

HXTT's HXTT PDF Packages

Welcome to the HXTT PDF pages

You should read carefully License, Introduction, and Components first. If you have JDBC programming experience and SQL92 knowledge, you can start easily your project after you know `com.hxtt.sql.pdf.PDFDriver` (the suitable JDBC driver class name) and `jdbc:pdf:///[DatabasePath]` (the correct embedded JDBC url) from [here](#). You will get up to date information relating to the HXTT PDF, and look at current documentation from [here](#). JDBC 4.2 packages are for JDK 1.8.X. JDBC 4.1 packages are for JDK 1.7.X, and 1.8.X. JDBC 4.0 packages are for JDK 1.6.X, 1.7.X, and 1.8.X. For questions and general support, you should submit your request at [HXTT's technical support site](#).

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Chapter 1. Quick Start

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What Is the HXTT PDF?

HXTT PDF provides a type 4 JDBC driver for Portable Document Format (PDF) files. It supports JDBC4.0, JDB4.1, and JDBC4.2. It supports JDK1.6.X, JDK1.7.X, and JDK1.8.X. It supports all transactions level of READ UNCOMMITTED, READ COMMITTED, REPEATABLE READ, and SERIALIZABLE. It supports JBuilder's Database Pilot, Oracle's JVM, JDeveloper 10G, Dreamweaver UltraDev, Dreamweaver ColdFusion, ObjectRelationalBridge, DBVisualizer, iSQL-Viewer, AquaDataStudio, Sunopsis, MySQL Migration Toolkit, Tomcat, vqServer, Hibernate, Squirrel SQL Client, Crystal Reports, Jisql, and DbEdit Database Utilites for Eclipse Platform. It supports XOPEN SQLState, RMI, Jini, JNDI, and serialization. It supports { UNION | INTERSECT | EXCEPT | MINUS } [ALL] query , INNER JOIN, FULL JOIN, LEFT JOIN, RIGHT JOIN, NATURAL JOIN, CROSS JOIN, self join, GROUP_CONCAT, multiple-row VALUES table, PIVOT table, UNPIVOT table, and subquery which includes single-row subquery, multirow subquery, multiple-column subquery, inline views, and correlated subquery. The current version of the HXTT PDF packages are available [here](#):

Follow Me

First, you need to download JDK1.8.X from <http://www.oracle.com> if you use PDF JDBC 4.2 package(PDF_JDBC42.jar). You can download JDK1.7.X or JDK1.8.X if you use PDF JDBC 4.1 package(PDF_JDBC41.jar). You can download JDK1.6.X, JDK1.7.X, or JDK1.8.X if you use PDF JDBC 4.0 package(PDF_JDBC40.jar).

Secondly, please add PDF_JDBC42.jar, PDF_JDBC41.jar, or PDF_JDBC40.jar to your Java class path, for instance, "SET CLASSPATH=c:\javalib\PDF_JDBC40.jar;%classpath%". You can also use "java -classpath c:\javalib\PDF_JDBC40.jar yourPDFclass" to run your class. More information about classpath, please read the "Setting the Classpath" topic in file:///yourdriver/jdk1.6/docs/tooldocs/tools.html . You can use "java -classpath c:\javalib\PDF_JDBC40.jar yourPDFclass" too.

Thirdly, you can use 'Class.forName("com.hxtt.sql.pdf.PDFDriver").newInstance();' or Class.forName("com.hxtt.sql.pdf.PDFDriver");' to load this driver.

Fourth, if you have used other JDBC driver, you only need to know the correct URL format for DriverManager.getConnection(url,"",""); You can find the PDF URL format below. If you were a Java novice, please read also other Java examples code in [PDF_JDBC42demo.zip](#), [PDF_JDBC41demo.zip](#) or [PDF_JDBC40demo.zip](#). PDF URL format:

Embedded:
 jdbc:pdf:[//]/[DatabasePath][?prop1=value1[;prop2=value2]] (You can omit that "/" characters sometimes)

For example:

```
"jdbc:pdf:/"
"jdbc:pdf:/c:/data" for Windows driver
"jdbc:pdf:///c:/data" for Windows driver
"jdbc:pdf:///usr/data" for unix or linux
"jdbc:pdf://192.168.10.2/sharedir" for UNC path
"jdbc:pdf:./data"
"jdbc:pdf:./data/mydata.pdf"
```

Remote Access (client/server mode):

```
jdbc:pdf://host:port/[DatabasePath]
```

For example: "jdbc:pdf://domain.com:3099/c:/data" if one PDFServer is run on the 3099 port of domain.com

```
"jdbc:pdf://domain.com:3099/c:/data/mydata.pdf"
```

Compressed Database: (.ZIP, .JAR, .GZ, .TAR, .BZ2, .TGZ, .TAR.GZ, .TAR.BZ2)

jdbc url format is the same as embedded url and remote url.

For example:

```
"jdbc:pdf:/c:/test/testpdf.zip
Memory-only Database:
  jdbc:pdf:/_memory_/
URL Database:(http protocol, https protocol, ftp protocol, sftp protocol)
  jdbc:pdf:http://httpURL
  jdbc:pdf:https://httpsURL
  jdbc:pdf:ftp://ftpURL
  jdbc:pdf:sftp://sftpURL
```

For example:

```
"jdbc:pdf:http://www.hxtt.com/test" ////Note: FTP site's
user/password should be set in ftpURL, and cannot be set in JDBC connection property because
user/password JDBC connection property belongs to server/client connection.
"jdbc:pdf:sftp://testa:123456@localhost"
```

SAMBA Database:(smb protocol)

```
jdbc:pdf:smb://[[[domain;]username[:password]@]server[:port]/[[share/[dir/]file]]]
[?[param=value]]
```

For example:

```
"jdbc:pdf:smb://test1:123@100.100.13.94/pdffiles".zone" ////Note:
SAMBA user/password should be set in SMB URL, and cannot be set in JDBC connection property because
user/password JDBC connection property belongs to server/client connection.
```

Free JDBC url:(Warning: only use it for special project)

jdbc:pdf:/" or "jdbc:pdf:///". Then you can use some full UNC path names in SQL to visit anywhere where your Java VM has right to access.

For instance:

```
select * from "\\amd2500\e$\pdffiles\test;
elect * from "\\amd2500\d$\pdffiles".test;
select * from ".".test;
```

HXTT PDF supports seamlessly data mining on memory-only table, physical table, url table, compressed table, SAMBA table in a sql. More details is in Advanced Programming chapter.

Last, PDF driver is a standard JDBC driver so that you will find most of valuable information at <file:///yourdrive/jdk1.6/docs/api/java/sql/package-frame.html> .

PDF supports SQL-92. It supports { UNION | INTERSECT | EXCEPT | MINUS } [ALL] query , INNER JOIN, FULL JOIN, LEFT JOIN, RIGHT JOIN, NATURAL JOIN, CROSS JOIN, self join, GROUP_CONCAT, and subquery which includes single-row subquery, multirow subquery, multiple-column subquery, inline views, and correlated subquery. The major syntax is listed at [here](#).

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Introduction of HXTT PDF Packages

HXTT PDF contains the only type 4 JDBC(4.0, 4.1, 4.2) driver packages for Portable Document Format (PDF), which supports transaction, embedded access, client/server mode, and remote access(map network drive, SAMBA protocol, HTTP protocol, HTTPS protocol, FTP protocol, SFTP protocol, and UNC path). It can fetch/modify any object of PDF file through sql.

Trial version is for your evaluation only. If you want to use HXTT PDF after a trial period, you should purchase a licensed copy from [here](#).

Differences between the trial version and the licensed version:

- The trial version of the driver is available to use free for a **30-day** trial period.
- The trial version of the driver allows executing not more than **50** queries once.
- SELECT queries return the first **100** rows in the result set.

Ordering benefits:

- Full version of HXTT PDF without limitations
- Free technical support by forum and email
- Free online major and minor updates in the guarantee period

[Our Other JDBC Products](#)

[HXTT Access](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for Microsoft Access version from 95, 97, 2000, XP, 2002, 2003, 2007, 2010, 2013, to 2016

[HXTT Cobol](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for Cobol data files, which supports Cobol Copybook, Cobol source program, FB record, VB record, ASCII encoding, EBCDIC encoding.

[HXTT DBF](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for Xbase database (dbase, Visual DBASE, SIx Driver, Alaska, SoftC, Codebase, Clipper, Foxbase, Foxpro, VFP, xHarbour, Halcyon, Apollo, Goldmine, and BDE)

[HXTT Excel](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for Microsoft Excel version from 95, 97, 98, 2000, 2001, 2002, 2003, 2004, 2007, 2010, 2013, to 2016.

[HXTT Paradox](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for Corel Paradox version from 3.0, 3.5, 4.x, 5.x, 7.x to 11.x

[HXTT Text \(CSV\)](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for raw data, flat text , CSV file, TSV file, PSV file, fixed-length, and variable-length binary file

[HXTT XML](#) - JDBC(1.2, 2.0, 3.0, 4.0, 4.1, 4.2) driver packages for XML data (XML1.0, XML1.1).

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Components of HXTT PDF Packages

These components are included in the HXTT PDF license descriptions :

Component	Description
PDF Documentation	Development Documentation
PDF JDBC 4.0 Package	JDBC 4.0 compliant driver, and a Database GUI manager.
PDF JDBC 4.0 Embedded Package	JDBC 4.0 compliant driver without client/server mode support.
PDF JDBC 4.0 Remote Access Package	The client side JDBC 4.0 compliant ultra light applet driver
PDF JDBC 4.0 Driver's Demo	Demo Code for JDBC 4.0
HXTT JDBC 4.0 Common Package and PDF JDBC 4.0 Core Package	You can use common package if you employ more than one of HXTT JDBC products.
PDF JDBC 4.1 Package	JDBC 4.1 compliant driver, and a Database GUI manager.
PDF JDBC 4.1 Embedded Package	JDBC 4.1 compliant driver without client/server mode support.
PDF JDBC 4.1 Remote Access Package	The client side JDBC 4.1 compliant ultra light applet driver
PDF JDBC 4.1 Driver's Demo	Demo Code for JDBC 4.1
HXTT JDBC 4.1 Common Package and PDF JDBC 4.1 Core Package	You can use common package if you employ more than one of HXTT JDBC products.
PDF JDBC 4.2 Package	JDBC 4.2 compliant driver, and a Database GUI manager.
PDF JDBC 4.2 Embedded Package	JDBC 4.2 compliant driver without client/server mode support.
PDF JDBC 4.2 Remote Access Package	The client side JDBC 4.2 compliant ultra light applet driver
PDF JDBC 4.2 Driver's Demo	Demo Code for JDBC 4.2
HXTT JDBC 4.2 Common Package and PDF JDBC 4.2 Core Package	You can use common package if you employ more than one of HXTT JDBC products.

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HXTT's JDBC Packages Documentation

Welcome to the HXTT PDF v1.0 Documentation

Current documentation can be found [here](#). This documentation is not intended as a complete guide to JDBC programming, but should help to get you started. For more information, refer to the standard JDBC API documentation(supplied with Sun's JDK). Also, take a look at the examples included with the HXTT PDF packages. The basic example is used here.

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FAQ for HXTT PDF Packages of type 4 JDBC Driver for PDF file

The most recent version of this document can be viewed at [here](#).

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General Questions

1. How to know the detailed version information of HXTT PDF package?

1st way: "java com.hxtt.sql.pdf.PDFDriver" will print that information.

2nd way: check that MANIFEST.MF file in jar file.

2. Why I got "Illegal key size" for 256-bit AES(Acrobat X and later)?

In Java, by default AES supports a 128 Bit key, if you plans to use 192 Bit or 256 Bit key, java compiler will throw Illegal key size Exception, which you are getting. The solution is you will need to download JCE (Java Cryptography Extension) as per your JRE version,(java6, java7 or java8). The JCE zip contains local_policy.jar and US_export_policy.jar . You need to replace these jar form your <JAVA_HOME>/jre/lib/security . If you are on a unix system, it will probably refer to /home/urs/usr/lib/jvm/java-<version>-oracle/ . With Java 9, Java 8u161, Java 7u171 and Java 6u181 the limitation is now disabled by default. You can download [local_policy.jar](#) and [US_export_policy.jar](#) from our site.

3. What is difference between the HXTT PDF Package, Embedded Package, and Remote Access Package? Can I get some sample code to use the HXTT PDF?

The HXTT PDF supports Embedded and Remote Access. HXTT PDF Package includes a Database GUI manager. If you're accessing the local data, you can use the HXTT PDF Package or Embedded Package. If you're accessing the remote data, you can use the HXTT PDF Package or Remote Access Package. There is no any difference for your code to use anyone of three packages. Please download the demo package from [here](#).

4. What causes the 'No suitable driver' SQLException?

This error usually occurs during a call to DriverManager.getConnection(). The cause can be failing to load the appropriate JDBC driver before calling getConnection(), or specifying an invalid JDBC URL that isn't recognized by your JDBC driver. If you're using a trial version, you will get "No suitable driver" SQLException, and "Evaluation period over" after using about 30 days. The HXTT PDF driver's name is com.hxtt.sql.pdf.PDFDriver, and its JDBC URL:

Embedded:

jdbc:pdf:[//][DatabasePath][?prop1=value1[;prop2=value2]] (You can omit that "/" characters sometimes)

For example:

```
"jdbc:pdf:/"
"jdbc:pdf:c:/data"
"jdbc:pdf:///usr/data" for unix or linux:
"jdbc:pdf://data"
```

Access by PDF Server: Skip it if you don't use TCP, RMI or JINI.

jdbc:pdf://host:port/[DatabasePath]

For example: "jdbc:pdf://domain.com:3099/c:/data" if one PDFServer is run on the 3099 port of domain.com

5. How to setup PDF url on the Novell Server?

PDF driver can run on Novell server. You can use directly access or PDFServer to visit your data on Novell server. If your PDF files is at sys:/java/yourdata, the direct URL should be:

jdbc:pdf:///sys:/java/yourdata

or
 jdbc:pdf:///java/yourdata

6. I got "java.io.IOException: Permission denied" sometimes for my SELECT query.

Please figure out what directory Java's java.io.tmpdir system property points to, and make sure that directory is writable by the user that runs your Java applications, otherwise you should set tmpdir property in Connection property to a writable directory. tmpdir property indicates whether set a temp directory, Default: the value of JVM's "java.io.tmpdir" property. If that value is incorrect, using the directory of JDBC url.

7. When I used jdbc:pdf:<DatabasePath>, the connection's schema was empty. "create catalog if not exists pdffiles". What is Catalog?

PDF's schema is always empty. You can use catalog to query subdirectory. Catalog means a directory, which contains some PDF files.

Applet Questions

1. I already configured the .java.policy for my applet, but I continue with problems of "access denied".

For instance, you're using "jdbc:pdf:/C:/test", and grant codeBase "file:/C:/test" in your policy file, but your applet is running from "D:\sample\CargaStatApplet.html". You should grant codeBase "file:/D:/sample", not "file:/c:/test".

2. http://localhost:8080/jdbcapplet.html, the applet started but returns a Classnotfound com.hxtt.sql.pdf.PDFDriver error in the gui list.

Please add a codebase tag. For instance, "<applet code="jdbcapplet.class" codebase="PDF_Remote_Access_JDBC40.jar"></applet>". The PDF_Remote_Access_JDBC40.jar should be at the same directory of jdbcapplet.html.

Remote Access Questions and Client/Server Mode Questions

1. Client/Server mode question: The data directory is not in the IBM machine where the Java program should run, but instead those PDF files are in another machine with Windows operating system.

com.hxtt.sql.admin.Admin provides a GUI manger for [PDF server](#). For instance, you wish to provide JDBC4.0 remote data access. Please use "java -cp yourdirectory/PDF_JDBC40.jar com.hxtt.sql.admin.Admin" to start GUI manager, and add a url setting of "'jdbc:pdf://10.32.90.48:' + 8029 +'/' + databaseDirectory' on your host of 10.32.90.48(just an IP sample), then click Start button. Third, you can use 'String url = "jdbc:pdf://10.32.90.48:' + 8029 +'/' + databaseDirectory;' to visit your PDF database from your IBM machine. If you're running that GUI manager on "yourNT.com" host to visit "c:/database" directory, you can use "jdbc:pdf://yourNT.com:8029/c:/database" on your web application. jdbc:pdf://yourNT.com:8029/c:/database?user=oneuser&password=onpassword can provide a simply user/password verification for client/server mode. If you wish to write a secure PDF server for some sensitive information, embedded encrypt/decrypt functions can help you.

2. Remote access through map network drive question: How to remote access PDF data without PDFServer?

You can share your remote directory which contains your data files, then map it to a local driver.

For Windows: You can connect remote PDF database by sharing the directory and map it to local drive. You should disable the OPLOCKS of your Samba/NT/2000 server. How to turn off opportunistic locking in windows on client and on server side? This is done by manipulating the following registry key:

For client side: oplocks.reg file

```
REGEDIT4
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\MRXSmb\Parameters]
"OplocksDisabled"=dword:00000001
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanWorkstation\Parameters]
"UseOpportunisticLocking"=dword:00000000
```

For server side: oplocksServer.reg

```
REGEDIT4
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters]
"EnableOplocks"=dword:00000000
```

You should put additional registry entry like e.g.

The following registry entries disable opportunistic locking and caching:

HKey_Local_Machine \ System \ CurrentControlSet \ Services \ LanmanServer \ Parameters \ EnableOpLocks must be set to 0.

HKey_Local_Machine \ System \ CurrentControlSet \ Services \ LanmanServer \ Parameters \ CachedOpenLimit must be set to 0.

HKey_Local_Machine \ System \ CurrentControlSet \ Services \ LanmanWorkStation \ Parameters \ UseOpportunisticLocking must be set to 0.

HKey_Local_Machine \ System \ CurrentControlSet \ Services \ LanmanWorkStation \ Parameters \ UtilizeNtCaching must be set to 0.

For Linux: You can use mounting. One user uses Samba to map NTFS partitions in Linux servers, and PDF driver works normally like mapping any mount point in Linux.

For Novell: You can map NCP directory as driver or mount NCP directory.

3. Remote access through UNC path question: Can I setup only one datasource to access four servers for my Cold Fusion?

To access one unc path, you can use jdbc:pdf:\PC17\c\$\values or jdbc:pdf:\PC17\val.

To access four unc paths in the same connection, you need to use a free JDBC url, "jdbc:pdf:/" or "jdbc:pdf:///". Then you can use some full UNC path names in SQL to visit your four servers where your Java VM has right to access.. For instance:

```
select * from \\amd2500\e$\pdffiles\test;
select * from "\\amd2500\d$\pdffiles".test;
select * from ".".test;
```

4. Remote access through http/https/ftp protocol question: How to let my program to fetch data daily from our web host?

You need to use [url database](#), which supports http protocol, https protocol, ftp protocol, and sftp protocol.

5. Remote access through SAMBA protocol question: How to let my servlet on Linux to access over 300 hundred shared folders that all are on Windows boxes

You need to use [SAMBA table](#), which needn't to map or mount driver.

6. I can't get the [com.hxtt.sql.admin.Admin](#) running for internet --> intranet

HXTT PDF supports port mapping and NAT route. Let HXTT PDF listening a port on the database server, and modify your route table or NAT table to map an external port to that internal port. You can use "start java -Djava.security.policy=policy com.hxtt.sql.admin.Admin" to start GUI manager. You should add a remote url, for instance, jdbc:pdf://localhost:8029/d:/pdffiles, and click Start button to start that server. Then on your internet client side, you can use jdbc:pdf://externalIP:8029/d:/pdffiles to access your intranet host. externalIP means an external IP or domain name address of your gateway or database server.

BTW, except for TCPServer protocol, HXTT PDF can use also RMIServer protocol. For instance, you have used "start rmiregistry 1099 -J-Djava.security.policy=yourPolicyFile" to startup your rmi service. Then you can use jdbc:pdf://localhost:1099/d:/pdffiles?serverType=RMIServer to let HXTT PDF bind remote service in registry. The key is use "java -Djava.security.policy=policy -Djava.rmi.server.hostname=externalIP com.hxtt.sql.admin.Admin RMISERVER 8029" to start your server. RMIServer protocol is slower much than the default TCPServer protocol.

7. I would like to start a server (TCP) from our application, instead of [DBAdmin](#). I need to be able to programmatically tell the application which profile to start.

Please read [Start/Stop Server Programmatically](#).

8. Is there a way to specify a file path in the url that will connect to a mapped drive in Windows 2000. ie drive \\gomer\pyle\db which is mapped to f drive on the server.

PDF driver can work with mapped driver, and you should use "jdbc:pdf:/f:" to access your data.

Note: If you're using a database file through a UNC path or a mapped drive of Windows, there is a Windows Security restriction. If you run ColdFusion (Tomcat, or tanuki sw wrapper) as a service on Windows, it operates by default as System, and cannot access directories on a remote system or mapped drive; to resolve this issue, do not run ColdFusion (Tomcat, or tanuki sw wrapper) using the local system account.

9. When I click Start button to start a remote service, I get a security exception: access denied (java.net.SocketPermission 127.0.0.1:8029 connect,resolve)

You have to enable java.net.SocketPermission right in your policy file if you run a PDF server. Please read

file:///yourdriver/jdk1.6/docs/guide/security/PolicyFiles.html for more information about policy file. It is unnecessary to know the specific content of a policy file, since you can use policy tool to create and maintain your policy files. Please read

file:///yourdriver/jdk1.6/docs/tooldocs/win32/policytool.html for policy tool.

10. How to start remote service as MS Windows service and Linux(Solaris) Daemon?

Please read [Run HXTT PDFServer as Windows Service or Linux\(Solaris\) Daemon](#).

11. How to start remote control when PDFServer is running as Windows service or Linux(Solaris) Daemon?

You can use "java com.hxtt.sql.admin.Admin TCPCLIENT [host:]port [remoteControlPassword]" to start your remote control.

SQL Questions

1. How to use password to open an encrypted PDF file?

For instance, tomcat is the password for testpasswordl.pdf, then you can use the following sql

```
DECLARE CURRENT_Password '{"testpasswordl":"tomcat"}';
```

or

```
set CURRENT_Password='{"testpasswordl":"tomcat"}';
```

or

```
DECLARE CURRENT_Password '{"testpasswordl.pdf":"tomcat"}';
```

or

```
set CURRENT_Password='{"testpasswordl.pdf":"tomcat"}';
```

The password is visible only in the same connection

2. How to return text content for a pdf file?

"select STRING_AGG(textline,'\r\n') as content from testpdf.page1;" will return the content for page 1 in testpdf.pdf file.

"select STRING_AGG(textline,'\r\n') as content from testpdf;" will return all content for testpdf.pdf file.

3. How to fill a form in a pdf file?

"select *,words from testpdf.page1;" will return all text content information in testpdf.pdf file.

Then you can use

```
update testpdf.page1 set Words#>'{1,text}'='not' where CoordinateY=120 and Words#>'{1,text}'='Not';
```

or

```
update testpdf.page1 set textline=textline+'?' where CoordinateY<=100;
```

to replace the old text content.

3. How to clear content in a pdf file?

```
delete from testpdf.page3; /* remove all textline in page 3 but it will keep still old font information*/
```

```
truncate table testpdf.page3; /* become a blank page with nothing*/
```

Concurrency Questions

1. Does HXTT PDF support multi-user access?

The HXTT PDF supports multi-user access, and you can update document incrementally.

