Manager
  - C. IBM DB2 Information Integrator
  - D. DB2 LUW