Interoperability Questions

1. How to set up HXTT PDF with Tomcat4.1 as PoolableConnection?

This sample shows three PoolableConnections ways through Database Connection Pool (DBCP) Configurations and JNDI Resources(You should read [JNDI Datasource HOW-TO](#) and [JNDI Resources HOW-TO](#) also.):

In server.xml:

```
<Context path="" docBase="ROOT" debug="5" reloadable="true" crossContext="true">
  <Resource name="jdbc/testpdfPool1" auth="Container" type="javax.sql.DataSource"/>
    <ResourceParams name="jdbc/testPDFPool1">
      <parameter>
        <name>factory</name>
        <value>org.apache.commons.dbcp.BasicDataSourceFactory</value>
      </parameter>

      <parameter>
        <name>maxActive</name>
        <value>50</value>
      </parameter>

      <parameter>
        <name>maxIdle</name>
        <value>10</value>
      </parameter>

      <parameter>
        <name>maxWait</name>
        <value>10000</value>
      </parameter>

      <parameter>
        <name>username</name>
        <value></value>
      </parameter>

      <parameter>
        <name>password</name>
        <value></value>
      </parameter>

      <parameter>
        <name>driverClassName</name>
        <value>com.hxtt.sql.pdf.PDFDriver</value>
      </parameter>

      <parameter>
        <name>url</name>
        <value>jdbc:pdf:///d:/pdffiles</value>
      </parameter>
    </ResourceParams>

  <Resource name="jdbc/testPDFPool2" auth="Container" type="com.hxtt.sql.HxttConnectionPoolDataSource"/>
    <ResourceParams name="jdbc/testPDFPool2">
      <parameter>
        <name>factory</name>
        <value>org.apache.naming.factory.BeanFactory</value>
      </parameter>

      <parameter>
        <name>url</name>
        <value>jdbc:pdf:///d:/pdffiles</value>
      </parameter>

      <parameter><name>username</name><value></value></parameter>
      <parameter><name>password</name><value></value></parameter>
      <parameter><name>host</name><value></value></parameter>
      <parameter><name>port</name><value>8029</value></parameter>
    </ResourceParams>

  <Resource name="jdbc/testPDFPool3" auth="Container" type="com.hxtt.sql.HxttConnectionPoolDataSource"/>
    <ResourceParams name="jdbc/testPDFPool3">
      <parameter>
        <name>factory</name>
        <value>com.hxtt.sql.HxttObjectFactory</value>
      </parameter>
      <parameter>
        <name>url</name>
        <value>jdbc:pdf:///d:/pdffiles</value>
      </parameter>
    </ResourceParams>
</Context>
```

```

    <parameter><name>username</name><value></value></parameter>
    <parameter><name>password</name><value></value></parameter>
    <parameter><name>host</name><value></value></parameter>
    <parameter><name>port</name><value>8029</value></parameter>
</ResourceParams>

</Context>

```

Then you can use the below code to test those PoolableConnections:

```

Context initContext = new InitialContext();
Context envContext = (Context)initContext.lookup("java:/comp/env");

DataSource ds1 = (DataSource)envContext.lookup("jdbc/testPDFPool1");
Connection conn1 = ds1.getConnection();
out.println("testPDFPool1 OK:)<br/>");
Statement stmt1 = conn1.createStatement();
ResultSet rs1 = stmt1.executeQuery("select * from test");
if(rs1.next())
    out.println(rs1.getString(1)+":)<br/>");
rs1.close();
stmt1.close();
conn1.close();

DataSource ds2 = (DataSource)envContext.lookup("jdbc/testPDFPool2");
Connection conn2 = ds2.getConnection();
out.println("testPDFPool2 OK:)<br/>");
Statement stmt2 = conn2.createStatement();
ResultSet rs2 = stmt2.executeQuery("select * from test");
if(rs2.next())
    out.println(rs2.getString(1)+":)<br/>");
rs2.close();
stmt2.close();
conn2.close();

DataSource ds3 = (DataSource)envContext.lookup("jdbc/testPDFPool3");
Connection conn3 = ds3.getConnection();
out.println("testPDFPool3 OK:)<br/>");
Statement stmt3 = conn3.createStatement();
ResultSet rs3 = stmt3.executeQuery("select * from test");
if(rs3.next())
    out.println(rs3.getString(1)+":)<br/>");
rs3.close();
stmt3.close();
conn3.close();

```

If you use org.apache.commons.dbcp.BasicDataSource, but get "Cannot create PoolableConnectionFactory" Error, you should check your commons-pool-1.x.jar and commons-dbcp-1.*.jar file in \$TOMCAT/common/lib directory to see whether two files have the same version. DBCP v1.2 requires Pool v1.2 so that you should update Pool v1.1 from the tomcat website.

If you wish to add more Connection property, you should use connectionProperties, for instance:

```

<parameter>
<name>connectionProperties</name>
<value>charSet=Cp737</value>
</parameter>

```

2. How to set up HXTT PDF with vqServer 1.9.55 as web server?

The key is to use an absolute path as Java libraries' location, and restart vqServer after modified Java libraries. For instance, your vqServer is installed at C:\vqServer\.

1. Please use <http://yourhost:9090/> to visit your administration server.
2. Click on Java libraries in the vqServer control centre menu (<http://yourhost:9090/admin?action=libraries&serial=14>)
- 3 Click New library (http://yourhost:9090/admin?lib=New_library&action=edit)
4. Enter C:\vqServer\classes\PDF_JDBC20.jar as location value, PDF Driver as Description value, then click OK button.
5. Please copy PDF_JDBC20.jar into C:\vqServer\classes directory.

6. Please copy ex01.class into C:\vqServer\servlets\servlets
7. Stop and restart vqServer
8. Please use <http://yourhost/servlet/yourServlets> to get your result.

3. How to set up HXTT PDF with Coldfusion MX 6.1 Application Server?

For instance, your Coldfusion MX is installed at C:\CFusionMX\, and wish to use PDF_JDBC30.jar.

1. Please copy PDF_JDBC30.jar into C:\CFusionMX\wwwroot\WEB-INF\classes/.
2. Use <http://yourhost:8500/CFIDE/administrator/index.cfm> to enter the CFMX Administrator.
3. Go to the "Java and JVM" of Server Settings, <http://yourhost:8500/CFIDE/administrator/settings/jvm.cfm> page, and enter the full path, C:\CFusionMX\wwwroot\WEB-INF\classes\PDF_JDBC30.jar, in the Class Path. Then, click "Submit Changes".
4. Restart the CFMX Service.
5. Please go back to the administrator page, and go to the "Data Sources" of Data & Services, <http://yourhost:8500/CFIDE/administrator/datasources/index.cfm> page, and enter the name for the new datasource, for instance "PDFTest", and select "Other" for the driver. Then Click "Add".
6. Enter the datasource information. JDBC URL is always in the format `jdbc:pdf://[host:port]/[DatabasePath]`, for instance `jdbc:pdf:/c:/data`. You can set more connection properties in your JDBC URL, for instance: `jdbc:pdf:/c:/data?delayedClose=15;maxCacheSize=6144;lockTimeout=2000;`. Driver class is always `com.hxtt.sql.pdf.PDFDriver`. Driver name is used to identify the driver in the datasources view, and you can use PDF. Username and password are not required. They can also be specified in the `cfquery` tag (but datasource verification will fail if you don't enter them). Description is not required.
7. Lastly, please press "Submit" to finalize the entered data.
8. You can find `edit.cfm` and `edit_action.cfm` sample in demo package.

4. HXTT PDF with If you run ColdFusion (Tomcat, or alexandria sw and tanuki sw wrapper) on Windows 2000 and Windows XP Pro does not work on mapped drives.

Note: If you're using a database file through a UNC path or a mapped drive of Windows, there is a Windows Security restriction. If you run ColdFusion (Tomcat, or tanuki sw wrapper) as a service on Windows, it operates by default as System, and cannot access directories on a remote system or mapped drive; to resolve this issue, do not run ColdFusion (Tomcat, or tanuki sw wrapper) using the local system account.

The service (For instance, ColdFusion MX Application Server, ColdFusion MX 7 Application Server, or Apache Tomcat) built by ColdFusion (Tomcat, or tanuki sw wrapper) can not access the share directory at other machine by default. But you can do as follows to solve this problem:

1. Right click the service built by ColdFusion (Tomcat, or tanuki sw wrapper) in service manager, and click the property menu.
2. On the open window, select the login tab, click this account radio box, and click the browse button.
3. Select the administrator account (it seems that you should select the administrator account), input the correct password in the password textbox and confirm password textbox.
4. Restart this service, you can find this service can access the share directory at other machine.

5. How to resolve 'DataSet has no unique row identifiers.' issue in JBuilder's QueryDataSet?

You can use `_rowid_`, a virtual column to avoid that issue, For instance:

```
//...
queryDataSet = new QueryDataSet();
//...
queryDataSet.setMetaDataUpdate(MetaDataUpdate.ALL-MetaDataUpdate.ROWID-MetaDataUpdate.TABLENAME);

queryDataSet.setQuery(new QueryDescriptor(database, "select _rowid_,* from test", null, true,
Load.ALL));
queryDataSet.open();

queryDataSet.setTableName("test");
queryDataSet.setRowId("_rowid_", true);
//...
```

6. How to set HXTT PDF with WebSphere Application Server?

You can download a pdf guide from [here](#).

7. How to set HXTT PDF with Hibernate?

You should download support package and sample from [here](#).

8. How to set HXTT PDF Data Source with Oracle Application Server 10G?

You should read guide at [Oracle Application Server 10G\(v10.1.3\)](#) and [Oracle Application Server 10G\(v10.1.2.02\)](#).

9. How to set HXTT PDF Data Source with JBoss AS 7.0.2?

After downloading HXTT PDF driver jar file, just move the HXTT PDF driver jar file into Jboss 7 installation directory under standalone/deployments (jboss-as-web-7.0.2.Final/standalone/deployments).

Restart your jboss server

Then go to the url and type <http://localhost:8080/>

click Administration console.

In Jboss Administration console you can press Add button of Datasource Configurations. step 1/3 Datasource

Attributes: enter datasource name(testpdf) and jndi name(testpdf) then click Next button. step 2/3 JDBC Driver: select

HXTT PDF driver jar file. click Next button. Step 3 Connection Settings: enter connection URL (jdbc:pdf:///data) ,

Username(null) and Password(null). finally click Done button.

10. How to set HXTT PDF Data Source with Railo 3.3.1 Express?

After downloading HXTT PDF driver jar file, just move the HXTT PDF driver jar file into Railo 3 installation directory under /lib/ext/railo-server/context/library (railo-3.3.1.000/lib/ext/railo-server/context/library).

Restart your Railo server

Then go to the url and type <http://localhost:8888/>

click Railo Server Administrator (or type <http://localhost:8888/railo-context/admin/server.cfm>).

In Services - Datasource of Railo Server Administrator console, you can Create new datasource: step 1/2 Name: enter

datasource name(testpdf) and Type(Other - JDBC driver) then click create button. step 2/2 enter

Class(com.hxtt.sql.pdf.PDFDriver), DSN(jdbc:pdf:///data), Username(null) and Password(null). finally click create

button.

11. Where's JDBC Connection Pool Templates for GlassFish?

MS Access template is at http://www.hxtt.com/test/microsoft_access_type4_datasource.xml

Cobol data file template is at http://www.hxtt.com/test/microsoft_access_type4_datasource.xml

MS Excel template is at http://www.hxtt.com/test/microsoft_excel_type4_datasource.xml

Corel Paradox template is at http://www.hxtt.com/test/paradox_type4_datasource.xml

Xbase template is at http://www.hxtt.com/test/dbf_type4_datasource.xml

CSV template is at http://www.hxtt.com/test/csv_type4_datasource.xml

Text template is at http://www.hxtt.com/test/text_type4_datasource.xml

PDF template is at http://www.hxtt.com/test/pdf_type4_datasource.xml

XML template is at http://www.hxtt.com/test/xml_type4_datasource.xml

12. How to set HXTT PDF database in DBeaver?

1. Create a JDBC Data Source for HXTT PDF Data

Open the DBeaver application, in the Databases menu, click the Driver Manager item. Click New to open the Create New Driver form.

In the Driver Name box, enter a user-friendly name for the driver, for instance, testPDF.

In the Class Name box, enter com.hxtt.sql.pdf.PDFDriver.

In the URL Template box, enter jdbc:pdf: .

In the Category box, enter PDF.

In the Libraries panel, click Add File so that load the driver JAR (for instance, PDF_JDBC40.jar) in DBeaver.

In the Open driver library dialog that appears, select the PDF_JDBC40.jar file.

2. Create a Connection to HXTT PDF Data

In the Databases menu, click New Connection item.

In the Create new connection wizard that results, select PDF, then testPDF.

On the next page of the wizard, click the Driver properties tab.

Add new property, Property Name is database, Value is the path of your database file, for instance, d:/test/pdf .

Click Finish button.

13. How to set HXTT PDF with Apache EmpireDB?

You should download support package from [here](#).

13. Does HXTT PDF driver support XA connections ?

It provides an experimental com.hxtt.sql.HxttXADataSource .

14. How to set HXTT PDF into my projects maven pom.xml.?

For instance,

Once you've downloaded the JAR just add it to your computer repository with:
 mvn install:install-file -DgroupId=com.hxtt.sql.pdf -DartifactId=pdfjdbc4 \
 -Dversion=v1.0 -Dpackaging=jar -Dfile=PDF_JDBC40.jar -DgeneratePom=true
 The last parameter for generating a POM will save you from pom.xml warnings.

Include the new dependency by modifying your project's pom.xml. Add the following dependency:

```
<dependency>
  <groupId>com.hxtt.sql.pdf</groupId>
  <artifactId>pdfjdbc4</artifactId>
  <version>v1.0</version>
</dependency>
```

Save the pom.xml file and build the project to make sure no errors exist.

15. How to set HXTT PDF Data Source with JBoss Application Server 4.0.1?

For instance,

```
<datasources>
<local-tx-datasource>
  <jndi-name>TestData</jndi-name>
  <connection-url>jdbc:pdf:///data</connection-url>
  <driver-class>com.hxtt.sql.pdf.PDFDriver</driver-class>
  <connection-property name="delayedClose">-1</connection-property>
  <user-name/>
  <password/>
  <min-pool-size>5</min-pool-size>
  <max-pool-size>20</max-pool-size>
  <idle-timeout-minutes>5</idle-timeout-minutes>
</local-tx-datasource>
</datasources>
```

16. How to set HXTT PDF database dialect with EclipseLink of Glassfish?

You should download support package and sample from [here](#).

17. How to set HXTT PDF database dialect with TopLink of Glassfish?

You should download support package and sample from [here](#).

18. How to set HXTT PDF database in JasperSoft Studio?

1. right-click a project in the Project Explorer and select New > Data Adapter to open the Data Adapters Wizard.
2. In the DataAdapter File window, choose the project where you want to save the data adapter file. This should be the project that contains the report(s) you want to use with your data adapter.
3. Enter a file name for your adapter and click Next.
4. Select Database JDBC Connection as the data adapter type and click Next.
5. Enter a name for your adapter. This name is used when you select an adapter for a report.
6. Enter com.hxtt.sql.pdf.PDFDriver for JDBC Driver
7. Enter jdbc:pdf:/yourDatabasePath for JDBC Driver
8. Click Driver Classpath tab.
9. Click Add button to select the PDF_JDBC40.jar file.

10. Click Finish to create the adapter.

The adapter is saved as an XML file in the project location you selected.

19. How to set HXTT PDF database in Jasper Server?

First, copy the Driver to the JasperReports Server Classpath

Now you need to copy the driver (the PDF_JDBC40.jar file) to the classpath of your application server to enable JasperServer to find it.

In general it's best to copy the driver to the application server's shared library location. Refer to your application server documentation for exact locations.

For example in a JasperServer Bundle install on windows this is located at: C:/Jaspersoft/jasperreports-server-cp-7.1.0/apache-tomcat/lib

After these modifications you will need to restart the application server for this settings to take effect. For information on restarting your server see Chapter 3 of the JasperReport Server Install Guide (is located on the /docs folder of your Jasper Server install path)

1. Log into JasperReport Server from your browser using the jasperadmin or superuser account (e.g.:

http://localhost:8080/jasperserver-pro)

2. Go to View | Repository, Select a folder where you want to create your Data Source (e.g.: /Data Sources). Right click on the folder name in the repository view and from the context menu select called Add Resource and then click on Data Source. Now you are presented with a screen to enter the settings of your Data Source connection

3. Type choose JDBC Data Source. JDBC Driver option choose Other... .

4. JDBC Driver (required): enter com.hxtt.sql.pdf.PDFDriver

5. URL (required): enter jdbc:pdf:/yourDatabasePath .

6. Click Save button.

7. Data Source Name (required): enter a user-friendly name for the driver, for instance, testPDF.

8. Click Save button.

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Released Version Log

Latest feature:

- 2018-10-22 supports aggregate function ARRAY_AGG([DISTINCT] expression), STRING_AGG([DISTINCT] expression[, delimiter]).
- 2018-10-07 provides dbo as a pseudo name for the current schema for JasperSoft tool. The old "." name can still be used too.
- 2018-08-30 provides _CURRENT_ as a pseudo name for the current catalog for JasperSoft tool. The old "." name can still be used too.

2018-08-29 PDF v1.0.021 JDBC4.0 Package(9837KB) JDBC4.1 Package(9841KB) JDBC4.2 Package(9852KB)

- supports all kinds of password security encryption level, which includes 128-bit RC4((Acrobat 6.0 and later), 128-bit AES(Acrobat 7.0 and later), and 256-bit AES(Acrobat X and later).
- supports PDF version from 1.0 to 1.7 .
- supports JSON, JSONB, XML, and ARRAY.
- supports seamlessly url(http, ftp) database in jdbc url and sql.
- supports seamlessly memory-only database in jdbc url and sql for internal data processing, applets, or certain special applications.
- supports seamlessly files and directories in ZIP, GZIP, TAR and BZ2 file formats(.ZIP, .JAR, .TAR, .BZ2, .TGZ, .TAR.GZ, .TAR.BZ2) in jdbc url and sql.
- supports all of four transaction levels.
- supports CREATE DATABASE, CREATE CATALOG, CREATE TABLE, DROP TABLE, ALTER TABLE, CREATE VIEW, DROP VIEW, SELECT, INSERT, UPDATE, DELETE, and FLUSH DATABASE sql.
- Development Documentation is available.
- supports JDBC4.2, JDBC4.1, and JDBC4.0.
- supports JDK1.6.X, JDK1.7.X, or JDK1.8.X .

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Chapter 6. SQL Syntax

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Use ";" to separate multi sql statements. "reserved word" or {v 'reserved word'} is used to quote a column with reserved word name in SQL statement. The HXTT PDF supports using DATE, TIME, TIMESTAMP, GROUP, ORDER, KEY, DESC, SEQUENCE, INCREMENT, MINVALUE, MAXVALUE, CACHE, CHECK, CYCLE, OTHER, SET, INT, UNIQUE, LEVEL, RELEASE, INDEX, TOP, PACK, CALL, CONNECT, START, PRIMARY, COMMENT, TRANSACTION, REFERENCES, and UPDATE directly in SQL, although they're reserved words too.

```
SELECT [ALL | DISTINCT [ ON ( expression [, ...] ) ] ] | DISTINCTROW [TOP n [PERCENT]] select_list [INTO
variable [, ...] | INTO OUTFILE 'outfileName'] FROM table_reference_list [WHERE condition_expression] [[START
WITH initial-condition] CONNECT BY [NOCYCLE] recurse-condition] [group_by_clause] [HAVING
condition_expression] [union_clause] [order_by_clause] [LIMIT [offset,] [limit] ] [FOR UPDATE]
```

```
select_list: { expression [ [AS] columnAlias] | table.* | * } [,...]
```

```
table_reference_list: {table_reference | table_join} [,...]
```

table_reference: { { table_name | subquery | (table_join) | (VALUES expression[, ...]) AS
tableName(columnName[,...]) } [[AS] tableAlias] [pivot_clause] [unpivot_clause]

table_name: { [catalog.]tableName } | {UNC path}

table_join: table_reference join_clause [join_clause,...]

join_clause: [NATURAL] { INNER | { [LEFT | RIGHT | FULL] [OUTER] } } JOIN table_reference [ON
condition_expression | USING(column1,column2,...)]

condition_expression: an expression which should return a boolean value.

pivot_clause: PIVOT (aggregate_function(value_column) FOR pivot_expr IN (column_list)) [AS] tableAlias

unpivot_clause: UNPIVOT (value_column FOR pivot_column IN (column_list)) [AS] tableAlias

group_by_clause: GROUP BY expression [,...] [WITH ROLLUP | CUBE]

union_clause: { UNION | INTERSECT | EXCEPT | MINUS } [ALL] select_statement [union_clause ...]

order_by_clause: ORDER BY expression [ASC|DESC] [,...]

DISTINCT specifies that duplicate rows are discarded. A duplicate row is when each corresponding select_list column has the same value. DISTINCT has no effect on constant value, and pseudo columns(rowid_).

expression: a complicated expression which can include parentheses, logical operator(NOT, AND, OR), positives/minus sign(+, -), arithmetical operator(+,-,*,/,%), string operator(|| (left string concat right string), +(left string concat right string), -(trim left string then concat rightstring), \$(check whether left string is contained in right string), comparison operator(>, >=, =, ==, <=, <, !=, <>), bitwise logical operator(&, |, ~, ^, <<, >>), [NOT] LIKE pattern {escape 'escape_character'},[NOT] ILIKE pattern {escape 'escape_character'}, IS [NOT] NULL, BETWEEN ... AND ..., [NOT] IN, [NOT] EXISTS, [ALL|ANY|SOME] (subquery), [NOT] CASE WHEN expr THEN result [WHEN expr THEN result ...] [ELSE expr] END, CASE expr WHEN compare_expr THEN result [WHEN compare_expr THEN result ...] [ELSE result] END, SQL Escape Syntax({d 'yyyy-mm-dd'}, {t 'hh:mm:ss'}, {ts 'yyyy-mm-dd hh:mm:ss.f...'}, {v 'reserved_word'}, {fn functionExpression}, {escape 'oneEscapeCharacter'}, {"varbinary" 'string'}), function(more than 200), aggregate function(MAX, MIN, AVG, COUNT, SUM, STD, STDDEV), constant(null, true, false, CURRENT_DATE, CURRENT_TIME, CURRENT_TIMESTAMP, date, time, timestamp, number, string), column, parameter(?), subquery(single-row subquery, multirow subquery, multiple-column subquery, inline views, correlated subquery) and so on.

"SELECT select_list" can be used to get some calculated values through an one-row ResultSet. Column can be used in all sql except for "SELECT select_list". Parameter(?) can only be used in PreparedStatement.

SELECT sql is used to query text content information. If you wish to get image, attachment, or document meta data, please let us know.

For instance:

```
select val('123.222')
SELECT top 8 percent * FROM sz9010.page1;
select STRING_AGG(textline,'\r\n') as content from testpdf.page1; /* it will return the content for page 1*/
select * from testpdf.page4 where CoordinateY=120 and Words#>' {1,text}'='Not';
select CONVERT('123',SQL_INTEGER) as a,TTOC({d '1999-10-10'},1) as b, IFNULL(1,33) as c, 123
in(456,123,789,'abc') as d, EXTRACT(DECADE FROM '2001-02-16 20:38:40'), '88'+IIF(3<6,'1','0')
select encode('adsdfsdf');
select decode(encode('adsdfsdf'))+";
```

```

select *,words from testpdf where CoordinateY<=100;
select PageNo,CoordinateX,CoordinateY,textline,array_ndims(words),words,words[1]->'x',words[1]-
>'y',words[1]->'text' from testpdf.page1;
select * from testpdf;
select * from "HXTT JDBC Products Corel Paradox Order Invoice";
select * from "001test";
select * from "001test".Page1;
select * from "001test".Page2;

```

INSERT INTO table_name [[AS] tableAlias] [(column_identifier [,...])] { VALUES (expression [, ...]) | VALUES expression [, ...] | VALUES (expression [, ...]),... | SELECT query | ? }

column_identifier = columnName | "reserved_word" | {v 'reserved_word'}

INSERT sql is used to insert text. You can assign font size and text format through variable([CURRENT_Font](#),[CURRENT_TextFormat](#)).If you wish to insert image or attachment, please let us know.

For instance:

```

insert into testpdf.page1 (textline) values('A demo line');/* inser into page 1, append after the last text line
*/
insert into testpdf (PageNo,CoordinateY,textline) values(1,100,'New demo line for page1');/* inser into
page 1 */
insert into testpdf (PageNo,CoordinateY,textline) values(3,100,'New demo line for page3');/* inser into
page 3 */
insert into testpdf (PageNo,CoordinateY,CoordinateX,textline) values(1,120,50,'Not');
insert into testpdf.page1 (textline) values('Another demo line');
insert into testpdf.page2 (textline) values('demo line for page2');
insert into testpdf (PageNo,CoordinateY,textline) values(3,300,'demo line for page3');
insert into testpdf (PageNo,CoordinateY,CoordinateX,textline) values(3,120,12,'Why');
insert into testpdf (PageNo,CoordinateY,CoordinateX,textline) values(3,120,50,'Not');

```

UPDATE table_name [[AS] tableAlias] SET [column_identifier | (column_identifier,...)] = expression [...] [WHERE condition_expression]

UPDATE sql is used to set text content, if you wish to fill a form in pdf document. If you wish to update image or attachment, please let us know.

For instance:

```

update testpdf.page1 set textline=textline+'?' where CoordinateY<=100;
update testpdf.page3 set Words#>' {1,text}'='not' where CoordinateY=120 and Words#>' {1,text}'='Not';
update testpdf.page3 set textline=textline+'?' where CoordinateY<=100;

```

DELETE FROM table_name [[AS] tableAlias] [WHERE condition_expression]

Removes rows in a table according to condition_expression.

UPDATE sql is used to clear text content, but it will keep still old font information. The following SELECT sql will see an empty string for deleted row

For instance:

```

delete from testpdf.page3; /* remove all textline in page 3*/
delete from testpdf.page1 where textline='A demo line' ;

```

CREATE CATALOG [IF NOT EXISTS] catalogName

Create a subdirectory to contain database files.

For instance:

```
create catalog if not exists data222;
```

CREATE DATABASE [IF NOT EXISTS] databaseName

Create a new PDF document, the URL format must be assigned as a directory, for example,"jdbc:pdf:///usr/data"

```
create database if not exists testpdf;
```

DROP DATABASE [IF EXISTS] compressed-file-name

The DROP DATABASE statement is used to delete a database. IF that database doesn't exist without using IF EXIST, an SQLException will be thrown.

FLUSH DATABASE [IF EXISTS] databaseName

Flush all cached modications to database file.

For instance:

```
flush DATABASE db1;
```

CREATE TABLE [IF NOT EXISTS] table_name [(column_identifier data_type [constraint] [,...] [, constraint_clause [,...]])] [[AS] SELECT query | ?]

data_type: CHAR(n) | CHARACTER(n) | VARCHAR[(n)] | BINARY (n) | VARBINARY (n) | NUMERIC(n1[,n2]) | DEC[IMAL](n1[,n2]) | INT[EGER] [AUTO_INCREMENT] | SMALLINT | FLOAT [(n)] | REAL | DOUBLE | BIT | BOOLEAN | DATE [(dateFormat)] | TIME [(dateFormat)] | TIMESTAMP [(dateFormat)] | LONGVARCHAR [(n)] | LONGVARBINARY [(n)] | JAVA_OBJECT [(n)] | CLOB | BLOB | OTHER(type_name [,n]) | NUMBER[(n1[,n2])]

n, n1,n2: positive integer, n2 can be 0

constraint: [NULL| NOT NULL] [UNIQUE] [DEFAULT expression] [PRIMARY KEY] [COMMENT 'string']

constraint_clause: [CONSTRAINT constraint_name] PRIMARY KEY (column1, column2, . column_n) | CONSTRAINT constraint_name FOREIGN KEY (column1, column2, ... column_n) REFERENCES parent_table (column1, column2, ... column_n) [ON DELETE CASCADE] [ON UPDATE CASCADE] | [CONSTRAINT constraint_name] UNIQUE (column1, column2, . column_n) | CONSTRAINT constraint_name CHECK (column_name condition)

Temporary table is only visible in the current connection.

Table name allows only pageN format, and column(size,rotate) in CREATE TABLE sql is used to set page size and rotate direction. You can assign page size and rotate direction through variable([CURRENT_Page](#)).

For instance:

```
create table if not exists testpdf.page1 (size varchar(2) default 'A5' );
create table if not exists testpdf.page4 (nothing int);
create table if not exists testpdf.page2 select 'A demo line for create page2' as textline;
create table if not exists testpdf.page3 (textline longvarchar) select 'A demo line for create page3';
```

```
create table if not exists testpdf.page4 (textline longvarchar) select 'A demo line for create page4';
```

```
DROP TABLE [IF EXISTS] table_name
```

Removes a table, and its indexes from the database. IF that table doesn't exist without using IF EXIST, an SQLException will be thrown.

If all pages have been dropped, then that PDF file will be removed. You should take care DROP TABLE sql, because the following page 5 will become the new page 4 if you remove a page 4.

For instance:

```
drop table if exists testpdf.page4;
```

```
ALTER TABLE table_name alter_specification [,...]
```

```
alter_specification: {{ADD|MODIFY} column_identifier data_type [constraint]} | DROP column_identifier | RENAME
column_identifier 1 TO column_identifier 2 | RENAME TO table_name2 | ADD constraint_clause
```

Modify column(size,rotate) in ALTER TABLE sql is used to change page size and rotate direction for one page or all pages.

For instance:

```
alter table testpdf.page3 modify size longvarchar default 'A4';/*for page 3*/
alter table testpdf modify size longvarchar default 'A4';/* for all pages*/
```

```
TRUNCATE TABLE [IF EXISTS] table_name
```

Remove all table rows.

Warning: that page will become a blank page without any text, image, or attachment).

For instance:

```
truncate table testpdf.page3;/* page 3 become a blank page with nothing*/
```

```
LOCK TABLE table_name
```

lock the table. Returns 1 if success, 0 if failed to lock a table.

For instance:

```
lock table page2;
```

```
UNLOCK TABLE table_name
```

unlock the table. Returns 1 if success, 0 if failed to unlock a table.

For instance:

```
unlock table page2;
```

```
REINDEX {ALL | indexFileName[,...]} ON table_name
```

```
CREATE [OR REPLACE] [ TEMP | TEMPORARY ] VIEW table [ ( column_identifier [...] ) ] [AS ] SELECT query
```

Creates a virtual table whose contents (columns and rows) are defined by a query. Temporary view is only visible in the current connection.

For instance:

```
create or replace temporary view abcv (aaa) select FEC_ANAL FROM ANALISIS;
```

DROP VIEW [IF EXISTS] table

Drop a virtual table.

For instance:

```
drop view if exists abcv;
```

```
CREATE SEQUENCE [IF NOT EXISTS] sequence_name [AS {INT|SMALLINT|TINYINT|BIGINT}] [START  
[WITH] n] [INCREMENT [BY] n] [MINVALUE n | NO MINVALUE] [ MAXVALUE n | NO MAXVALUE ] [  
CACHE n | NO CACHE] [ [ NO ] CYCLE ]
```

sequence_name: [catalog.]sequenceName

The optional clause `START WITH n` allows the sequence to begin anywhere. The default starting value is minvalue for ascending sequences and maxvalue for descending ones. The optional clause `INCREMENT BY n` specifies which value is added to the current sequence value to create a new value. A positive value will make an ascending sequence, a negative one a descending sequence. The default value is 1. The optional clause `MINVALUE n` determines the minimum value a sequence can generate. If this clause is not supplied or `NO MINVALUE` is specified, then defaults will be used. The defaults are 1 and -128(-32768,0x80000000,0x8000000000000000L) for ascending and descending sequences, respectively. The optional clause `MAXVALUE n` determines the maximum value for the sequence. If this clause is not supplied or `NO MAXVALUE` is specified, then default values will be used. The defaults are 127(32767,0x7fffffff,0x7fffffffL) and -1 for ascending and descending sequences, respectively. The optional clause `CACHE cache` specifies how many sequence numbers are to be preallocated and stored in memory for faster access. The minimum value is 1 (only one value can be generated at a time, i.e., no cache), and this is also the default. The maximum value for cache is 65535. The `CYCLE` option allows the sequence to wrap around when the maxvalue or minvalue has been reached by an ascending or descending sequence respectively. If the limit is reached, the next number generated will be the minvalue or maxvalue, respectively. If `NO CYCLE` is specified, any calls to nextval after the sequence has reached its maximum value will throw an exception. If neither `CYCLE` or `NO CYCLE` are specified, `NO CYCLE` is the default.

For instance:

```
create sequence if not exists userID start WITH 100 increment by 2 maxvalue 2000 cache 5 cycle;
```

DROP SEQUENCE [IF EXISTS] sequence_name

Removes a sequence from the database. IF that sequence doesn't exist without using IF EXIST, an SQLException will be thrown.

For instance:

```
drop sequence if exists userID;
```

```
ALTER SEQUENCE sequence_name [AS {INT|SMALLINT|TINYINT|BIGINT}] [RESTART [WITH] n]  
[INCREMENT [BY] n] [MINVALUE n | NO MINVALUE] [ MAXVALUE n | NO MAXVALUE ] [ CACHE n | NO  
CACHE] [ [ NO ] CYCLE ]
```

ALTER SEQUENCE changes the parameters of an existing sequence generator. Any parameter not specifically set in the ALTER SEQUENCE command retains its prior setting.

For instance:

```
alter sequence userID restart WITH 100 increment by 1 maxvalue 5000;
```

SET TRANSACTION transaction_mode [, ...]

transaction_mode: { ISOLATION LEVEL {READ UNCOMMITTED | READ COMMITTED | REPEATABLE READ | SERIALIZABLE } | { READ WRITE | READ ONLY } }

Sets the transaction characteristics of the current transaction. It effects any subsequent transactions in the same connection. java.sql.Connection.setTransactionIsolation(int level) and java.sql.Connection.setReadOnly(boolean readOnly) can do the same task.

For instance:

```
SET TRANSACTION ISOLATION LEVEL SERIALIZABLE;
```

START TRANSACTION [transaction_mode [, ...]]

Begins a new transaction block. java.sql.Connection.setAutoCommit(false), java.sql.Connection.setTransactionIsolation(int level), and java.sql.Connection.setReadOnly(boolean readOnly) can do the same task.

For instance:

```
START TRANSACTION;
```

COMMIT [WORK]

Terminates the current transaction and makes all changes under the transaction persistent. It commits the changes to the database. java.sql.Connection.commit() can do the same task.

For instance:

```
commit;
```

ROLLBACK [WORK] [TO [SAVEPOINT] savepoint_name]

Without savepoint_name, terminates the current transaction and rescinds all changes made under the transaction. It rolls back the changes to the database. With savepoint_name, rolls back all commands that were executed after the savepoint was established. java.sql.Connection.rollback() can do the same task of ROLLBACK [WORK] sql.

For instance:

```
rollback;
```

SAVEPOINT savepoint_name

SAVEPOINT establishes a new savepoint within the current transaction. java.sql.Connection.setSavepoint(String name) and java.sql.Connection.setSavepoint() can do the same task.

For instance:

```
savepoint t1;
```

```
RELEASE SAVEPOINT savepoint_name
```

Destroys a savepoint previously defined in the current transaction. `java.sql.Connection.releaseSavepoint(Savepoint savepoint)` can do the same task.

For instance:

```
release savepoint t1;
```

```
{ [ ? = ] call procedure_name [ ( ? [, ? [, ... ] ] ) ] }
```

`java.sql.CallableStatement` can be used to call stored procedure.

For instance:

```
{call myview(?)};
```

Pseudo Tables

`PageN`(`n` is an int page number from 1 to `n`) is a pseudo table name to access PDF page. PDF filename can be used to access all pages.

The `INFORMATION_SCHEMA` implementation include `SCHEMATA`, `TABLES`, `COLUMNS`, and `DATABASES`. For instance,

```
SELECT TABLE_SCHEMA FROM INFORMATION_SCHEMA.SCHEMATA;
SELECT * FROM INFORMATION_SCHEMA.TABLES WHERE TABLE_TYPE='TABLE';
SELECT * FROM INFORMATION_SCHEMA.TABLES WHERE TABLE_TYPE='TABLE' AND
TABLE_SCHEMA='SCHEMA-NAME';
SELECT column_name,data_type,column_default,is_nullable FROM information_schema.tables AS t JOIN
information_schema.columns AS c ON t.table_catalog=c.table_catalog AND t.table_schem=c.table_schem AND
t.table_name=c.table_name WHERE t.table_name='TABLE-NAME';
SELECT column_name, data_type, character_maximum_length, numeric_precision, column_default, is_nullable
FROM information_schema.tables as t JOIN information_schema.columns AS c ON t.table_catalog=c.table_catalog
AND t.table_schem=c.table_schem AND t.table_name=c.table_name WHERE c.table_schema='TABLE-SCHEMA'
AND c.table_name='TABLE-NAME';
```

The `INFORMATION_PARSER.sql` provides SQL syntax analysis feature. For instance,

```
sql = "SELECT * FROM INFORMATION_PARSER.sql WHERE SQL_COMMAND = ? and
OBJECT_TYPE='TABLE'";
sql = "SELECT SQL_TYPE,OBJECT_TYPE,OBJECT_NAME FROM INFORMATION_PARSER.SQL WHERE
SQL_COMMAND= ?";

pstmt = con.prepareStatement(sql);

set a=3;");
//      pstmt.setString(1, "select * from a.test out; SELECT efg,3+2 as dd FROM ABC;update a
//      pstmt.setString(1, "select EFG from a.test, test2 where test.b=test2.c");
from abc) as o;");
//      pstmt.setString(1, "select EFG from (select * from abc);select EFG from (select *
SELECT A FROM B UNION SELECT C FROM D;");
ResultSet rs = pstmt.executeQuery();
```

Pseudo Columns

PageNo: the page number

CoordinateX: the coordinate of x axis for text

CoordinateY: the coordinate of y axis for text

textline: a text line

words: a JOSN array contains some words for a text line.

For instance, select PageNo,CoordinateX,CoordinateY,textline,words,words#>' {0}',words->0->'x',words#>' {0,x}',words#>' {0,y}',words#>' {0,text}' from testpdf.page3;

`_rowid_`, is a pseudo column as primary key. A `_rowid_` identifies a row in a table.

`level` is a pseudo column that can be used in hierarchical queries (start with `.. connect by`). For records that appear in the root, `level` is 1, for their (direct) children, `level` is 2 and so on.

Pseudo Variable

`CURRENT_DATE` is a pseudo variable which returns the current date.

`CURRENT_TIME` is a pseudo variable which returns the current time.

`CURRENT_TIMESTAMP` is a pseudo variable which returns the current timestamp.

`_CURRENT_` is a pseudo catalog(or schema name) which returns the current catalog (or schema).

`CURRENT_Password` is a pseudo variable which used to set password for pdf document

```
DECLARE CURRENT_Password '{"testpassword1":"password2"}';
set CURRENT_Password={'p189l.pdf":"p189"}; /*same result*/
set CURRENT_Password={'password256":"password256"}';
set CURRENT_Password={'passwordrc4":"passwordrc4"}';
set CURRENT_Password={'testcrypt.pdf":"password256"}';
set CURRENT_Password={'p189l":null}'; /* remove it from map*/
```

`CURRENT_Page` is a pseudo variable which used to set page size and rotate direction for pdf page

Size: A0, A1, A2, A3, A4, A5, A6, Legal, Letter, nxn (for instance, 8.5x1.4 means 8.5" x 14")

Rotate integer (Optional; inheritable) The number of degrees by which the page shall be rotated clockwise when displayed or printed. The value shall be a multiple of 90. Default value: 0.

```
select CURRENT_Page;
DECLARE _Page_Demo '{"size":"A4"}';
set _Page_Demo.size='A2';
set CURRENT_Page=_Page_Demo;
DECLARE CURRENT_Page '{"size":"A4","rotate":0}';
select CURRENT_Page;
```

`CURRENT_Font` is a pseudo variable which used to set font information for current text operation

Name: Courier, Courier-Bold, Courier-BoldOblique, Courier-Oblique, Helvetica, Helvetica-Bold, Helvetica-BoldOblique, Helvetica-Oblique, Times-Roman, Times-Bold, Times-BoldItalic, Times-Italic, and so on

```
DECLARE CURRENT_Font '{"name":"Courier"}';
DECLARE _Font_Demo '{"name":"Times-Roman"}';
set CURRENT_Font=_Font_Demo;
```

`CURRENT_TextFormat` is a pseudo variable which used to set text format information for current text operation

```
DECLARE CURRENT_TextFormat '{"fontSize":12}';
```

Split Multivalue Column Into Rows

If each row has multiple multi value columns, a special subquery table can be used in special join sql. For instance,

```
select User,Role from aTable,(select split(aTable.Roles,',') as Role) AS bTable;
```

```
select User,Role,Year from aTable,(select split(aTable.Roles,',') as Role,split(aTable.Years,',') as Year) AS bTable;
```

```
DECLARE variable_name[,...] type [DEFAULT expression]
```

```
DECLARE var_name[,...] 'jsonText'
```

Variable is visible only in the same connection.

For instance:

```
DECLARE abc CHAR(20) DEFAULT 'Hello';
DECLARE x, y INT;
DECLARE _Page_Demo '{"size":"A4","rotate":0}';
select _Page_Demo; select _Page_Demo.size;
```

```
SET variable_name[.propertyName] = expression [,...]
```

expression can be a complicated expression. BTW, INTO variable[,...] clause of SELECT syntax can set selected columns directly into variables.

For instance:

```
SET x = 1+int(55.5),y=2;
SELECT name,id INTO x,y FROM table1 WHERE id=33;
SELECT date(),pi() INTO x,y;
SELECT id,data INTO x,y FROM test.t1 LIMIT 1;
set _Page_Demo.size='A2';
```

Comment Syntax

```
#one-line comment
```

```
--one-line comment
```

```
/*multiline comment*/
```

For instance:

```
select /* column list */ from test;#This is a select sql.
```

SQL States

SQL State	Description
01001	Cursor operation conflict
01427	single-row subquery returns more than one row
01428	single-column subquery returns more than one column
01429	subquery returns mismatch column number
01436	CONNECT BY loop in user data
01430	single-row subquery returns none row
07006	Restricted data type attribute violation

08000	Connection exception
08003	Connection not open
08007	Connection failure during transaction
08S01	Remote database access failure
0A000	Feature not supported
0A001	Multiple server transactions
21S01	Insert value list does not match column list
22000	Data exception
22019	Invalid escape character
22023	Invalid parameter value
23000	Integrity constraint violation
24000	Invalid cursor state
25000	Invalid transaction state
26000	Invalid SQL statement name
28000	Access denied error
2A000	Direct SQL syntax error or access rule violation
2D000	Invalid transaction termination
2E000	Invalid connection name
34000	Invalid cursor name
34102	Invalid variable name
34103	Invalid function name
34104	Invalid index file name
3C000	Duplicate cursor name
3D000	Invalid catalog name
3F000	Invalid schema name
40000	Transaction rollback
42000	Syntax error or access violation
42001	Syntax error
42002	Access violation
42003	Statement has been closed
60000	System errors
99999	Catch all others
C0100	Unknown CodePageID
C0101	Unknown File Format
C0102	Unknown Table Version
C0103	Unknown Index Version
C0104	Corrupt Index File
C0105	Invalid Record Number
C0106	Convert dirty data into null value
S0001	Base table or view already exists

S0021	Index already exists
S0022	Column not found
S1002	Invalid column number
S1009	Invalid Argument value
S1T00	Timeout expired
HY008	Operation canceled

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Chapter 2. Installation

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System Requirements

HXTT PDF packages include a Type 4 JDBC driver. Type 4 indicates that the driver is written in Pure Java, and communicates in the database system's own network protocol. Because of this, the driver is platform independent; once compiled, the driver can be used on any system. HXTT PDF can run on any platforms with Java VM, which includes Microsoft Windows, Novell Netware, OS2, UNIX, and LINUX. HXTT PDF supports JDK1.6.X, JDK1.7.X, JDK1.8.X, and JDK1.9.X. HXTT PDF includes a database engine which can support multi-user access. It supports { UNION | INTERSECT | EXCEPT | MINUS } [ALL] query , INNER JOIN, FULL JOIN, LEFT JOIN, RIGHT JOIN, NATURAL JOIN, CROSS JOIN, and subquery which includes single-row subquery, multirow subquery, multiple-column subquery, inline views, and correlated subquery.

Setting the CLASSPATH

When java loads any class, it searches a list known as the classpath. This is a list of directories where classes are placed, or a list of jar files (archives containing classes and other resources) or both. HXTT PDF driver is a Type 4 driver. You can do this in many different methods, but the most command are:

1. Setting the CLASSPATH environment variable.
2. putting it on the command line using the -cp parameter.
3. placing it in the JVM's lib/ext directory.
4. extract all files in jar file into the directory of your application.

You can know detailed information about "Setting the Classpath" from your JDK Tools and Utilities. Let's use JDBC4.0 package as a simple sample. To put PDF_JDBC40.jar into your class path, you should use "export CLASSPATH=/usr/share/lib/PDF_JDBC40.jar:\$CLASSPATH" on Solaris and Linux, and "SET CLASSPATH=javalib\PDF_JDBC40.jar;%classpath%" on Windows.

Loading the Driver

Any source that uses JDBC needs to import the java.sql package by using " import java.sql.*;".

HXTT PDF driver' name is **com.hxtt.sql.pdf.PDFDriver**, and you can uses it without involving hard coding the driver into your code. You do this by setting the jdbc.drivers system property. For example, for command line apps you can use:

```
java -Djdbc.drivers=com.hxtt.sql.pdf.PDFDriver yourApp
```

Then, the JVM upon startup will load the drivers automatically. Some applications (JBoss, Tomcat etc) support a .properties file which they use to save putting this on the command line.

The second method is the most common and involves you loading the driver yourself. It's simple:

```
Class.forName("com.hxtt.sql.pdf.PDFDriver");
```

From then on you can get connections from DriverManager.

Note: If Class.forName() throws ClassNotFoundException, you should check your classpath.

Connecting to the Database

After the driver has been registered with the DriverManager, you can obtain a Connection instance that is connected to a

particular database by calling `DriverManager.getConnection()`. With JDBC, a database is represented by a URL (Uniform Resource Locator).

Embedded:

`jdbc:pdf:[//]/[DatabasePath][?prop1=value1[;prop2=value2]]` (You can omit that `"/"` characters sometimes)

For example:

```
"jdbc:pdf:/"
"jdbc:pdf:/c:/data" for Windows driver
"jdbc:pdf:///c:/data" for Windows driver
"jdbc:pdf:///usr/data" for unix or linux
"jdbc:pdf://192.168.10.2/sharedir" for UNC path
"jdbc:pdf:/./data"
"jdbc:pdf:/./data/testabc.pdf"
```

Remote Access (client/server mode):

`jdbc:pdf://host:port/[DatabasePath]`

For example: `"jdbc:pdf://domain.com:3099/c:/data"` if one PDFServer is run on the 3099 port of domain.com

`"jdbc:pdf://domain.com:3099/c:/data/mydata.pdf"`

Compressed Database: (.ZIP, .JAR, .GZ, .TAR, .BZ2, .TGZ, .TAR.GZ, .TAR.BZ2)

`jdbc` url format is the same as embedded url and remote url.

For example:

`"jdbc:pdf:/c:/test/testpdf.zip"`

Memory-only Database:

`jdbc:pdf:/memory/`

URL Database: (http protocol, https protocol, ftp protocol, sftp protocol)

`jdbc:pdf:http://httpURL`

`jdbc:pdf:https://httpsURL`

`jdbc:pdf:ftp://ftpURL`

`jdbc:pdf:sftp://sftpURL`

For example:

`"jdbc:pdf:http://www.hxtt.com/test"` //Note: FTP site's

user/password should be set in ftpURL, and cannot be set in JDBC connection property because user/password JDBC connection property belongs to server/client connection.

`"jdbc:pdf:sftp://testa:123456@localhost"`

SAMBA Database: (smb protocol)

`jdbc:pdf:smb://[[[domain;]username[:password]@]server[:port]/[[share/[dir/]file]]][?[param=value]]`

For example:

`"jdbc:pdf:smb://test1:123@100.100.13.94/pdffiles/zone"` //Note:

SAMBA user/password should be set in SMB url, and cannot be set in JDBC connection property because user/password JDBC connection property belongs to server/client connection.

UNC path JDBC url:

`jdbc:pdf:/uncpath`

`jdbc:pdf:///uncpath`

For example:

`"jdbc:pdf://PC17\c$\values"`

`"jdbc:pdf://PC17\val"`

Free JDBC url: (Warning: only use it for special project)

`jdbc:pdf:/"` or `"jdbc:pdf:///"`. Then you can use some full UNC path names in SQL to visit anywhere where your Java VM has right to access.

For instance:

```
select * from \\amd2500\e$\pdffiles\test;
select * from "\\amd2500\d$\pdffiles".test;
select * from ".".test;
```

HXTT PDF supports seamlessly data mining on memory-only table, physical table, url table, compressed table, SAMBA table in a sql. More details is in Advanced Programming chapter.

To connect, you need to get a Connection instance from JDBC. To do this, you use the `DriverManager.getConnection()` method:

```
Connection con = DriverManager.getConnection(url, properties);
```

There are a few different signatures for the `getConnection()` method. You should see the API documentation that comes with your JDK for more specific information on how to use them. You can specify additional properties to the JDBC driver by placing them in a `java.util.Properties` instance and passing that instance to the `DriverManager` when you connect.

Property Name	Definition	Default Value
---------------	------------	---------------

host	The remote host on which one PDFServer is running	null
port	The port on which one PDFServer is listening	null
serverType	The type of PDFServer on the remote host	null
user	The user to connect as	null
password	The password to use when connecting	null
charSet	To specify a Character Encoding Scheme other than the client default. You can find a Supported Encodings list of file:///c:/jdk1.2/docs/guide/internat/encoding.doc.html. Cp895(Czech MS - DOS 895), Cp620(Polish MS - DOS 620) and Mazovia are extra supported although JVM doesn't support those. PDF driver will detect and translate automatically between Java VM and PDF format	null
lockType	To specify a compatible lock for other applications. You needn't set that property now since there is no lock from other applications.	null
lockTimeout	To specify PDF driver's timeout in milliseconds to wait until processes released record lock or table lock. 0 means a default value, and <0 means no wait.	1000
refreshInterval	To specify a refresh interval setting in seconds for FTP/SFTP database file which determines how long it to discard the content cache.	60
cryptType	To specify a crypt type for Table Encryption and Column Level Encryption. All new created table in this connection will become crypted table. You can use DES, TRIDES, BLOWFISH, and AES now. Because PDF format has embedded encryption, you needn't that settig.	null
cryptKey	To specify a crypt key. Without encrypt key, CREATE TABLE won't create crypted table. Because PDF format has embedded encryption, you needn't that settig.	null
storeCryptKey	Indicates whether crypt key is stored in crypted table. If stored, crypted table can be opened automatically in any connection without predefined crypt properites. If not stored, cryptd table can only be opened with the correct key, and none include us can help you in cracking your data without the correct key. Because PDF format has embedded encryption, you needn't that settig.	false
tmpdir	Indicates whether set a temp directory, Default: the value of JVM's "java.io.tmpdir" property. If that value is incorrect, using the directory of JDBC url. <code>_memory_</code> means large data in memory.	null
delayedClose	Indicates the delayed seconds for close transaction. That option is used to avoid frequent close/open table operations for following sqls. Automatic temporary index is disabled when <code>delayedClose<=60s</code> . You can use 0~120 seconds. Default: 3.	null
maxIdleTime	Indicates the max idle time in minute for remote connection. That option is mainly used to avoid closing automatically idle remote connection for connection pool. Embedded idle connectoin won't be closed automatically except for garbage collection. You can use 1~1440 minutes. Default: 30.	null
maxCacheSize	Indicates the max memory utilization for per table on automatic temporary index or matched result cache. You can use 16~65536 kilo bytes. Default: 1024.	null
otherExtension	Indicates whether PDF driver supports other extension beside 'pdf'. You can use comma to assign more than one extension.	PDF
	Indicates where PDF driver can find font files to display text. You can use comma to assign more than one path. Default is null, and PDF driver will use only embedded font. If you use empty value(""), PDF will search default font directory for MS Windows(WINDIR/Fonts), Mac OS(/Library/Fonts,	

pathes4font	/System/Library/Fonts, /Network/Library/Fonts, /System Folder/Fonts, /Users//Library/Fonts), Linux(/usr/share/fonts/truetype, /usr/share/fonts/truetype, /usr/share/fonts, /usr/X11R6/lib/X11/fonts/ttfonts, /usr/X11R6/lib/X11/fonts), Unix(/usr/share/fonts, /usr/local/share/fonts, user.home//.fonts)	null
locale	locale is used to specify a default local for parse. You can use CANADA, CANADA_FRENCH, CHINA, CHINESE, ENGLISH, FRANCE, FRENCH, GERMAN, GERMANY, ITALIAN, ITALY, JAPAN, JAPANESE, KOREA, KOREAN, PRC, ROOT, SIMPLIFIED_CHINESE, TAIWAN, TRADITIONAL_CHINESE, UK, or US.	null
dateFormat	dateFormat is used to specify a default parse sequence of date(Default: 'yyyy-MM-dd') format.	yyyy-MM-dd
timeFormat	timeFormat is used to specify a default parse sequence of time(Default: 'hh:mm:ss') format.	hh:mm:ss
timestampFormat	timestampFormat is used to specify a default parse sequence of timestamp(Default: 'yyyy-MM-dd hh:mm:ss') format.	yyyy-MM-dd hh:mm:ss
decimalFormat	decimalFormat is used to specify a default parse sequence of decimal number format.	null
decimalSeparator	decimalSeparator is used to specify a default character for decimal sign. Different for French, etc.	null
groupingSeparator	groupingSeparator is used to specify a default character for thousands separator. Different for French, etc.	null
ODBCTrimBehavior	Indicates whether works like MS Access ODBC driver to ignore tail space characters in condition expression. You can use null, true, false	false
caseInsensitive	Indicates whether is case insentive for string comparison. You can use null, true, false	false
emptyDecimalAsZero	Indicates whether returns empty decimal as zero value. You can use null, true, false	false
emptyStringAsNull	Indicates whether returns empty string as null value. You can use null, true, false	true

When your code then tries to open a Connection, and you get a No driver available SQLException being thrown, this is probably caused by the driver not being in the class path, or the JDBC url not being correct.

To close the database connection, simply call the close() method to the Connection:

```
con.close();
```

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Chapter 3. Statement

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2. [Issuing a Query](#)
3. [Performing Updates](#)
4. [Creating and Modifying Database Objects](#)

Creating a Statement Instance

Once a Connection is established, it can be used to create Statements and PreparedStatement. Any time you want to issue SQL statements to the database, you require a Statement or PreparedStatement instance. To get a Statement object, you call the createStatement() method on the Connection object you have retrieved via the DriverManager.getConnection() method. Once you have a Statement object, you can execute a SELECT query by calling the executeQuery(String SQL) method with the SQL you want to use. To update data in the database use the executeUpdate(String SQL) method. This method returns the number of rows affected by the update statement. If you don't know ahead of time whether the SQL statement will be a SELECT or an UPDATE/INSERT, then you can use the execute(String SQL) method. This method will return true if the SQL query was a SELECT, or false if an UPDATE/INSERT/DELETE query. If the query was a SELECT query, you can retrieve the results by calling the getResultSet() method. If the query was an UPDATE/INSERT/DELETE query, you can retrieve the affected rows count by calling getUpdateCount() on the Statement instance. This is explained in the following sections.

Issuing a Query

A simple sample can illustrates more than some words:

```
String sql = "select *,words from testpdf.page1;";
Connection con = DriverManager.getConnection(url, "", "");

Statement stmt = con.createStatement();

ResultSet rs = stmt.executeQuery(sql);

ResultSetMetaData resultSetMetaData = rs.getMetaData();
int iNumCols = resultSetMetaData.getColumnCount();
for (int i = 1; i <= iNumCols; i++) {
    System.out.println(resultSetMetaData.getColumnLabel(i)
        + " " +
        resultSetMetaData.getColumnTypeName(i));
}

Object colval;
while (rs.next()) {
    for (int i = 1; i <= iNumCols; i++) {
        colval = rs.getObject(i);
        System.out.print(colval + " ");
    }
    System.out.println();
}

rs.close();
stmt.close();
con.close();
```

This example issues the same query as before but uses a PreparedStatement and a bind value in the query.

```
String sql = "select *,words from testpdf where PageNo>?;";
Connection con = DriverManager.getConnection(url, "", "");
PreparedStatement stmt = con.prepareStatement(sql);

stmt.setInt(1, 0);

ResultSet rs = stmt.executeQuery();
```

```

ResultSetMetaData resultSetMetaData = rs.getMetaData();
int iNumCols = resultSetMetaData.getColumnCount();
for (int i = 1; i <= iNumCols; i++) {
    System.out.println(resultSetMetaData.getColumnLabel(i)
        + " " +
        resultSetMetaData.getColumnTypeName(i));
}

Object colval;
while (rs.next()) {
    for (int i = 1; i <= iNumCols; i++) {
        colval = rs.getObject(i);
        System.out.print(colval + " ");
    }
    System.out.println();
}

rs.close();
stmt.close();
con.close();

```

You can use a single Statement instance as many times as you want. You could create one as soon as you open the connection and use it for the connection's lifetime. But you have to remember that only one ResultSet can exist per Statement or PreparedStatement at a given time. When you are done using the Statement or PreparedStatement, you should close it.

Before reading any values from ResultSet, you have to call next(). This returns true if there is a result, but more importantly, it prepares the row for processing. Under the JDBC specification, you should access a column only once. It is safest to stick to this rule, although the HXTT PDF driver will allow you to access a column as many times as you want. You should close a ResultSet by calling close() once you have finished using it too. Once you make another query with the Statement used to create a ResultSet, the currently open ResultSet instance is closed automatically. The HXTT PDF driver supports updatable result sets, but an updatable query can only span one table (i.e. no joins).

Performing Updates

To change data (perform an INSERT, UPDATE, or DELETE), you should use the executeUpdate() method. This method is similar to the method executeQuery() used to issue a SELECT statement, but it doesn't return a ResultSet; instead it returns the number of rows affected by the INSERT, UPDATE, or DELETE statement. This example will issue a simple UPDATE statement and print out the number of rows updated.

```

String sql="update testpdf.page3 set Words#>'{1,text}'='not' where CoordinateY=120 and
Words#>'{1,text}'='Not';";

Connection con = DriverManager.getConnection(url, "", "");

Statement stmt=con.createStatement();

int updateCount=stmt.executeUpdate(sql);
System.out.println(sql+" : "+updateCount);

stmt.close();
con.close();

```

Creating and Modifying Database Objects

To create, modify or drop a database object like a table, index, or view, you should use the execute() method. This method is similar to the method executeUpdate(), but it doesn't return a result. This example will drop a table.

```

String sql="drop table page4";//If you remove page 4, then the following page 5 will
become page 4.

Connection con = DriverManager.getConnection(url, "", "");

Statement stmt=con.createStatement();

```

```
stmt.execute(sql);  
  
stmt.close();  
con.close();
```

The HXTT PDF driver can create, modify or drop a database object like a table, database, or view through `executeUpdate()`, but the returned result is unexpectable. For instance, dropping a table can return 0(dropped nothing), 1(only one table file), 2(two table files, or one table files and one index file), 3, 4, and so on. The returned result of `executeUpdate()` is valuable when it creates something with IF NOT EXISTS clause, or drops something with IF EXISTS clause. This example will drop a test table if that table exists.

```
String sql="drop table if exists page4";//If you remove page 4, then the following  
page 5 will become page 4.  
  
Connection con = DriverManager.getConnection(url, "", "");  
  
Statement stmt=con.createStatement();  
  
boolean droppedFlag=stmt.executeUpdate(sql)!=0;  
  
stmt.close();  
con.close();
```

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Chapter 4. ResultSet

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2. [Providing Performance Hints](#)
3. [Performing Updates](#)
4. [Serializing ResultSet](#)

ResultSet Overview

A `ResultSet` is a Java object that contains the results of executing an SQL query. In other words, it contains the rows that satisfy the conditions of the query. The data stored in a `ResultSet` object is retrieved through a set of get methods that allows access to the various columns of the current row. The `ResultSet.next` method is used to move to the next row of the `ResultSet`, making it the current row.

A `ResultSet` object maintains a cursor, which points to its current row of data. The cursor moves down one row each time the method `next` is called. When a `ResultSet` object is first created, the cursor is positioned before the first row, so the first call to the `next` method puts the cursor on the first row, making it the current row. `ResultSet` rows can be retrieved in sequence from top to bottom as the cursor moves down one row with each successive call to the method `next`. A scrollable result set's cursor can move both forward and backward as well as to a particular row. The following methods move the cursor backward, to the first row, to the last row, to a particular row number, to a specified number of rows from the current row, and so on: `previous`, `first`, `last`, `absolute`, `relative`, `afterLast`, and `beforeFirst`. As with scrollability, making a `ResultSet` object updatable increases overhead and should be done only when necessary. That said, it is often more convenient to make updates programmatically, and that can only be done if a result set is made updatable.

The HXTT PDF driver supports scrollable updatable result set.

Providing Performance Hints

The number of rows that should be fetched from the database each time new rows are needed. The number of rows to be fetched is called the fetch size, and it can be set by two different methods: `Statement.setFetchSize` and `ResultSet.setFetchSize`. The statement that creates a `ResultSet` object sets the default fetch size for that `ResultSet` object, using the `Statement` method `setFetchSize`. The following code fragment sets the fetch size for the `ResultSet` object `rs` to 10. Until the fetch size is changed, any result set created by the `Statement` object `stmt` will automatically have a fetch size of 10.

```
Statement stmt = con.createStatement();
stmt.setFetchSize(10);
ResultSet rs = stmt.executeQuery("SELECT * FROM test");
```

A result set can, at any time, change its default fetch size by setting a new fetch size with the `ResultSet` version of the method `setFetchSize`. Continuing from the previous code fragment, the following line of code changes the fetch size of `rs` to 50:

```
stmt.setFetchSize(50);
```

Normally the most efficient fetch size is already the default for the HXTT PDF driver. The method `setFetchSize` simply allows a programmer to experiment to see if a certain fetch size is more efficient than the default for a particular application.

Performing Updates

A `ResultSet` object may be updated (have its rows modified, inserted, or deleted) programmatically if its concurrency type is `CONCUR_UPDATABLE`. The following example demonstrates show how to update, delete, and insert data.

```

PreparedStatement stmt = con.prepareStatement(
    "select PageNo,CoordinateX,CoordinateY,textline from test where PageNo=3",
    ResultSet.TYPE_SCROLL_SENSITIVE, ResultSet.CONCUR_UPDATABLE);

stmt.setFetchSize(12);

stmt.setDouble(1, 0);
ResultSet rs = stmt.executeQuery();

ResultSetMetaData resultSetMetaData = rs.getMetaData();
int iNumCols = resultSetMetaData.getColumnCount();
for (int i = 1; i <= iNumCols; i++) {
    System.out.println(resultSetMetaData.getColumnLabel(i));
}

Object colval;
while (rs.next()) {
    for (int i = 1; i <= iNumCols; i++) {
        colval = rs.getObject(i);
        System.out.print(colval + " ");
    }
    System.out.println();
}

rs.first();
rs.relative(5);
CoordinateY rs.updateString("textline", "eeee333ee3");//A hint: All of PageNo,CoordinateX, and
rs.updateRow();

rs.absolute(6);
rs.deleteRow();

rs.relative(-2);
rs.refreshRow();

rs.moveToInsertRow();
rs.updateInt(1, 3);//PageNo
rs.updateFloat("CoordinateX", 12.0f);
rs.updateFloat("CoordinateY", 100.0f);
rs.updateObject("words", "abc" + (new java.sql.Time(System.currentTimeMillis())));
rs.insertRow();
rs.moveToCurrentRow();

System.out.println("After be updated:");

rs.beforeFirst();
while (rs.next()) {
    for (int i = 1; i <= iNumCols; i++) {
        colval = rs.getObject(i);
        System.out.print(colval + " ");
    }
    System.out.println();
}

rs.close();
stmt.close();
con.close();

```

Serializing ResultSet

The HXTT PDF driver's result set is Serializable.

```

// serialize the resultSet
java.io.FileOutputStream fileOutputStream = new java.io.FileOutputStream("testrs.tmp");
java.io.ObjectOutputStream objectOutputStream = new
java.io.ObjectOutputStream(fileOutputStream);
objectOutputStream.writeObject(rs);
objectOutputStream.flush();

rs.close();
rs = null;

```

```
// deserialize the resultSet
java.io.FileInputStream fileInputStream = new java.io.FileInputStream("testrs.tmp");
java.io.ObjectInputStream objectInputStream = new
java.io.ObjectInputStream(fileInputStream);
rs = (ResultSet) objectInputStream.readObject();
```

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Chapter 5. Advanced Programming

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Sending Very Large IN Parameters

The methods `setBytes`, `setString`, `setBinaryStream`, `setAsciiStream`, `setCharacterStream`, `setBlob`, and `setClob` are capable of sending unlimited amounts of data. The following code illustrates using a stream to send the contents of a file as an IN parameter.

```
String sql="update testpdf.page3 set Words#>'{1,text}'='not' where CoordinateY=? and
Words#>'{1,text}'='Not';";
java.sql.PreparedStatement pstmt = con.prepareStatement(sql);

java.io.File file = new java.io.File(dir+"/somechar.txt");
int fileLength =(int) file.length();
java.io.InputStream fin = new java.io.FileInputStream(file);
pstmt.setFloat(1,120);
pstmt.executeUpdate();
pstmt.close();
```

Encryption

`ENCRYPT(content,cKey,cCryptMethod)`: Returns a crypted byte[]. `cCryptMethod` should be 'DES', 'TRIDES', or 'BLOWFISH' now. `ENCRYPT` function is used for `VARBINARY` column.

`DECRYPT(content,cKey,cCryptMethod)`: Returns a decrypted byte[]. `cCryptMethod` should be 'DES', 'TRIDES', or 'BLOWFISH' now.

`ENCODE(content)`: Encodes a BASE64 encoding string.

`DECODE(content)`: Returns a byte[] from a BASE64 string.

`ENCODE(content,cKey,cCryptMethod)`: Crypts and encodes content. `cCryptMethod` should be 'DES', 'TRIDES', or 'BLOWFISH'. `ENCRYPT` function is used for `VARCHAR` column.

`DECODE(content,cKey,cCryptMethod)`: Decodes and decrypts content. `cCryptMethod` should be 'DES', 'TRIDES', or 'BLOWFISH' now.

For instance:

```
select encode('adsdfsdf');
select decode(encode('adsdfsdf'))+";
select decode(encode('dfdfdf233','12345','trides'),'12345','trides')+':('
select decrypt(encrypt('25355','12345','trides'),'12345','trides')+':('
select decrypt(encrypt('25355','12345','des'),'12345','des')+':('
```

SELECT ... INTO OUTFILE Syntax

`SELECT ... INTO OUTFILE` writes the selected rows to a file. `SELECT [ALL | DISTINCT [ON (expression [, ...])]]`

[DISTINCTROW [TOP n [PERCENT]] select_list [INTO variable [, ...] | INTO OUTFILE 'outfileName'] FROM table_reference_list [WHERE condition_expression] [[START WITH initial-condition] CONNECT BY [NOCYCLE] recurse-condition] [group_by_clause] [HAVING condition_expression] [union_clause] [order_by_clause] [LIMIT [offset,] [limit]] [FOR UPDATE]

'outfileName' support CSV and XML format. For instance:

```
SELECT * into OUTFILE 'A' FROM USER_PLANS; /* Default suffix: csv */
```

```
SELECT * into OUTFILE 'A.xml' FROM USER_PLANS; /* It will use XML format now. */
```

```
SELECT 'A"A' AS BB,12345 AS C,now() as e into OUTFILE 'b.CSV' ;
```

Because that SELECT ... INTO OUTFILE Syntax need to write file, so that it will throw SQLException if Connection.isReadOnly(). ResultSet.getRow() will show the number of rows exported to the file. The ResultSet object can be reused in code if it's not ResultSet.TYPE_FORWARD_ONLY type. Connection properties can be specified to produce a specific output format.

Property Name	Definition	Default Value
charSet	To specify a Character Encoding Scheme other than the client default. You can find a Supported Encodings list of file:///c:/jdk1.2/docs/guide/internet/encoding.doc.html. Cp895(Czech MS - DOS 895), Cp620(Polish MS - DOS 620) and Mazovia are extra supported although JVM doesn't support those.	null
csvfileExtension	To specify other suffix as default csv file extension.	CSV
_CSV_Separator	To specify a character sequence used to separate the values of the fields. It supports escape processing so that you can use \t, \r, \u001A, \x32, and so on.	,
_CSV_EOL	To specify 1~2 character sequence to terminate one line. An end-of-line line sequence is any one of a line feed ('\n', 0x0A), a carriage return ('\r', 0x0D), or a carriage return followed immediately by a linefeed. In most occasions, you needn't to care that connection property, since HXTT CSV supports even to mix three styles in one file. For data update, HXTT CSV can detect automatically OS version and choose the suitable EOL style in UNIX-style, DOS-style, and Mac-style. If you wish to create unix-style file on Windows, then you need to assign that connection property. It supports escape processing so that you can use \t, \r, \u001A, \x32, and so on. For instance, your data file is using \$ as EOL, HXTT CSV can support that file.	null
_CSV_Quoter	To specify a character used to quote the string value. It supports escape processing so that you can use \t, \r, \u001A, \x32, and so on.	"
_CSV_Header	Indicates whether the first record of text file to consist of the names of the fields in the data following.	true
_CSV_Comment	To specify whether there're some comment lines before csv header and data rows. If you use n (integer values), the first n lines will be ingored as comment. If you use some paragraphs, these paragraphs will be used for csv file creation, the total line number of comment will be used for existent file.	null
locale	locale is used to specify a default local for parse. You can use CANADA, CANADA_FRENCH, CHINA, CHINESE, ENGLISH, FRANCE, FRENCH, GERMAN, GERMANY, ITALIAN, ITALY, JAPAN, JAPANESE, KOREA, KOREAN, PRC, ROOT, SIMPLIFIED_CHINESE, TAIWAN, TRADITIONAL_CHINESE, UK, or US.	null
dateFormat	dateFormat is used to specify a default parse sequence of date(Default: 'yyyy-MM-dd') format.	yyyy-MM-dd
timeFormat	timeFormat is used to specify a default parse sequence of time(Default: 'hh:mm:ss') format.	hh:mm:ss
timestampFormat	timestampFormat is used to specify a default parse sequence of timestamp(Default: 'yyyy-MM-dd hh:mm:ss') format.	yyyy-MM-dd hh:mm:ss

decimalFormat	decimalFormat is used to specify a default parse sequence of decimal number format.	null
decimalSeparator	decimalSeparator is used to specify a default character for decimal sign. Different for French, etc.	null
groupingSeparator	groupingSeparator is used to specify a default character for thousands separator. Different for French, etc.	null

RowSet

com.hxtt.sql.HxttRowSet can work with any descendent class of java.sql.DataSource. For instance:

```
import java.sql.*;
import java.util.Properties;

import com.hxtt.sql.HxttDataSource;
import com.hxtt.sql.HxttRowSet;

public class testRowSet{
    public static void main(String argv[]){
        try{
            Class.forName("com.hxtt.sql.pdf.PDFDriver").newInstance();

            HxttDataSource ds=new HxttDataSource();
            ds.setUrl("jdbc:pdf:/f:/pdffiles");

            HxttRowSet rowSet=new HxttRowSet(ds);
            /*
            Another way:
            HxttRowSet rowSet=new HxttRowSet();
            rowSet.setDataSourceName(dsName);
            will use
                Context ctx = new InitialContext();
                return (DataSource) ctx.lookup(dataSourceName);
            to load the ds.
            */

            rowSet.setCommand("select * from test");

            rowSet.execute();

            ResultSetMetaData resultSetMetaData = rowSet.getMetaData();
            int iNumCols = resultSetMetaData.getColumnCount();
            for (int i = 1; i <= iNumCols; i++) {
                System.out.println(resultSetMetaData.
                    getColumnLabel(i)
                    + " " +
                    resultSetMetaData.getColumnTypeName(i));
            }

            rowSet.beforeFirst();
            while (rowSet.next()) {
                for (int i = 1; i <= iNumCols; i++) {
                    System.out.print(rowSet.getObject(i) + " ");
                }
                System.out.println();
            }

            rowSet.close();
        }
        catch( SQLException sqle )
        {
            do
            {
                System.out.println(sqle.getMessage());
                System.out.println("Error Code:"+sqle.getErrorCode());
                System.out.println("SQL State:"+sqle.getSQLState());
                sqle.printStackTrace();
            }while((sqle=sqle.getNextException())!=null);
        }
    }
}
```

```

        catch( Exception e )
        {
            System.out.println(e.getMessage());
            e.printStackTrace();
        }
    }
}

```

PooledConnection

For instance:

```

com.hxtt.sql.HxttConnectionPoolDataSource pds=new
com.hxtt.sql.HxttConnectionPoolDataSource();
pds.setUrl("jdbc:pdf:/f:/pdffiles");
javax.sql.PooledConnection pc=pds.getPooledConnection();

```

SSL Connection

SSL Connection has been provided since JDK1.4.X. To use SSL Connection, you should know how to use javax.net.ssl package first. With hxtt.socketclass=SSL **system** property, all of HXTT PDFServer's receiving connections in one JVM will become SSL connection. For client side, using hxtt.socketclass=SSL or hxtt.socketclass=null as **connection** property will overlay hxtt.socketclass **system** property so that it's possible that some connections are SSL encryption connection, but other connections are common connections or customer connections.

For instance, you can use java -Djavax.net.ssl.keyStore=yourKeyStore -Djavax.net.ssl.keyStorePassword=yourKeyStorePassword -Djavax.net.ssl.trustStore=yourTruststore -Djavax.net.ssl.trustStorePassword=yourTrustStorePassword -Dhxtt.socketclass=ssl -cp yourClassPath com.hxtt.sql.admin.Admin to start a HXTT PDFServer with SSL Connection capability. If you wish to use HXTT PDFServer as Linux(Solaris) daemon or Windows Service without GUI, you should read [Run HXTT PDFServer as Windows Service or Linux\(Solaris\) Daemon](#) too.

java -Djavax.net.ssl.trustStore=yourTruststore -Djavax.net.ssl.trustStorePassword=yourTrustStorePassword -Dhxtt.socketclass=ssl -cp yourClassPath yourApplication will let your application to use SSL for remote connection. If you wish to write customer connection, please click [Customer Connection](#).

Run HXTT PDFServer as Windows Service or Linux(Solaris) Daemon

In Linux(Solaris), we assume that you save it to /jdbclib directory.

In Windows, we assume it is c:/ . You should have built the database server configuration by com.hxtt.sql.admin.Admin program. It will create a file named urlconfig.properties which locate on the user home directory.

For example, in Linux(Solaris), you build the database server configuration in root user, the urlconfig.properties will located

at /root directory if the root's home directory is /root; in windows, it will be the C:\Documents and Settings\Administrator.

You should copy the file to other directory for the service program maybe not access the file. In Linux(Solaris), we assume you copy it to /jdbclib;in windows,we assume it is c:/.

For Windows NT/2000/2003/XP system, you can use JavaService.exe([Here](#) to download, [here](#) is its forge) to register a window service to start the servers.

[Here](#) is a simple bat file to tell you how to register a service, you should change some options accord your environment. After you download these two files, you can run the bat file to register and start the

service at the Control Panel.

For Windows 7, Windows 2008, and Vista system, you can copy jsl64.exe([Here](#) to download, [here](#) is its home) and jsl64.ini([Here](#) to download) into somewhere on your disk.

Modify the jsl64.ini to reflect your desired settings. Specially the last line cmdline parameters.

Use Administrator Role to run jsl64.exe -install jsl64.ini

Start it in the NT service manager or by calling NET start "HXTTService"

In Linux(Solaris),you can use jsvc([Here](#) to download) as a daemon to start the servers for remote connection.

1.You should download the Apache common daemons package([Here](#) to download).

We assume that you save this two files to /commondaemon directory.

2.please run the follows command to enable the exec file property.

```
chmod +x /commondaemon/jsvc
```

Attention,the jsvc program has tested at RedHat 9.0 and Sun Open Desktop System 1.0.If it don't work at your enviroment,please download the jsvc source and make a binary program or tell us your environment.

3.run the follows command to know the default run level of your machine.

```
cat /etc/inittab | grep :initdefault
```

it's result will be as follows: id:3:initdefault

or

```
runlevel
```

it's result will be as follows:N 3

In common,the default run level should be 3 or 5.

4.Please download the [hxttjsvcserv](#) script to save it to /etc/init.d directory and run the follows command to enable the file exec-able bit mask .

```
chmod +x /etc/init.d/hxttjsvcserv
```

Attension ,if you don't put HXTT PDF Package to /jdbcplib directory or jsvc and commons-daemon.jar to /commondaemon directory,you should modify the

hxttjsvcserv file to fit your configuration.

BTW,the default user run this service is root,maybe you should changed it to another low right user.Please see the hxttjsvcserv for more detail information.

5.cd /etc/rcx.d (x is the run level,in some os,the rcx.d is not directly located in /etc directory,you can use find . -name rcx.d to find where is it)

At first you should list all the file for find the new service's running sequence number;

run the command

```
ls
```

You will see some files which starts with K or S,for example,S99local and K99local.

S99local is the run script file when start this machine.

K99local is the stop script file when shut down this machine.

local is the service name.K represent kill and S represent the start.

This two files all are a file linked to /etc/init.d/local.This is,when starting machine,OS will run local script with start parameter and when stopping with stop parameter.

99 is the run sequence number when start this machine.

For example,httpd service will start before this local service and stop after the local service for its start script file name is S15httpd and end script file name is K15httpd.

Find the max running sequence number,in my machine,it is 99,so the new service's running sequence number will be 100.

run the command to build this two file.

```
ln -s /etc/init.d/hxttjsvcserv S100hxttjsvcserv
```

```
ln -s /etc/init.d/hxttjsvcserv K100hxttjsvcserv
```

now you can run /etc/init.d/hxttjsvcserv start to start the service or reboot your machine to test if this service can auto start.

You can use "java com.hxtt.sql.admin.Admin TCPCLIENT [host:]port [remoteControlPassword]" to start your remote control when PDFServer is running as Windows service or Linux(Solaris) Daemon.

For Novell Netware OS console without GUI, you can also run directly com.hxtt.sql.admin.HxttService with above

same parameters.

On LINUX and UNIX, if you got "Cannot connect to X11 window server. The environment variable DISPLAY is not set.", you should use `-Djava.awt.headless=true` to run Java in headless mode.

If startup using `jsvc` is not implemented on a specific operation system, you can also run directly `com.hxtt.sql.admin.HxttService` with above same parameters on SCO OpenServer, OS/400, and so on.

How to Use Memory-only Table, Physical Table, Url table, Compressed table, SAMBA table in a SQL.

1. Compressed Database:(.ZIP, .JAR, .GZ, .TAR, .BZ2, .TGZ, .TAR.GZ, .TAR.BZ2)

`jdbc url` format is the same as embedded url and remote url. For example, `"jdbc:pdf:/c:/test/testpdf.zip"`, then you can use `select * from aTable` to visit aTable table in testpdf.zip file.

No special requirement for sql. Both of the compressed file name and directory name in compressed file are also used as catalog name.

For TAR and BZ2 support, you should download [Apache's tarbz2.jar](#) package.

For case-insensitive sql compatibility, all name of directory and file in compressed file are case-insensitive too.

Compressed database is read-only, and all data modification won't be flushed into compressed file.

You can union compressed table in sql with the common table.

For instance, `"jdbc:pdf:/c:/test"`, `select * from "testpdf.zip/files/a.pdf"`; `select * from "b.tar.bz2/java"."test.pdf"`;

2. Memory-only Database:

`jdbc url: jdbc:pdf:/_memory_/`

No special requirement for sql.

Memory-only database is hold commonly in memory, but it will be stored into temporary directory if its length exceed 8MB limitation to avoid memory overburden.

`_memory_` is a special catalog name for memory-only database. Through `_memory_` catalog, memory-only database is visible for all applications in the same JVM. For instance, in an embedded connection, you can use to do the same things.

You can use memory-only table in sql with the common table. For instance, `select * from _memory_.abc,test;`

Memory-only database is volatile, and you can't see your old data any more after restart a JVM.

3. URL Database:(http protocol, https protocol, ftp protocol, sftp protocol)

`jdbc:pdf:http://httpURL`

`jdbc:pdf:https://httpsURL`

`jdbc:pdf:ftp://ftpURL`

`jdbc:pdf:sftp://sftpURL`

For example, `"jdbc:pdf:http://www.hxtt.com/test"`, then you can use `select * from pdf.page1;`. Because All of http, https, ftp protocol, and sftp protocol are case-sensitive, you have to take care of your sql, and use proper table file suffix to avoid FileNotFound exception. //Note: FTP site's user/password should be set in ftpURL, and cannot be set in JDBC connection property because user/password JDBC connection property belongs to server/client connection.

Without URL database url, you can access url database in an embedded connection too. For instance, `select * from "http://www.hxtt.com/test/b.tar/a.pdf"`; `select * from "http://www.hxtt.com/test/a.jsp?aaa=33"`; `select * from "sftp://testa:123456@localhost/a.pdf"`;

You can use url table in sql with the common table. For instance, `select * from "http://www.hxtt.com/test/b.tar/a.pdf",alocTable;`

URL database is read-only, and all data modification won't be flushed into URL content. If you're using a dial-up network, don't waste time to access too big URL database.

For https support in JDK 1.2.x and 1.3.x, you should download [JSSE 1.0.3](#) package.

For sftp support, you should download [JSch - Java Secure Channel Library](#) or [JSch for J2ME if you are using olderJDBC1.2 or JDBC2.0 package](#), which is developed by [Atsuhiko Yamanaka of JCraft, Inc.](#)

For ftp url, HXTT PDF supports extra `ftp mode=active|passive` and `detectsize=true|false` parameters. For instance `jdbc:pdf:ftp://username:apassword@127.0.0.1/test/abc.pdf;mode=passive;detectsize=true"`, `jdbc:pdf:ftp://192.168.1.1:5005/test/abc.pdf;mode=active"`,

4. SAMBA Database:(smb protocol)

`jdbc:pdf:smb://[[[domain;]username[:password]@]server[:port]/[[share/[dir/]file]]][?param=value]]`

For example, "jdbc:pdf:smb://test1:123@100.100.13.94/pdffiles", then you can use "select * from pdf.page1; to visit table. Note: SAMBA user/password should be set in SMB URL, and cannot be set in JDBC connection property because user/password JDBC connection property belongs to server/client connection.

Without SAMBA database url, you can access SAMBA database in an embedded connection too. For instance, select * from "smb://test1:123@100.100.13.94/pdffiles/zone.pdf"

You can use SAMBA table in sql with the common table. For instance, select * from "smb://test1:123@100.100.13.94/pdffiles/zone.pdf",aLocalTable

For SAMBA support, you should download [Java CIFS Client Library](#), which is developed by [Michael B. Allen](#).

HXTT PDF supports seamlessly data mining on memory-only table, physical table, url table, compressed table, SAMBA table in a sql. A compressed database can be a URL database or SAMBA database at the same time. It's powerful, and you should ask for HXTT's support if you don't know how to use it for special purpose.

Create Database from any java.io.InputStream object

"CREATE DATABASE [IF NOT EXISTS] dbname-name ?" sql can be used to create a database from any java.io.InputStream object. Let's see a sample, which can create a physical database or a memory-only database from an HTTP stream.

```
package test.jdbc.pdf;

import java.net.URL;
import java.net.URLConnection;

import java.io.IOException;
import java.io.InputStream;
import java.sql.*;
import java.util.Properties;

public class testInputCreateTable{
    public static void main(String argv[]) {
        try {
            Class.forName("com.hxtt.sql.pdf.PDFDriver").newInstance();

            String url="jdbc:pdf:/// memory /";//Enabled it if you have not disk access right.
            // String url="jdbc:pdf://pdffiles/";

            Properties properties=new Properties();
            properties.setProperty("tmpdir","_memory");//Enabled it if you have not disk access
            right.
            properties.setProperty("delayedClose","-1");//Release database at once.
            Connection con = DriverManager.getConnection(url,properties);

            String sql;
            PreparedStatement pstmt;

            sql="create database testaaa ?";
            pstmt = con.prepareStatement(sql);

            URL httpurl=new URL("http://www.hxtt.com/test/abc.pdf");

            URLConnection urlConnection=httpurl.openConnection();
            InputStream is=urlConnection.getInputStream();
            pstmt.setObject(1,is);//create a table from a HTTP stream
            pstmt.executeUpdate();

            pstmt.close();
            is.close();

            sql = "select * from testaaa.page1";

            Statement stmt=con.createStatement();
            ResultSet rs = stmt.executeQuery(sql);

            ResultSetMetaData resultSetMetaData = rs.getMetaData();
            int iNumCols = resultSetMetaData.getColumnCount();
            for (int j = 1; j <= iNumCols; j++) {
                System.out.println(resultSetMetaData.getColumnLabel(j)
                    + " " + resultSetMetaData.getColumnTypeName(j)
                    + " " + resultSetMetaData.getColumnDisplaySize(j)
                );
            }
        }
    }
}
```

```

    }
    Object colval;

    rs.beforeFirst();
    long ncount = 0;
    while (rs.next()) {
        ncount++;
        for (int j = 1; j <= iNumCols; j++) {
            colval = rs.getObject(j);
            System.out.print(colval + " ");
        }
        System.out.println();
    }
    System.out.println("row count:"+ncount);

    rs.close();

    stmt.execute("drop database testaaa");//remove that testaaa database.

    stmt.close();

    con.close();
}
catch( SQLException sqle )
{
    do
    {
        System.out.println(sqle.getMessage());
        System.out.println("Error Code:"+sqle.getErrorCode());
        System.out.println("SQL State:"+sqle.getSQLState());
        sqle.printStackTrace();
    }while((sqle=sqle.getNextException())!=null);
}
catch (Exception e) {
    System.out.println(e.getMessage());
    e.printStackTrace();
}
}
}
}

```

Create Database from any compressed java.io.InputStream object

"CREATE DATABASE [IF NOT EXISTS] file-name ?" sql can be used to create a database from any compressed java.io.InputStream object. Let's see a sample, which can create a physical database or a memory-only database from a compressed HTTP stream.

```

package test.jdbc.pdf;

import java.net.URL;
import java.net.URLConnection;

import java.io.IOException;
import java.io.InputStream;
import java.sql.*;
import java.util.Properties;

public class testInputCreateDatabase{
    public static void main(String argv[]) {
        try {
            Class.forName("com.hxtt.sql.pdf.PDFDriver").newInstance();

            String url="jdbc:pdf:///memory/";//Enabled it if you have not disk access right.
            // String url="jdbc:pdf://pdffiles/";

            Properties properties=new Properties();
            properties.setProperty("tmpdir","_memory");//Enabled it if you have not disk access
            right.
            properties.setProperty("delayedClose","-1");//Release database at once.

            Connection con = DriverManager.getConnection(url,properties);

            String sql;
            PreparedStatement pstmt;

            sql="create database [testaaa.zip] ?";

```

```

pstmt = con.prepareStatement(sql);

URL httpurl=new URL("http://www.hxtt.com/test/pdfdb.zip");

URLConnection urlConnection=httpurl.openConnection();
InputStream is=urlConnection.getInputStream();
pstmt.setObject(1,is);//create a table from a HTTP stream
pstmt.executeUpdate();

pstmt.close();
is.close();

sql = "select * from \"testaaa.zip\".abc";

sql = "select * from \"testaaa.zip\\efg.pdf\".page1";

Statement stmt=con.createStatement();
ResultSet rs = stmt.executeQuery(sql);

ResultSetMetaData resultSetMetaData = rs.getMetaData();
int iNumCols = resultSetMetaData.getColumnCount();
for (int j = 1; j <= iNumCols; j++) {
    System.out.println(resultSetMetaData.getColumnLabel(j)
        + " " + resultSetMetaData.getColumnTypeName(j)
        + " " + resultSetMetaData.getColumnDisplaySize(j)
        );
}
Object colval;

rs.beforeFirst();
long ncount = 0;
while (rs.next()) {
    ncount++;
    for (int j = 1; j <= iNumCols; j++) {
        colval = rs.getObject(j);
        System.out.print(colval + " ");
    }
    System.out.println();
}
System.out.println("row count:"+ncount);

rs.close();

stmt.execute("drop database \"testaaa.zip\"");//remove that testaaa database.

stmt.close();

con.close();
}
catch( SQLException sqle )
{
    do
    {
        System.out.println(sqle.getMessage());
        System.out.println("Error Code:"+sqle.getErrorCode());
        System.out.println("SQL State:"+sqle.getSQLState());
        sqle.printStackTrace();
    }while( (sqle=sqle.getNextException()) !=null);
}
catch (Exception e) {
    System.out.println(e.getMessage());
    e.printStackTrace();
}
}
}

```

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Transaction Processing

Index:

1. [Commit Mode](#)
2. [Isolation Levels](#)
3. [Performance Hints](#)

Commit Mode

There are two modes for managing transactions within JDBC:

- auto-commit
- manual-commit

`java.sql.Connection.setAutoCommit(boolean autoCommit)` is used to switch between the two modes. If a connection is in auto-commit mode, then all its SQL statements will be executed and committed as individual transactions. Otherwise, its SQL statements are grouped into transactions that are terminated by a call to either the method `java.sql.Connection.commit` or the method `java.sql.Connection.rollback`. By default, new connections are in auto-commit mode. After an application turns auto-commit off, a transaction is started. The transaction continues until either the `java.sql.Connection.commit` method, `COMMIT [WORK]` sql, the `java.sql.Connection.rollback` method, or `ROLLBACK [WORK]` sql is called; after that a new transaction is automatically started.

Calling the commit method ends the transaction. At that stage, HXTT PDF checks whether the transaction is valid and raises an exception if a conflict is identified. If a conflict is encountered, your application should determine how to continue, for example whether to automatically retry the transaction or inform the user of the failure. A request to rollback a transaction causes HXTT PDF to discard any changes made since the start of the transaction and to end the transaction.

```
connection.setAutoCommit(false); // Explicit transaction handling
Statement stmt = connection.createStatement();

// Loop until transaction successful (or max retry exceeded)
for(int count=0;; count++) {
    stmt.executeUpdate(yourSQL);
    try{
        connection.commit(); // Commit transaction
        break;
    }catch(SQLException sqe) {
        // Check commit error
        if(sqe.getSQLState().equals("40000")) {
            //You can use sqe.getNextException() to know more information

            // Check number of times the transaction has been attempted
            if (count<3) {
                continue;
            }
        }
        throw sqe;
    }
}
```

Isolation Levels

An isolation level represents a particular locking strategy employed in the HXTT PDF to improve data consistency. The higher the isolation level, the more locking or snapshot involved, and the more time users may spend waiting for data to be freed by another user. The isolation level provided by the HXTT PDF determines whether a transaction will encounter the following behaviors in data consistency:

- dirty read: A row changed by one transaction can be read by another transaction before any changes in that row have been committed. For instance, User 1 modifies a row. User 2 reads the same row before User 1 commits.

User 1 performs a rollback. User 2 has read a row that has never really existed in the database. User 2 may base decisions on false data.

- non-repeatable read: Where one transaction reads a row, a second transaction alters the row, and the first transaction rereads the row, getting different values the second time (a "non-repeatable read"). For instance, User 1 reads a row but does not commit. User 2 modifies or deletes the same row and then commits. User 1 rereads the row and finds it has changed (or has been deleted).
- phantom read: When one transaction reads all rows that satisfy a WHERE condition, a second transaction inserts a row that satisfies that WHERE condition, and the first transaction rereads for the same condition, retrieving the additional "phantom" row in the second read. For instance, User 1 uses a search condition to read a set of rows but does not commit. User 2 inserts one or more rows that satisfy this search condition, then commits. User 1 rereads the rows using the search condition and discovers rows that were not present before.

Isolation Levels and Data Consistency Definition

Isolation Level	Dirty Read	Non-repeatable Read	Phantom Read
None	Yes	Yes	Yes
Read uncommitted	Yes	Yes	Yes
Read committed	No	Yes	Yes
Repeatable read	No	No	Yes
Serializable	No	No	No

Performance Hints

- With auto-commit mode, all operations will be done in TRANSACTION NONE level with concurrent support.
- READ UNCOMMITTED level is always faster than three other transaction levels if you don't do many roolback operations.
- Under REPEATABLE READ or SERIALIZABLE mode, the default CLOSE_CURSORS_AT_COMMIT for ResultSet holdability is faster than HOLD_CURSORS_OVER_COMMIT.

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DBAdmin is intergrated enviroment for start,stop,test,manage and monitor the HXTT database software! DBAdmin is contained in the all hxtt java database software package ,you can download the package from [here](#) for test use! How to start this DBAdmin program?

For example,if you have download the HXTT PDF 4.0 package whose filename is PDF_JDBC40.jar and save it to c disk,you can run it by

```
java -classpath c:/PDF_JDBC40.jar com.hxtt.sql.admin.Admin
```

In default ,this program will product a file named urlconfig.properties locate in user.home enviroment variable.

You can assign the hxtt.urlconfig environment variable to assign the urlconfig.properties path.For example,

```
java -classpath c:/PDF_JDBC40.jar -Dhxtt.urlconfig=c:/urlconfig.properties  
com.hxtt.sql.admin.Admin
```

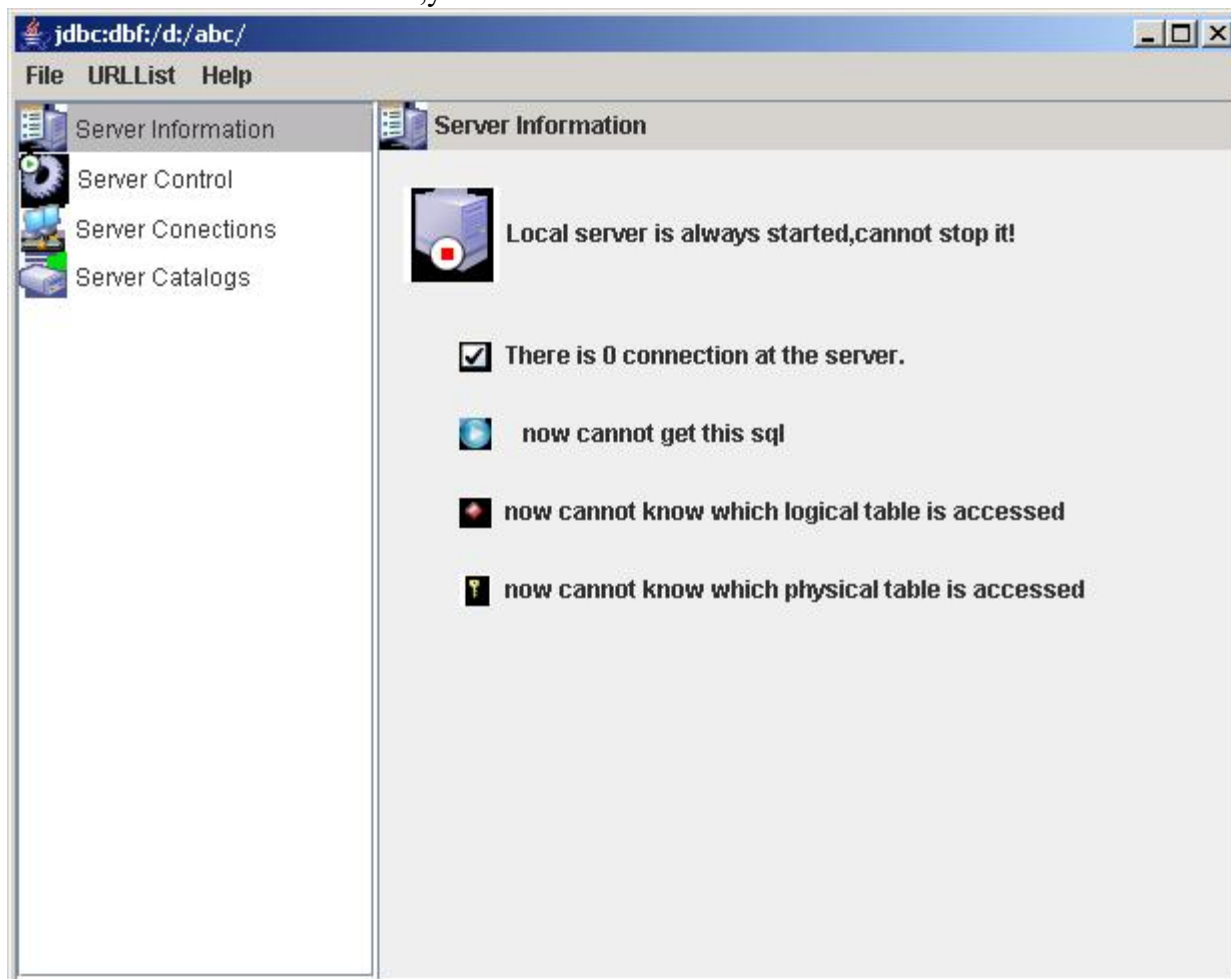


This left list is the configed url list,click a url in this list ,you can see this url config information at the right window!

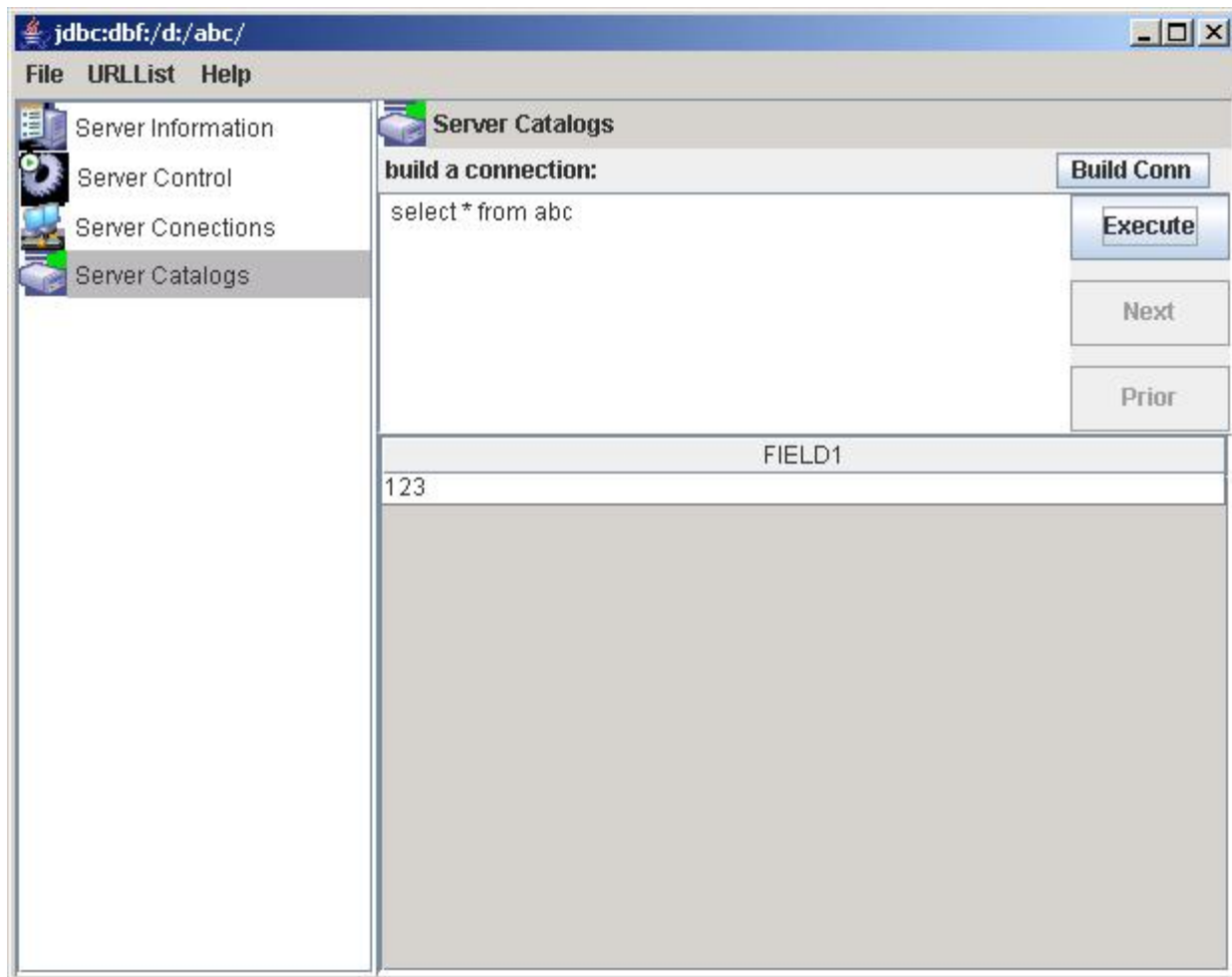


This url name is used to represented this url config information; this url information text is this url information for start,stop,manage and monotor url information, this url information must be a correct embedded jdbc url or remote jdbc url(this sample describes only an embedded url service, if you wish to access remote, you should use remote url service, for instance,

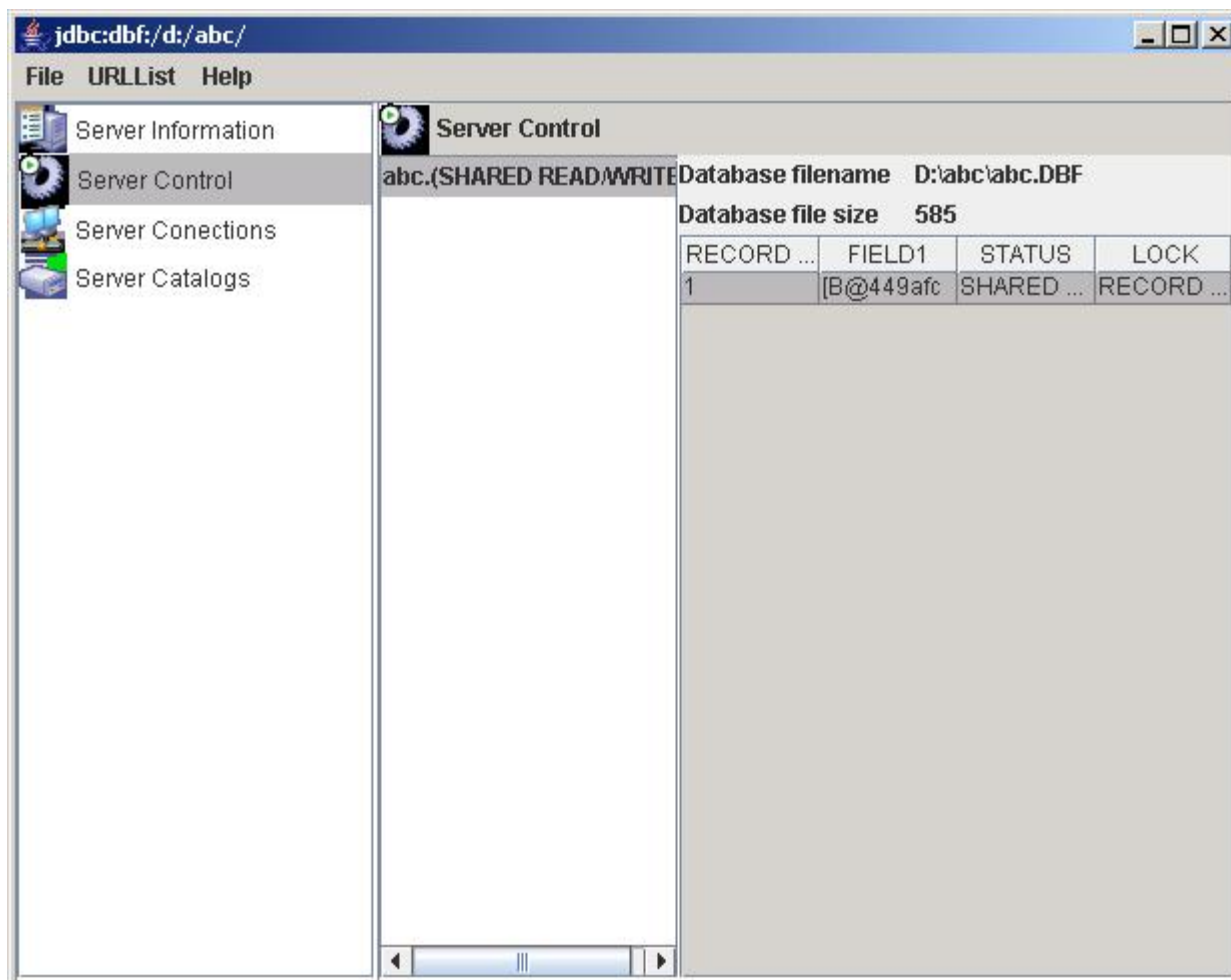
jdbc:pdf://localhost:3099//usr/datadir); this auto start is used to assign if this remote url start when this dbadmin program start,it is general used to start the hxtt java database server after start the rmi service ! this log information is used to assign if log this server access information to a disk file ; Click this View Monitor button,you can view the select url monitor window!



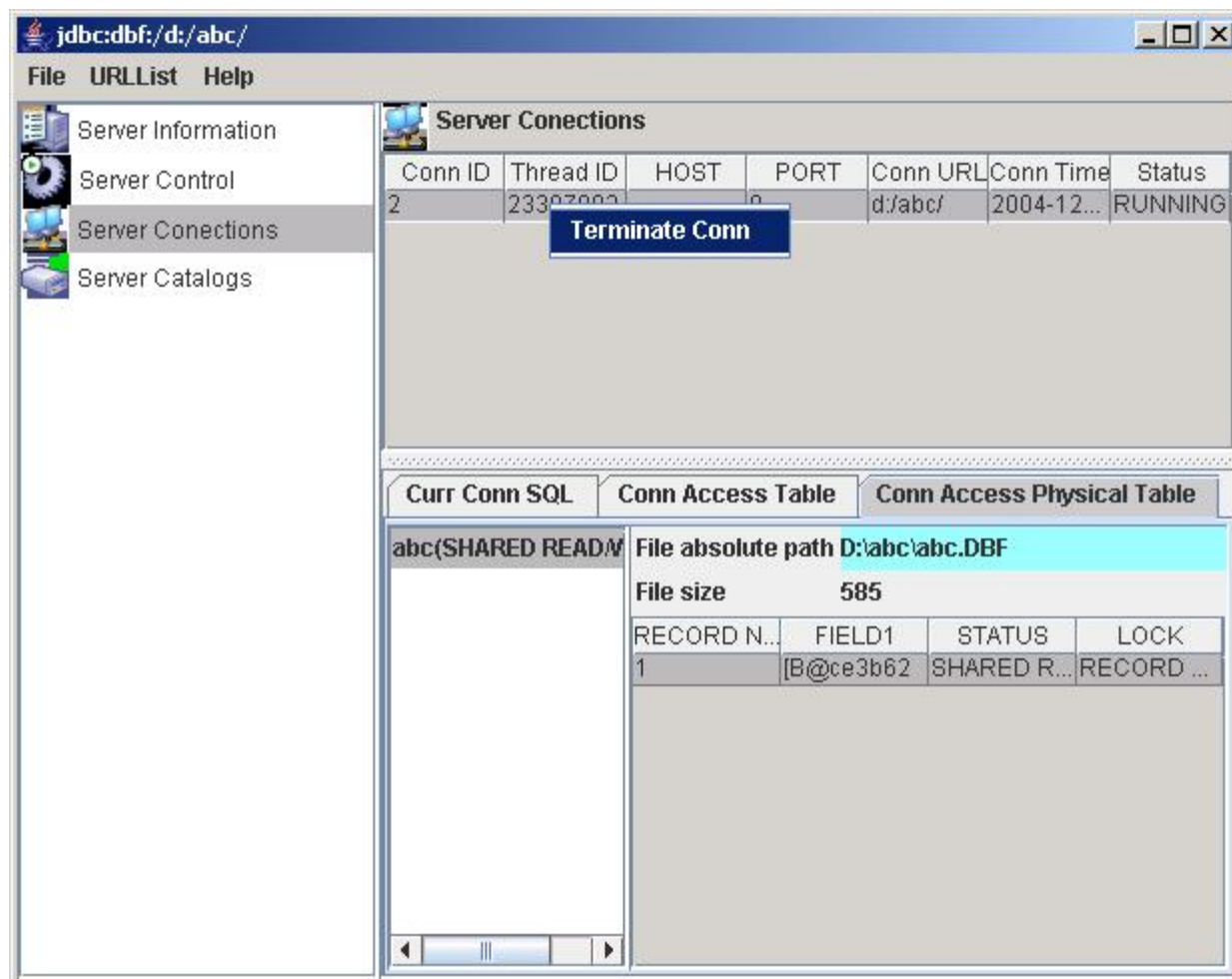
This Server Information item in the left list is used to show the general information about this selected url! If the server have not started,you can click the right image to start this server, after start this server,you can see four item at this left list! This Server Catalogs is used to build a connection and execute some sql at the server,you can see the result at this right-bottom window!



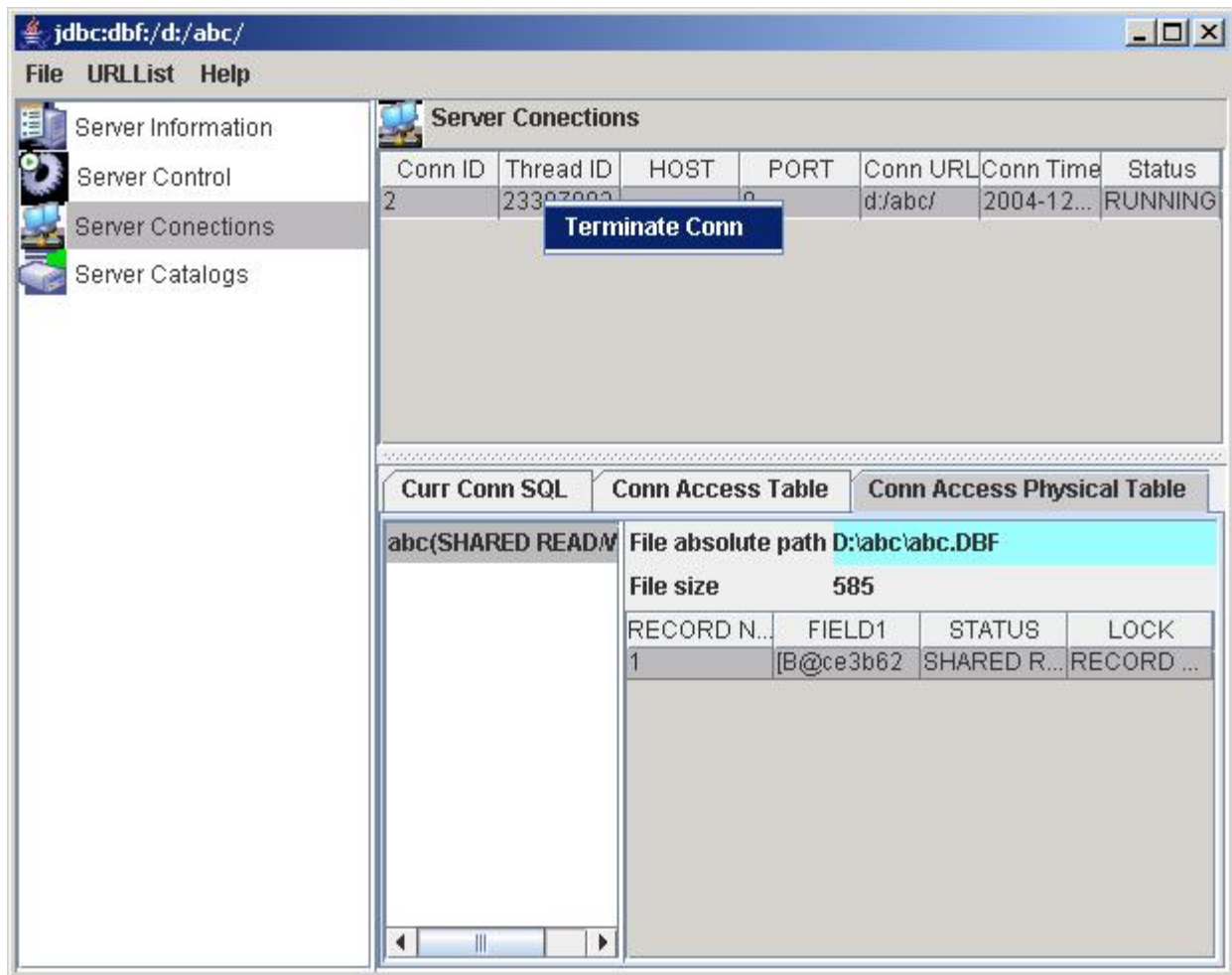
This Server Controls is used to monitor the physical file which is now accessed by the server! ;)



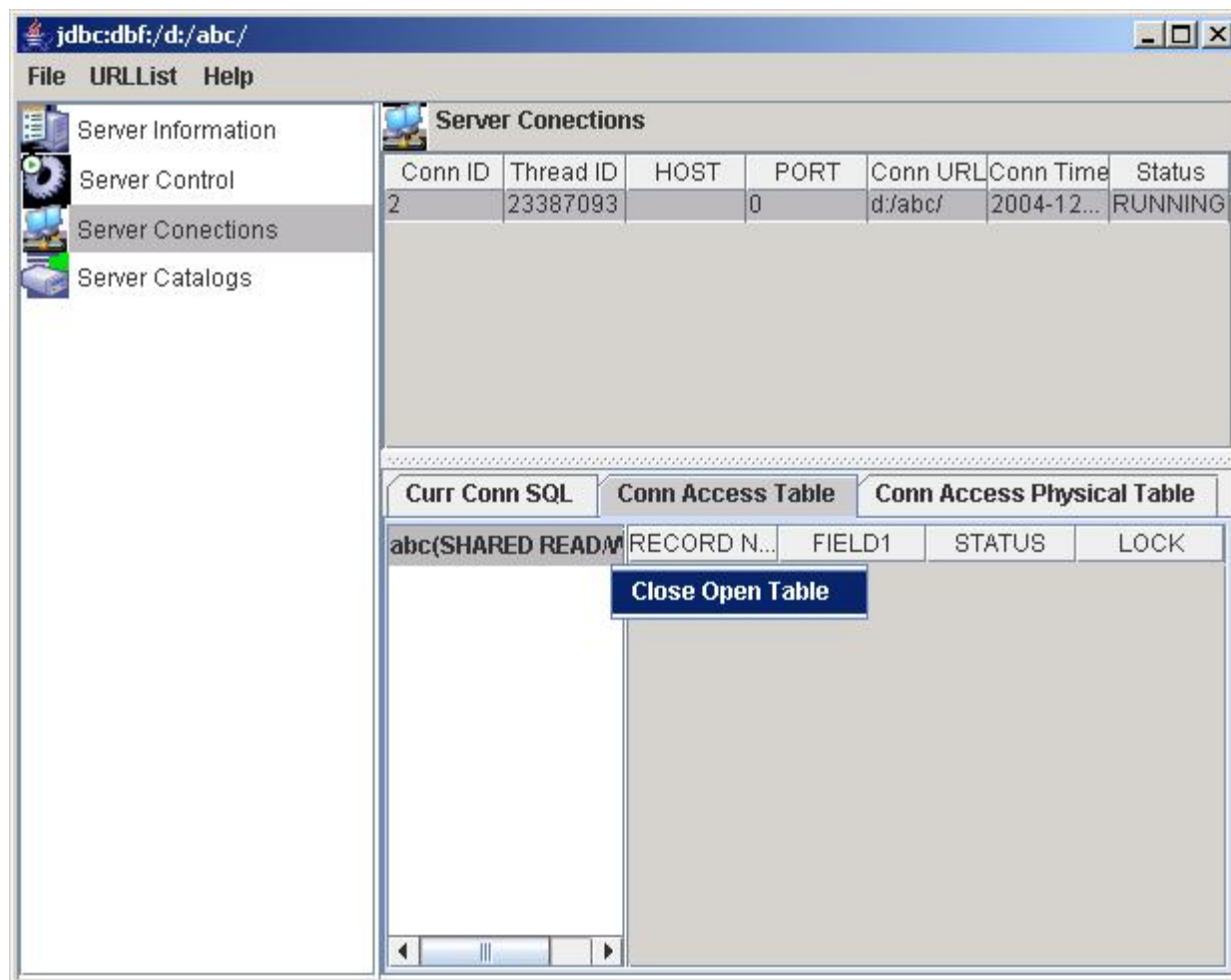
This Server Connections is used to monitor the current connections connected this server and their activity. There are a connection list at the right top window to show the current connections! At the right bottom window, there are three tabpanes! The first is used to show the current sql sentence executed by the selected connection ; this second is used to show the logical table accessed by the selected connection; this third is used to show the physical table accessed by the selected connection;



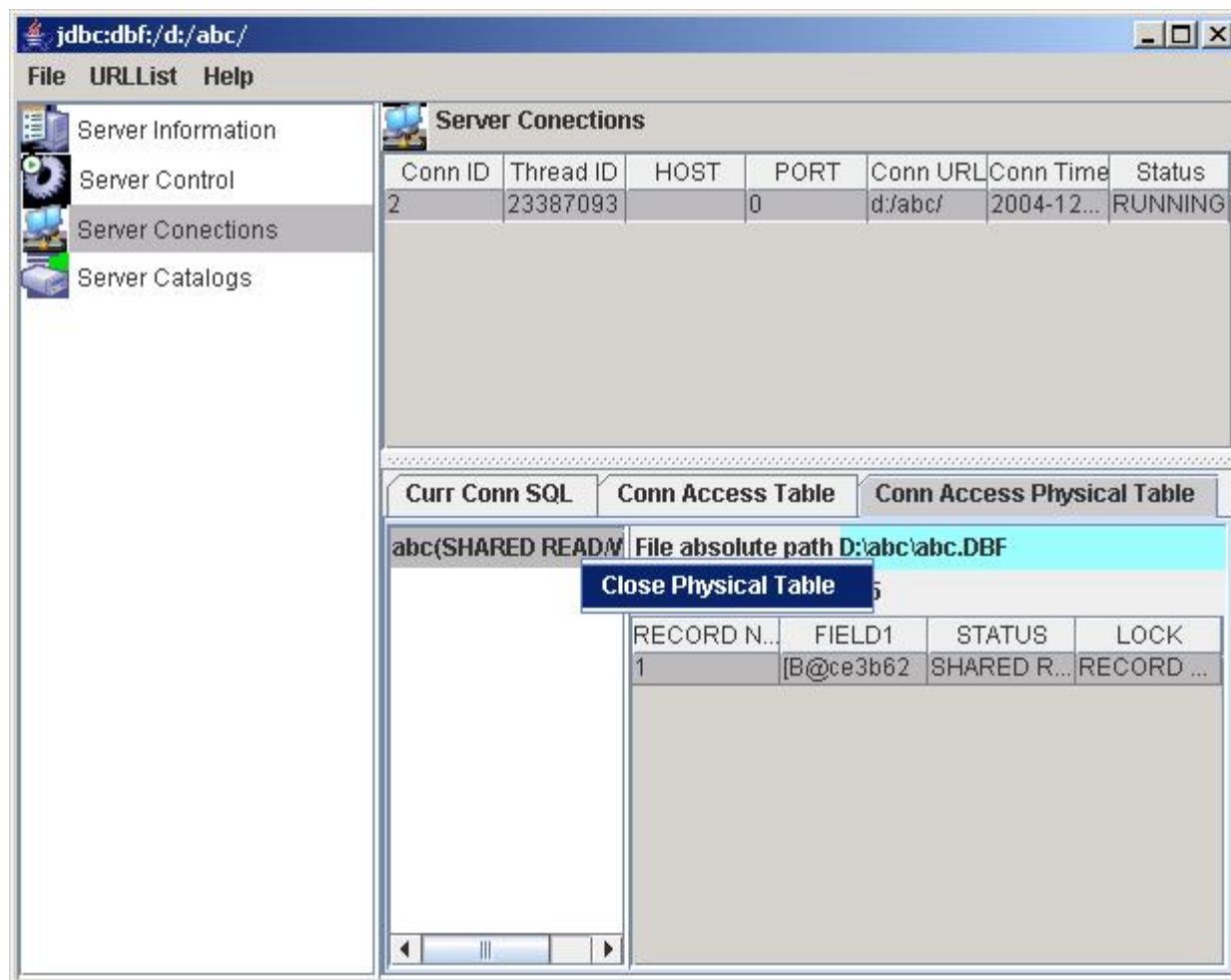
At the connections list,select a connection and right-click mouse ,you can close a connection at the popup menu!



At the accessed logical table list ,select a item and right click mouse,you can close the this logical table opened by this selected connection!



At the accessed physical table list ,select a item and right click mouse,you can close the physical table ,but you should be careful,because this operation will close the physical table no matter this table is accessed by other connection!



It a physical table is locked a lot of records and you can only release some records locks,you should select a item at the physical table record locks list and right click mouse,click the close menu to release the selected record lock,and redo this step to release other record lock until you don't want to do so.

The screenshot shows the 'jdbcdbf: /d:/abc/' application window. The menu bar includes 'File', 'URLList', and 'Help'. The left sidebar contains 'Server Information', 'Server Control', 'Server Conections', and 'Server Catalogs'. The main area is titled 'Server Conections' and contains a table with the following data:

Conn ID	Thread ID	HOST	PORT	Conn URL	Conn Time	Status
2	23387093		0	d:/abc/	2004-12-...	RUNNING
4	23387093		0	d:/abc/	2004-12-...	RUNNING

Below the table are three tabs: 'Curr Conn SQL', 'Conn Access Table', and 'Conn Access Physical Table'. The 'Conn Access Physical Table' tab is active, showing details for 'abc(SHARED READM...'. The details include:

- File absolute path: D:\abc\abc.DBF
- File size: 585
- Table structure:

RECORD NU...	FIELD1	STATUS	LOCK
1	!B@1 d6bf7	SHARED RE...	RECORD 1 S...

A 'Release Select Record Lock' button is visible below the table structure.

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Chapter 7. Scalar Functions and Aggregate Functions

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8. [Security Functions](#)
9. [Sequence Functions](#)
10. [Regular Expresson Functions](#)
11. [Miscellaneous Functions](#)
12. [Aggregate Functions](#)

Mathematical Functions

1. ABS(x): the absolute value
2. BITAND(x, y): returns the result of performing a bitwise AND on x and y.
3. BIT_COUNT(x): returns the number of bits of x.
4. CEIL(x), CEILING(x): the smallest integer that is not less than x
5. DEGREES(x): converts radians to degrees
6. EXP(x): exponential, e(2.718...) raised to the power of x
7. FLOOR(x): the largest integer not greater than argument x
8. INT(x) : truncates x to nearest integer
9. LOG(x), LN(x): the natural logarithm
10. LOG(b,x): returns the logarithm of X for an arbitrary base B
11. LOG10(x): the base 10 logarithm
12. LOG2(X): the base 2 logarithm
13. LN(x): the natural logarithm
14. MOD(y, x): the remainder of y/x, you can use y%x too.
15. PI(): pi constant, 3.14159265358979323846.
16. POW(x, y), POWER(x, y): x raised to the power of y
17. RADIANS(x): converts degrees to radians
18. RAND([seed]): a random value between 0.0 and 1.0
19. ROUND(x [,y]): rounds x to nearest integer without y, or round x to y digits after the decimal point.
20. SIGN(x): returns -1 if x is smaller than 0, 0 if x==0 and 1 if x is bigger than 0.
21. SQRT(x): the square root
22. TRUNC(x[,y]), TRUNCATE(x[,y]): truncates x to nearest integer without y, truncates x to y digits after the decimal point

Trigonometric Functions

1. ACOS(x): the inverse cosine of an angle
2. ASIN(x): the inverse sine of an angle
3. ATAN(x), ATN(x): the inverse tangent of an angle
4. ATAN2(x, y): the inverse tangent of x/y
5. COS(x): the cosine of an angle
6. COT(x): the cotangent of an angle
7. SIN(x): the sine of an angle
8. TAN(x): the tangent of an angle

String Functions

1. ALLTRIM(string1): removes all leading and trailing blanks in string1
2. ASC(string1), ASCII(string1): the ASCII code of the leftmost character of the argument
3. AT(cSearchExpression, cExpressionSearched [, nOccurrence]): returns the beginning numeric position of the first occurrence of a character expression or memo field within another character expression or memo field, counting from the leftmost character. If the character expression isn't found, AT() returns 0.
4. ATC(cSearchExpression, cExpressionSearched [, nOccurrence]): returns the beginning numeric position of the first occurrence of a character expression or memo field within another character expression or memo field, counting from the leftmost character. If the character expression isn't found, RAT() returns 0. It is case insensitive.
5. BIN(number1): returns a string representation of the binary value of number1, where number1 is a integer(TINYINT, SMALLINT, INT, or BIGINT) number. Returns NULL if N is NULL.
6. BIT_LENGTH(string1): the length of the string str in bits
7. CHAR_LENGTH(string1), CHARACTER_LENGTH(string1): the number of characters in string1
8. CHAR(integer), CHR(integer): a character with the given ASCII code
9. CHAR(integer1,...): interprets the arguments as integers and returns a string consisting of the characters given by the unicode values of those integers. NULL values are skipped.

10. CHRTRAN(cSearchedExpression, cSearchExpression, cReplacementExpression): Replaces each character in a character expression that matches a character in a second character expression with the corresponding character in a third character expression. CHRTRAN() translates the character expression cSearchedExpression using the translation expressions cSearchExpression and cReplacementExpression and returns the resulting character string. If a character in cSearchExpression is found in cSearchedExpression, the character in cSearchedExpression is replaced by a character from cReplacementExpression that's in the same position in cReplacementExpression as the respective character in cSearchExpression. If cReplacementExpression has fewer characters than cSearchExpression, the additional characters in cSearchExpression are deleted from cSearchedExpression. If cReplacementExpression has more characters than cSearchExpression, the additional characters in cReplacementExpression are ignored.
11. CONCAT(string1, string2): string concatenation, you can use string1+string2 too.
12. CONCAT(string1, string2,...): returns the string that results from concatenating the arguments. NULL values are skipped.
13. CONCAT_WS(separator,string1, string2,...): returns the string that results from concatenating the arguments. The first argument is the separator for the rest of the arguments. The separator is added between the strings to be concatenated. If the separator is NULL, the result is NULL. The function skips any NULL values after the separator argument.
14. CONV(number1,base): returns a string representation of the first argument in the radix specified by the second argument. The minimum base is 2 and the maximum base is 36.
15. DIFFERENCE(string1, string2): the difference between the sound of string1 and string2
16. HEX(number1): returns a string representation of the hexadecimal value of number1, where number1 is a integer(TINYINT, SMALLINT, INT, or BIGINT) number. Returns NULL if N is NULL.
17. INITCAP(string1): converts first letter of each word (whitespace-separated) to upper case
18. INSERT(string1, start1, length1, string2): a string where length1 number of characters beginning at start1 has been replaced by string2
19. INSTR(string1, string2 [,start1]): the first index (>0:left location, 0:not found) where string2 is found in string1, starting at start1
20. INSTR(start1, string1, string2): (Compatible purpose) the first index (>0:left location, 0:not found) where string2 is found in string1, starting at start1.
21. LCASE(string1): converts string1 to lower case
22. LEFT(string1, count1): the leftmost count1 of characters of string1
23. LENGTH(string1), LEN(string1): the number of characters in string1
24. LOCATE(string1, string2 [,start1]): the first index (>0:left location, 0:not found) where string1 is found in string2, starting at start1
25. LOWER(string1): converts string1 to lower case
26. LPAD(string1, length1 [, cPadCharacter]): returns a string from an expression, padded with character(a space by default) to a specified length on the left. If the string is already longer than length then it is truncated (on the right).
27. LTRIM(string1): removes all leading blanks in string1
28. MID(string1 FROM start1 [FOR length1]), MID(string1, start1 [,length1]): extracts the substring starting at start1 with length length1. MID is a synonym for SUBSTRING.
29. OCT(number1): returns a string representation of the octal value of number1, where number1 is a integer(TINYINT, SMALLINT, INT, or BIGINT) number. Returns NULL if N is NULL.
30. OCTET_LENGTH(string1): the number of octets (8-bit bytes) needed to represent the string1.
31. PADC(string1, length1 [, cPadCharacter]): returns a string from an expression, padded with character(a space by default) to a specified length on both sides. If the string is already longer than length then it is truncated (on the right).
32. PADL(string1, length1 [, cPadCharacter]): returns a string from an expression, padded with character(a space by default) to a specified length on the left. If the string is already longer than length then it is truncated (on the right).
33. PADR(string1, length1 [, cPadCharacter]): returns a string from an expression, padded with character(a space by default) to a specified length on the right. If the string is already longer than length then it is truncated (on the right).
34. RAT(cSearchExpression, cExpressionSearched [, nOccurrence]): returns the beginning numeric position of the last (rightmost) occurrence of a character expression or memo field within another character expression or memo field, counting from the rightmost character. If the character expression isn't found, RAT() returns 0.
35. RATC(cSearchExpression, cExpressionSearched [, nOccurrence]): returns the beginning numeric position of the last (rightmost) occurrence of a character expression or memo field within another character expression or memo field, counting from the rightmost character. If the character expression isn't found, RATC() returns 0. It is case insensitive.
36. POSITION(s1 IN s2), POSITION(substr,str): location of specified substring
37. PROPER(STRING1) : returns from a character expression a string capitalized as appropriate for proper names.
38. REPEAT(string1, count1): repeats string1 count1 times
39. REPLICATE(string1, count1): same as REPEAT(string1,count1)
40. REPLACE(string1, string2, string3): replaces all occurrences in string1 of substring string2 with substring string3.
41. RIGHT(string1, count1): the rightmost count1 of characters of string1
42. RPAD(string1, length1 [, cPadCharacter]): returns a string from an expression, padded with character(a space by default) to a specified length on the right. If the string is already longer than length then it is truncated (on the right).
43. RTRIM(string1): removes all trailing blanks in string1
44. SOUNDEX(string1): a four character code representing the sound of string1
45. SPACE(nSpaces): returns a character string composed of a specified number of spaces.
46. SPLIT(string1, string2): split string1 according to delimiter string2, and return an String[] object (Types.ARRAY). Special SPLIT(expression,"") will return strings which contains only Letter and Digit. Special SPLIT(expression,null) will split string into length=1 strings, which is only Letter or Digit.
47. STRCAT(string1, string2): string concatenation, you can use string1+string2 too,same as CONCAT.
48. STRCAT(string1, string2,...): returns the string that results from concatenating the arguments, NULL values are skipped,same as CONCAT.
49. STRCMP(expr1,expr2): returns 0 if the strings are the same, -1 if the first argument is smaller than the second, and 1 otherwise.
50. STRCONV(expr1 [, charsetName]): returns a string by decoding the specified array of bytes using the specified charset. Cp895(Czech MS - DOS 895), Cp620(Polish MS - DOS 620) and Mazovia are extra supported although JVM doesn't support those. The omitted charsetName is 'ISO8859_1'.
51. STRTRAN(cSearched, cSearchFor [, cReplacement][, nStartOccurrence] [, nNumberOfOccurrences]): searches a character expression or memo field for occurrences of a second character expression or memo field, and then replaces each occurrence with a third character expression or

- memo field.
52. STUFF(cExpression, nStartReplacement, nCharactersReplaced, cReplacement): returns a string created by replacing a specified number of characters in a character expression with another character expression. cExpression specifies the string expression in which the replacement occurs. nStartReplacement specifies the position in cExpression where the replacement begins. nCharactersReplaced specifies the number of characters to be replaced. If nCharactersReplaced is 0, the replacement string cReplacement is inserted into cExpression. cReplacement specifies the replacement string expression. If cReplacement is the empty string, the number of characters specified by nCharactersReplaced are removed from cExpression.
 53. SUBSTR(string1, start1 [,length1]): extracts the substring starting at start1 with length length1
 54. SUBSTRING(string1 FROM start1 [FOR length1]), SUBSTRING(string1, start1 [,length1]): extracts the substring starting at start1 with length length1
 55. TRANSLATE(string1, string2, string3): any character in string1 that matches a character in the string2 is replaced by the corresponding character in the string3.
 56. TRIM([[BOTH | LEADING | TRAILING] [removedstring1] FROM] string1): remove the removedstring1 (a space by default) from the start/end/both ends of the string1.
 57. UCASE(string1): converts string1 to upper case
 58. UPPER(string1): converts string1 to upper case
 59. CHARMIRR(string1 [,IDontMirrorSpaces]): mirrors string1 at character level. string1 is the string that should be mirrored. If IDontMirrorSpaces equal to true, spaces at the end of string1 will not be mirrored but kept at the end. IDontMirrorSpaces's default value is false, which means to mirror the whole string.
 60. REVERSE(string1[,IDontMirrorSpaces]): mirrors string1 at byte level.

Date/Time Functions

1. ADDTIME(expr,expr2): adds expr2 to expr and returns the result. expr is a date or timestamp expression, and expr2 is a time expression.
2. CDOW(date) Returns the day-of-the-week(Sunday,Monday, Tuesday, Wednesday, Thursday, Friday,Saturday) from a given date,
3. CMONTH(date) the name of the month
4. CURDATE(): the current date
5. CURTIME(): the current time
6. DATE(): the current date
7. DATE(expr): extracts the date part of the date or timestamp expression expr.
8. DATETIME(): the current timestamp
9. DATESERIAL(year,month,day): returns a date value representing a specified year, month, and day.
10. DATE_ADD(date,INTERVAL expr type), DATE_SUB(date,INTERVAL expr type), ADDDATE(date,INTERVAL expr type), SUBDATE(date,INTERVAL expr type). For instance, SELECT DATE_ADD(date1,INTERVAL hour(now()+1 HOUR), adddate(date1,interval 3 hour) FROM test;

type Value	Expected expr Format
MICROSECOND[S]	MICROSECONDS
MILLISECOND[S]	MILLISECONDS
SECOND	SECONDS
MINUTE	MINUTES
HOUR	HOURS
DAY	DAYS
WEEK	WEEKS
MONTH	MONTHS
QUARTER	QUARTERS
YEAR	YEARS
DECADE	DECADES
CENTURY	CENTURYS
MILLENNIUM	MILLENNIUMS
SECOND_MICROSECOND	'SECONDS.MICROSECONDS'
MINUTE_MICROSECOND	'MINUTES.MICROSECONDS'
MINUTE_SECOND	'MINUTES:SECONDS'
HOUR_MICROSECOND	'HOURS.MICROSECONDS'
HOUR_SECOND	'HOURS:MINUTES:SECONDS'
HOUR_MINUTE	'HOURS:MINUTES'
DAY_MICROSECOND	'DAYS.MICROSECONDS'
DAY_SECOND	'DAYS HOURS:MINUTES:SECONDS'
DAY_MINUTE	'DAYS HOURS:MINUTES'
DAY_HOUR	'DAYS HOURS'
YEAR_MONTH	'YEARS-MONTHS'

11. DATEDIFF(expr,expr2): returns the number of days between the start date expr and the end date expr2. expr and expr2 are date or date-and-time expressions. Only the date parts of the values are used in the calculation.
12. DATEADD(INTERVAL, expr, date), DATEDIFF (INTERVAL, date1, date2), DATEPART (INTERVAL, date) For instance, SELECT DateAdd('m', 3, date1) FROM test;

INTERVAL Value	Expected expr Format
yyyy	Year
q	Quarter
m	Month
y	Day of the year
d	Day
w	Weekday
ww	Week
h	Hour
n	Minute
s	Second

13. DAY(date1), DAYOFMONTH(date1): the day of the month (1-31)
14. DAYNAME(date1): the name of the day
15. DAYOFWEEK(date1): the day of the week (1 means Sunday)
16. DAYOFYEAR(date1): the day of the year (1-366)
17. EXTRACT(type FROM expr): extracts parts from the date.

type Value	Expected Result
MICROSECOND[S]	MILLISECOND*1000
MILLISECOND[S]	indicates the millisecond within the second.
SECOND	indicates the second within the minute
MINUTE	MINUTES
HOUR	HOURS
DAY	DAYS
MONTH	MONTHS
QUARTER	QUARTERS
YEAR	YEARS
DECADE	DECADES
CENTURY	CENTURYS
MILLENNIUM	MILLENNIUMS
DOW	indicates the day of the week, SUNDAY, MONDAY, TUESDAY, WEDNESDAY, THURSDAY, FRIDAY, and SATURDAY(1~7).
DOY	indicates the day number within the year. The first day of the year has value 1.
WEEK,WOM	indicates the ordinal number of the day of the week within the current month.
WOY	indicates the ordinal number of the day of the week within the current year.
EPOCH	the current time as UTC milliseconds from the epoch(1970-01-01 00:00:00).

18. DOW(date1) get the day of the week, SUNDAY, MONDAY, TUESDAY, WEDNESDAY, THURSDAY, FRIDAY, and SATURDAY(1~7)
19. FROM_DAYS(expr1): given a day number expr1, returns a DATE value.
20. GOMONTH(expr1,numMonths) : give a date,return the date before or after a number months
21. HOUR(time1): the hour (0-23)
22. LAST_DAY(date1): takes a date or timestamp value and returns the corresponding date for the last day of the month.
23. MINUTE(time1): the minute (0-59)
24. MILLISECOND(time1): the milliseconds from the time or timestamp expression time1.
25. MICROSECOND(time1): the microseconds from the time or timestamp expression time1.
26. MONTH(time1): the month (1-12)
27. MONTHNAME(date1): the name of the month
28. NOW(): the current date and time as a timestamp
29. QUARTER(date1): the quarter (1-4)
30. SECOND(time1): the second (0-59)
31. SEC(time1) (Compatible purpose): the second (0-59)
32. SUBTIME(expr,expr2): subtracts expr2 from expr and returns the result. expr is a date or timestamp expression, and expr2 is a time expression.

33. SYSDATE(): the current date and time as a timestamp. Asynonym for NOW().
34. TIME(): returns the current system time in 24-hour, eight-character string (hh:mm:ss) format.
35. TIME(expr): extracts the time part of the time or timestamp expression expr.
36. TIMEDIFF(expr,expr2) returns the time between the start time expr and the end time expr2. Only the time parts of the values are used in the calculation.
37. TIMESERIAL(hour,minute,second): returns a Time value representing a specified hour, minute, and second.
38. TIMESTAMP(expr): returns the date or timestamp expression expr as a timestamp value.
39. TIMESTAMPADD(interval, count, timestamp1): adds the integer expression count to the date or timestamp expression timestamp1. interval can be SQL_TSI_FRAC_SECOND, SQL_TSI_SECOND, SQL_TSI_MINUTE, SQL_TSI_HOUR, SQL_TSI_DAY, SQL_TSI_WEEK, SQL_TSI_MONTH, SQL_TSI_QUARTER, SQL_TSI_YEAR, FRAC_SECOND, SECOND, MINUTE, HOUR, DAY, WEEK, MONTH, QUARTER, or YEAR.
40. TIMESTAMPDIF(interval, timestamp1, timestamp2): returns the integer difference between the date or timestamp expressions timestamp1 and timestamp2 (timestamp2-timestamp1). interval can be SQL_TSI_FRAC_SECOND, SQL_TSI_SECOND, SQL_TSI_MINUTE, SQL_TSI_HOUR, SQL_TSI_DAY, SQL_TSI_WEEK, SQL_TSI_MONTH, SQL_TSI_QUARTER, SQL_TSI_YEAR, FRAC_SECOND, SECOND, MINUTE, HOUR, DAY, WEEK, MONTH, QUARTER, or YEAR.
41. TO_DAYS(date1): given a date date1, returns a day number.
42. WEEK(date1), WEEKOFYEAR(date1): the week of this year (1-53)
43. YEAR(date1): the year

Boolean Functions

1. BETWEEN(expression1,expression2,expression3) : determines whether the value of an expression1 lies between the expression2 and expression3, return true or false.
2. EMPTY(expression): determines whether an expression evaluates to empty or null. The expression you include can be a string, numeric, date, or logical expression. EMPTY() returns true, when a string is empty string, spaces, tabs, carriage returns, linefeeds, or any combination of these, numeric value equals to 0, and logical expression is false.
3. ISBLANK(expression): determines whether an expression evaluates to empty or null. The expression you include can be a string, numeric, date, or logical expression. ISBLANK() returns true, when a string is empty string or spaces, numeric value equals to null, and logical expression is null.
4. ISALPHA(expression): determines whether the leftmost character in a character expression is alphabetic.
5. ISDATE(expression): determines whether an expression can be converted to a date value.
6. ISDIGIT(expression): determines whether the leftmost character of the specified character expression is a digit (0 through 9).
7. ISDIGITS(expression): determines whether a string contains only digits(0 through 9).
8. ISNULL(expression): determines whether an expression evaluates to null. The expression you include can be a string, numeric, date, or logical expression. If expression is NULL, ISNULL() returns true, otherwise it returns false.
9. ISNUMERIC(expression): determines whether an expression can be converted to a number value.

System Functions

1. DATABASE(): the name of the database of this connection
2. USER(): the user name of this connection
3. DELETED([cTableAlias | nWorkArea]): returns a logical value that indicates whether the current record is marked for deletion.
4. RECCOUNT([cTableAlias | nWorkArea]): returns the number of records, which includes all deleted records.
5. RECNO([cTableAlias | nWorkArea]): returns the current record number in the current or specified table. nWorkArea specifies the work area number for a table open in another work area. cTableAlias specifies the table alias for a table open in another work area.
6. ROWLOCKED([cTableAlias | nWorkArea]): indicates whether the current row has been locked by process or application.
7. TABLELOCKED(cTableName): indicates whether a table has been locked by process or application. For instance, select tablelocked('test').

Conversion Functions

1. CAST(expression AS data_type): converts value1 to another data type data_type. data_type may be SQL_BIGINT(Types.BIGINT), SQL_BINARY(Types.BINARY), SQL_BIT(Types.BIT), SQL_CHAR(Types.CHAR), SQL_DATE(Types.DATE), SQL_DECIMAL(Types.DECIMAL), SQL_DOUBLE(Types.DOUBLE), SQL_FLOAT(Types.FLOAT), SQL_INTEGER(Types.INTEGER), SQL_LONGVARBINARY(Types.LONGVARBINARY), SQL_LONGVARCHAR(Types.LONGVARCHAR), SQL_REAL(Types.REAL), SQL_SMALLINT(Types.SMALLINT), SQL_TIME(Types.TIME), SQL_TIMESTAMP(Types.TIMESTAMP), SQL_TINYINT(Types.TINYINT), SQL_VARBINARY(Types.VARBINARY), SQL_VARCHAR(Types.VARCHAR), BIGINT(Types.BIGINT), BINARY(Types.BINARY), BIT(Types.BIT), CHAR(Types.CHAR), DATE(Types.DATE), DECIMAL(Types.DECIMAL), DOUBLE(Types.DOUBLE), FLOAT(Types.FLOAT), INTEGER(Types.INTEGER), INT(Types.INTEGER), LONGVARBINARY(Types.LONGVARBINARY), LONGVARCHAR(Types.LONGVARCHAR), NUMERIC (Types.NUMERIC), REAL(Types.REAL), SMALLINT(Types.SMALLINT), TIME(Types.TIME), TIMESTAMP(Types.TIMESTAMP), TINYINT(Types.TINYINT), VARBINARY(Types.VARBINARY), VARCHAR(Types.VARCHAR), JSON, and jsonb. For instance, cast('456' AS SQL_INTEGER),cast('123.456' AS DECIMAL(12,5)), and cast('2004-12-23' as sql_date).
2. CONVERT(value1, SQLtype1): converts value1 to another data type SQLtype1. SQLtype1 may be SQL_BIGINT(Types.BIGINT), SQL_BINARY(Types.BINARY), SQL_BIT(Types.BIT), SQL_CHAR(Types.CHAR), SQL_DATE(Types.DATE), SQL_DECIMAL(Types.DECIMAL), SQL_DOUBLE(Types.DOUBLE), SQL_FLOAT(Types.FLOAT), SQL_INTEGER(Types.INTEGER), INT(Types.INTEGER), SQL_LONGVARBINARY(Types.LONGVARBINARY), SQL_LONGVARCHAR(Types.LONGVARCHAR), SQL_REAL(Types.REAL), SQL_SMALLINT(Types.SMALLINT), SQL_TIME(Types.TIME), SQL_TIMESTAMP(Types.TIMESTAMP), SQL_TINYINT(Types.TINYINT), SQL_VARBINARY(Types.VARBINARY), SQL_VARCHAR(Types.VARCHAR), JSON, and jsonb. value1 may be any complicated expression. For instance, CONVERT("123",SQL_INTEGER).
3. CBOOL(expression): returns a Boolean value from an expression.

4. CBYTE(expression): returns a Byte value from an expression.
5. CCUR(expression): returns a Currency value with four decimal digits of precision to the right of the decimal from an expression.
6. CDATE(expression,pattern): returns a Date value according a pattern from an expression. For instance, CDATE('21111947','ddMMyyyy').
7. CDBL(expression): returns a Double value from an expression.
8. CINT(expression): returns an Integer value from an expression.
9. CLNG(expression): returns a Long value from an expression.
10. CSNG(expression): returns a Float value from an expression.
11. CSTR(expression): returns a String value from an expression.
12. CTOD(cExpression): converts a string expression to a date expression.
13. CTOT(cExpression): returns a timestamp value from a string expression.
14. DTOC(date1 | timestamp1[, 1]): returns a string from a date or timestamp expression.
15. DTOT(dDateExpression): returns a timestamp value from a date expression.
16. LTOC(bExpression): returns a string value(T,F, or ' ') from a logical expression.
17. DTOS(date1 | timestamp1): returns a string in a yyymmdd format from a specified date or timestamp expression.
18. DTOS(date1 | timestamp1,pattern): returns a string according to a pattern format from a specified date or timestamp expression.
19. TTOC(tExpression [, 1 | 2]): converts a timestamp expression to a string value of a specified format.
20. TTOD(tExpression): returns a date value from a timestamp expression.
21. POSIXTOT(expression): returns a timestamp value from a POSIX timestamp value.
22. TTOPOSIX(tExpression): converts a timestamp expression to a POSIX timestamp value.
23. STR(nExpression [, nLength [, nDecimalPlaces]]): Returns the character equivalent of a specified numeric expression. nExpression specifies the numeric expression STR() evaluates. nLength specifies the length of the character string STR() returns. The length includes one character for the decimal point and one character for each digit to the right of the decimal point. nDecimalPlaces specifies the number of decimal places in the character string STR() returns. If you specify fewer decimal places than are in nExpression, the extra digits are truncated. STR() pads the character string it returns with leading spaces if you specify a length larger than the number of digits to the left of the decimal point. STR() returns a string of asterisks, indicating numeric overflow, if you specify a length less than the number of digits to the left of the decimal point. If nLength is omitted, nLength defaults to 10 characters.
24. STRZERO(nExpression, nLength[, nDecimals]): convert a numeric expression to a string padded with leading zeros.
25. VAL(string1): returns a numeric value from a string1 composed of numbers.
26. COLLATE(string1[,collation]): For multilingual sort in ORDER BY clause. Now collation can be 'DUTCH', 'GERMAN', 'ICELAND', 'SPANISH', 'RUSSIAN', 'CZECH', 'GREEK', 'SLOVAK', 'POLISH', 'TURKISH', 'HUNGARY', 'CP850', 'CP852', 'CP866', 'CROATIAN', 'HEBREW', 'SWEDISH, and 'MAZOVIA'. Without collation parameter, COLLATE function will try to utilize charSet property in Connection properties.
27. PasToJava(str): get a Java string from a Pascal-style string
28. JavaToPas(str): get a Pascal-style string from a Java string
29. PasToJava(str): get a null-terminated string from a Pascal-style string
30. CToPas(str): get a Pascal-style string from a null-terminated string
31. CToJava(str): get a Java string from a null-terminated string
32. JavaToC(str): get a null-terminated from a Java string
33. BToInt_LE(binary): get int value from bytes with little-endian.
34. BToInt_BE(binary): get int value from bytes with big-endian.
35. IntToB_LE(binary): get bytes with little-endian from int value.
36. IntToB_BE(binary): get bytes with big-endian from int value.
37. BToShort_LE(binary): get short value from bytes with little-endian.
38. BToShort_BE(binary): get short value from bytes with big-endian.
39. ShortToB_LE(binary): get bytes with little-endian from short value.
40. ShortToB_BE(binary): get bytes with big-endian from short value.
41. BToLong_LE(binary): get long value from bytes with little-endian.
42. BToLong_BE(binary): get long value from bytes with big-endian.
43. LongToB_LE(binary): get bytes with little-endian from long value.
44. LongToB_BE(binary): get bytes with big-endian from long value.
45. GetNumber(str[, defaultValue]): return a number value(int, long, double) according to str. If failed to parse, return defaultValue(null is omitted value).
46. GetInt(str[, defaultValue]): return an int value according to str. If failed to parse, return defaultValue(null is omitted value).
47. GetLong(str[, defaultValue]): return a long value according to str. If failed to parse, return defaultValue(null is omitted value).
48. GetDouble(str[, defaultValue]): return a double value according to str. If failed to parse, return defaultValue(null is omitted value).

Security Functions

1. COMPRESS(content) : Return a compressed byte[]
2. UNCOMPRESS(compressedBytes) : Return an uncompressed byte[], please don't use it for non-compressed data
3. ENCRYPT(content,cKey,cCryptMethod): Returns a crypted byte[]. cCryptMethod should be 'DES', 'TRIDES', 'BLOWFISH', or 'AES' now. ENCRYPT function is used for VARBINARY column.
Data Encryption Standard (DES) algorithm, adopted by the U.S. government in 1977, is a block cipher that transforms 64-bit data blocks under a 56-bit secret key, by means of permutation and substitution. It is officially described in FIPS PUB 46. The DES algorithm is used for many applications within the government and in the private sector.
Triple-DES is an improvement over DES. It uses three DES keys k1, k2 and k3. A message is encrypted with k1 first, then decrypted with k2 and encrypted again with k3 (DESencryptiondecryptionencryption). This increases security as the key length effectively increases from 56 to 112 or 168 (two or three keys may be used in TriDES). The DES key size is 128 or 192 bit and block size 64 bit.
Blowfish is a keyed, symmetric block cipher, designed in 1993 by Bruce Schneier and included in a large number of cipher suites and encryption products. Blowfish has a 64-bit block size and a variable key length from 32 bits up to 448 bits. It is a 16-round Feistel cipher and

uses large key-dependent S-boxes.

The Advanced Encryption Standard (AES) is a specification for the encryption of electronic data established by the U.S. National Institute of Standards and Technology (NIST) in 2001. Originally called Rijndael, the cipher was developed by two Belgian cryptographers, Joan Daemen and Vincent Rijmen, who submitted to the AES selection process. The algorithm described by AES is a symmetric-key algorithm, meaning the same key is used for both encrypting and decrypting the data. AES is a variant of Rijndael which has a fixed block size of 128 bits, and a key size of 128, 192, or 256 bits.

4. DECRYPT(content,cKey,cCryptMethod): Returns a decrypted byte[]. cCryptMethod should be 'DES', 'TRIDES', 'BLOWFISH', or 'AES' now.
5. ENCODE(content): Encodes a BASE64 encoding string.
6. DECODE(content): Returns a byte[] from a BASE64 string.
7. ENCODE(content,cKey,cCryptMethod): Crypts and encodes content. cCryptMethod should be 'DES', 'TRIDES', 'BLOWFISH', or 'AES'. ENCRYPT function is used for VARCHAR column.
8. DECODE(content,cKey,cCryptMethod): Decodes and decrypts content. cCryptMethod should be 'DES', 'TRIDES', 'BLOWFISH', or 'AES' now.
9. MD5(string1): Calculates a MD5(Message-Digest Algorithm 5) checksum for the string1.
10. SHA1(string1): Calculates a SHA-1(Secure Hash Algorithm 1) hash for the string1.
11. Crypt3(word[, salt]): Returns a hashed string of 13 printable ASCII characters, with the first two characters represent the salt. It can be used to accept typed passwords from the user, or attempting to crack Unix passwords with a dictionary.

Sequence Functions

1. NEXTVAL(cSequenceName): advances sequence and returns new value.
2. CURRVAL(cSequenceName): returns value most recently obtained with nextval.

Regular Expression Functions

Function	Argument Type	Return Type	Description
REGEXP_LIKE(expression,pattern[,match_parameter])	expression is a string expression that serves as the search value. pattern is the regular expression. For a listing of the operators you can specify in pattern, refer to java.util.regex.Matcher.Pattern. match_parameter is a text literal that lets you change the default matching behavior of the function. You can specify one or more of the following values for match_parameter: 'i' specifies case-insensitive matching. 'c' specifies case-sensitive matching. 'n' allows the period (.), which is the match-any-character wildcard character, to match the newline character. If you omit this parameter, then the period does not match the newline character. 'm' treats the source string as multiple lines. HXTT PDF interprets ^ and \$ as the start and end, respectively, of any line anywhere in the source string, rather than only at the start or end of the entire source string. If you omit this parameter, then HXTT PDF treats the source string as a single line. 'x' ignores whitespace characters. By default, whitespace characters match themselves. If you specify multiple contradictory values, then HXTT PDF uses the last value. For example, if you specify 'ic', then HXTT PDF uses case-sensitive matching. If you specify a character other than those shown above, then HXTT PDF will ignore it. If you omit match_parameter, then: The default case sensitivity is determined by the value of the caseInsensitive connection property. A period (.) does not match the newline character. The source string is treated as a single line.	return true if it find one subsequence matches the pattern.	REGEXP_LIKE is similar to the LIKE condition, except REGEXP_LIKE performs regular expression matching instead of the simple pattern matching performed by LIKE. This condition evaluates strings using characters as defined by the charSet connection property.
	source_expression is a string expression that serves as the search value. pattern is the regular expression. IFor a listing of the operators you can specify in pattern, refer		

```
REGEXP_REPLACE(source_expression,pattern[,
cReplacement[, nStartOccurrence [,
nNumberOfOccurrences[,match_parameter]]])
```

to java.util.regex.Matcher.Pattern.
cReplacement may contain references to subsequences captured during the previous match: Each occurrence of \$g will be replaced by the result of evaluating group(g). The first number after the \$ is always treated as part of the group reference. Subsequent numbers are incorporated into g if they would form a legal group reference. Only the numerals '0' through '9' are considered as potential components of the group reference. If the second group matched the string "foo", for example, then passing the replacement string "\$2bar" would cause "foobar" to be appended to the string buffer. A dollar sign (\$) may be included as a literal in the replacement string by preceding it with a backslash (\\$).

nStartOccurrence is a positive integer indicating the character of source_expression where HXTT PDF should begin the search. The default is 1, meaning that HXTT PDF begins the search at the first character of source_expression.

nNumberOfOccurrences is a nonnegative integer indicating the occurrence of the replace operation:

If you specify 0, then HXTT PDF replaces all occurrences of the match.

If you specify a positive integer n, then HXTT PDF replaces the nth occurrence.

If occurrence is greater than 1, then the database searches for the second occurrence beginning with the first character following the first occurrence of pattern, and so forth. This behavior is different from the INSTR function, which begins its search for the second occurrence at the second character of the first occurrence.

match_parameter is a text literal that lets you change the default matching behavior of the function. You can specify one or more of the following values for match_parameter:

'i' specifies case-insensitive matching.

'c' specifies case-sensitive matching.

'n' allows the period (.), which is the match-any-character wildcard character, to match the newline character. If you omit this parameter, then the period does not match the newline character.

'm' treats the source string as multiple lines. HXTT PDF interprets ^ and \$ as the start and end, respectively, of any line anywhere in the source string, rather than only at the start or end of the entire source string. If you omit this parameter, then HXTT PDF treats the source string as a single line.

'x' ignores whitespace characters. By default, whitespace characters match themselves.

If you specify multiple contradictory values, then HXTT PDF uses the last value. For example, if you specify 'ic', then HXTT PDF uses case-sensitive matching. If you specify a character other than those shown above, then HXTT PDF will ignore it.

If you omit match_parameter, then:

The default case sensitivity is determined by the value of the caseInsensitive connection property.

A period (.) does not match the newline character.

searches a character expression for occurrences of a pattern, and then replaces each occurrence with a third pattern expression.

REGEXP_REPLACE extends the functionality of the STRTRAN function by letting you search a string for a regular expression pattern. By default, the function returns source_expression with every occurrence of the regular expression pattern replaced with replace_string. The string returned is in the same character set as source_expression.

<p>REGEXP_INSTR(source_expression,pattern[,nStartOccurrence [,nNumberOfOccurrences[,return_option [,match_parameter[,subexpr]]]]])</p>	<p>The source string is treated as a single line.</p> <p>source_expression is a string expression that serves as the search value.</p> <p>pattern is the regular expression. For a listing of the operators you can specify in pattern, refer to java.util.regex.Matcher.Pattern.</p> <p>nStartOccurrence is a positive integer indicating the character of source_expression where HXTT PDF should begin the search. The default is 1, meaning that HXTT PDF begins the search at the first character of source_expression.</p> <p>nNumberOfOccurrences is a nonnegative integer indicating the occurrence of the replace operation:</p> <p>If you specify 0, then HXTT PDF replaces all occurrences of the match.</p> <p>If you specify a positive integer n, then HXTT PDF replaces the nth occurrence.</p> <p>If occurrence is greater than 1, then the database searches for the second occurrence beginning with the first character following the first occurrence of pattern, and so forth. This behavior is different from the INSTR function, which begins its search for the second occurrence at the second character of the first occurrence.</p> <p>return_option lets you specify what HXTT PDF should return in relation to the occurrence:</p> <p>If you specify 0, then HXTT PDF returns the position of the first character of the occurrence. This is the default.</p> <p>If you specify 1, then HXTT PDF returns the position of the character following the occurrence.</p> <p>match_parameter is a text literal that lets you change the default matching behavior of the function. You can specify one or more of the following values for match_parameter:</p> <p>'i' specifies case-insensitive matching.</p> <p>'c' specifies case-sensitive matching.</p> <p>'n' allows the period (.), which is the match-any-character wildcard character, to match the newline character. If you omit this parameter, then the period does not match the newline character.</p> <p>'m' treats the source string as multiple lines. HXTT PDF interprets ^ and \$ as the start and end, respectively, of any line anywhere in the source string, rather than only at the start or end of the entire source string. If you omit this parameter, then HXTT PDF treats the source string as a single line.</p> <p>'x' ignores whitespace characters. By default, whitespace characters match themselves.</p> <p>If you specify multiple contradictory values, then HXTT PDF uses the last value. For example, if you specify 'ic', then HXTT PDF uses case-sensitive matching. If you specify a character other than those shown above, then HXTT PDF will ignore it.</p> <p>If you omit match_parameter, then:</p> <p>The default case sensitivity is determined by the value of the caseInsensitive connection property.</p> <p>A period (.) does not match the newline character.</p> <p>The source string is treated as a single line. For a pattern with subexpressions, the subexpr is a</p>	<p>returns the position of the first character of the occurrence or the character following the occurrence.</p>	<p>REGEXP_INSTR extends the functionality of the INSTR function by letting you search a string for a regular expression pattern. It returns an integer indicating the beginning or ending position of the matched substring, depending on the value of the return_option argument. If no match is found, then the function returns 0.</p>
---	--	---	---

	<p>fragment of pattern enclosed in parentheses. Subexpressions can be nested. Subexpressions are numbered in order in which their left parentheses appear in pattern. For example, consider the following expression: 0123(((abc)(de)fghi)45(678)</p> <p>This expression has five subexpressions in the following order: "abcdefghi" followed by "abcdef", "abc", "de" and "678".</p> <p>If subexpr is zero, then the position of the entire substring that matches the pattern is returned. If subexpr is greater than zero, then the position of the substring fragment that corresponds to subexpression number subexpr in the matched substring is returned. If pattern does not have at least subexpr subexpressions, the function returns zero. The default value for subexpr is zero.</p>		
<p>REGEXP_SUBSTR (source_expression,pattern[, nStartOccurrence [, nNumberOfOccurrences[,match_parameter[,subexpr]]])</p>	<p>source_expression is a string expression that serves as the search value.</p> <p>pattern is the regular expression. For a listing of the operators you can specify in pattern, refer to java.util.regex.Matcher.Pattern.</p> <p>nStartOccurrence is a positive integer indicating the character of source_expression where HXTT PDF should begin the search. The default is 1, meaning that HXTT PDF begins the search at the first character of source_expression.</p> <p>nNumberOfOccurrences is a nonnegative integer indicating the occurrence of the replace operation:</p> <p>If you specify 0, then HXTT PDF replaces all occurrences of the match.</p> <p>If you specify a positive integer n, then HXTT PDF replaces the nth occurrence.</p> <p>If occurrence is greater than 1, then the database searches for the second occurrence beginning with the first character following the first occurrence of pattern, and so forth. This behavior is different from the INSTR function, which begins its search for the second occurrence at the second character of the first occurrence.</p> <p>match_parameter is a text literal that lets you change the default matching behavior of the function. You can specify one or more of the following values for match_parameter:</p> <ul style="list-style-type: none"> 'i' specifies case-insensitive matching. 'c' specifies case-sensitive matching. 'n' allows the period (.), which is the match-any-character wildcard character, to match the newline character. If you omit this parameter, then the period does not match the newline character. 'm' treats the source string as multiple lines. HXTT PDF interprets ^ and \$ as the start and end, respectively, of any line anywhere in the source string, rather than only at the start or end of the entire source string. If you omit this parameter, then HXTT PDF treats the source string as a single line. 'x' ignores whitespace characters. By default, whitespace characters match themselves. If you specify multiple contradictory values, then HXTT PDF uses the last value. For example, if you specify 'ic', then HXTT PDF uses case-sensitive matching. If you specify a character other than those shown above, then 	<p>returns the substring of the occurrence.</p>	<p>REGEXP_SUBSTR extends the functionality of the SUBSTR function by letting you search a string for a regular expression pattern. It returns the substring itself. This function is useful if you need the contents of a match string but not its position in the source string.</p>

	<p>HXTT PDF will ignore it. If you omit <code>match_parameter</code>, then: The default case sensitivity is determined by the value of the <code>caseInsensitive</code> connection property. A period (.) does not match the newline character. The source string is treated as a single line. For a pattern with subexpressions, the <code>subexpr</code> is a fragment of pattern enclosed in parentheses. Subexpressions can be nested. Subexpressions are numbered in order in which their left parentheses appear in pattern. For example, consider the following expression: 0123(((abc)(de)f)ghi)45(678) This expression has five subexpressions in the following order: "abcdefghi" followed by "abcdef", "abc", "de" and "678". If <code>subexpr</code> is zero, then the position of the entire substring that matches the pattern is returned. If <code>subexpr</code> is greater than zero, then the position of the substring fragment that corresponds to subexpression number <code>subexpr</code> in the matched substring is returned. If pattern does not have at least <code>subexpr</code> subexpressions, the function returns zero. The default value for <code>subexpr</code> is zero.</p>		
<p><code>REGEXP_COUNT(source_expression,pattern[,nStartOccurrence[,match_parameter]])</code></p>	<p><code>source_expression</code> is a string expression that serves as the search value. <code>pattern</code> is the regular expression. For a listing of the operators you can specify in <code>pattern</code>, refer to <code>java.util.regex.Matcher.Pattern</code>. <code>nStartOccurrence</code> is a positive integer indicating the character of <code>source_expression</code> where HXTT PDF should begin the search. The default is 1, meaning that HXTT PDF begins the search at the first character of <code>source_expression</code>. <code>match_parameter</code> is a text literal that lets you change the default matching behavior of the function. You can specify one or more of the following values for <code>match_parameter</code>: 'i' specifies case-insensitive matching. 'c' specifies case-sensitive matching. 'n' allows the period (.), which is the match-any-character wildcard character, to match the newline character. If you omit this parameter, then the period does not match the newline character. 'm' treats the source string as multiple lines. HXTT PDF interprets ^ and \$ as the start and end, respectively, of any line anywhere in the source string, rather than only at the start or end of the entire source string. If you omit this parameter, then HXTT PDF treats the source string as a single line. 'x' ignores whitespace characters. By default, whitespace characters match themselves. If you specify multiple contradictory values, then HXTT PDF uses the last value. For example, if you specify 'ic', then HXTT PDF uses case-sensitive matching. If you specify a character other than those shown above, then HXTT PDF will ignore it. If you omit <code>match_parameter</code>, then: The default case sensitivity is determined by the value of the <code>caseInsensitive</code> connection property. A period (.) does not match the newline</p>	<p>returns the number of times a pattern occurs in a source string.</p>	<p><code>REGEXP_COUNT</code> returns the number of times a pattern occurs in a source string. It returns an integer indicating the number of occurrences of pattern. If no match is found, then the function returns 0.</p>

character.
The source string is treated as a single line.

Miscellaneous Functions

Function	Argument Type	Return Type	Description
DECODE(expression , search , result [, search , result]... [, default])	expression is the value to compare. search is the value that is compared against expression. result is the value returned, if expression is equal to search. default is optional. If no matches are found, the decode will return default. If default is omitted, then the decode statement will return null (if no matches are found).	same as argument type	The decode function has the functionality of an IF-THEN-ELSE statement.
GREATEST(expression1,expression2[,...]) MAX(expression1,expression2[,...])	any numeric, string, date/time, or boolean type	same as argument type	maximum value of all expressions
LEAST(expression1,expression2[,...]) MIN(expression1,expression2[,...])	any numeric, string, date/time, or boolean type	same as argument type	minimum value of all expressions
IF(IExpression, eExpression1, eExpression2) IIF(IExpression, eExpression1, eExpression2)	IExpression specifies the logical expression that IF()/IIF() evaluates.	Returns one of two values depending on the value of a logical expression.	If IExpression evaluates to true , eExpression1 is returned. If IExpression evaluates to false, eExpression2 is returned.
NVL(expression, value) IFNULL(expression, value)	any numeric, string, date/time, or boolean type	Returns one of two values depending on whether expression is null.	If expression evaluates to null , value is returned. Otherwise, expression is returned.
INLIST(eExpression1, eExpression2 [, eExpression3 ...])	eExpression1 specifies the expression INLIST() searches for in the set of expressions. eExpression2 [, eExpression3 ...] specifies the set of expressions to search. You must include at least one expression (eExpression2), and can include up to 24 expressions (eExpression2, eExpression3, and so on).	Determines whether an expression matches another expression in a set of expressions.	All the expressions in the set of expressions must be of the same data type.
COALESCE(value [, ...])	any numeric, string, date/time, or boolean type	the type of the first of its arguments that is not null	returns the first of its arguments that is not null
ELT(numberExpression,value1Expression, value2Expression)	numberExpression must be a integer type,value	Returns value depending on the	Returns value1Expression if numberExpression = 1, value2Expression if

[value2Expression,...])	expression can be any type	numberExpression,value1Expression,...valuexExpression	numberExpression = 2, and so on. Returns NULL if N is less than 1 or greater than the number of arguments.
INTERVAL(expression,expr1,expr2,...,exprn)	any numeric, string, date/time, or boolean type	integer value	returns 0 if expression < expr1, 1 if expression < expr2 and so on or -1 if expressionN is NULL. If expression > exprn, returns n.
TRANSFER (expression, search_1, result_1) TRANSFER (expression, search_1, result_1, search_2, result_2) TRANSFER (expression, search_1, result_1, search_2, result_2, ..., search_n, result_n) TRANSFER (expression, search_1, result_1, default) TRANSFER (expression, search_1, result_1, search_2, result_2, default) TRANSFER (expression, search_1, result_1, search_2, result_2, ..., search_n, result_n, default)	any numeric, string, date/time, or boolean type, or null	Returns value depending on the expression, search_x, result_x and default	TRANSFER compares expression to the search_x expressions and, if matches, returns result_x. If not, returns default, or, if default is left out, return null .
	expression specifies the character, currency, date, or numeric expression to format. formatcode specifies one format code that determine how the expression is formatted. The following table lists the available format codes Format Code Description @C CR is appended to positive currency or numeric values to indicate a credit. @D act as DTOS function. @E act as DTOS function. @T leading and trailing spaces are trimmed from character values. @X db is appended to negative currency or numeric values to indicate a debit. if 0, currency		

TRANSFORM(expression [, formatcodes])

@Z

or numeric values are converted to spaces.

@(

encloses negative currency or numeric values in parentheses.

@^

converts currency or numeric values to scientific notation.

@0

converts numeric or currency values to their hexadecimal equivalents. The numeric or currency value must be positive and less than 4,294,967,296.

return the formatted string

!

converts a character to uppercase. adds the current currency symbol specified by SET CURRENCY to currency and numeric values. By default, the symbol is placed immediately before or after the value.

\$

However, the currency symbol and its placement (specified with SET CURRENCY), the separator character (specified with SET SEPARATOR) and the decimal character (specified with SET POINT) can all be changed. specifies the

returns a character string from an expression in a format determined by a format code

	X	width of character values. For example, if cFormatCodes is XX? 2 characters are returned.
	Y	converts logical true (.T.) and false (.F.) values to Y and N, respectively.
	@!	converts a string to uppercase.

1. LASTNVL(column): returns the current value for a particular column. When a null value is encountered, it will try to return the nearest non-null value of prior rows in the specified table. That function is useful when data are stored by using suppression of repeated data.
2. LASTEVL(column): returns the current value for a particular column. When an empty value is encountered, it will try to return the nearest non-empty value of prior rows in the specified table. That function is useful when data are stored by using suppression of repeated data. It means empty value when it is a null value, or a string is empty string, spaces, tabs, carriage returns, linefeeds, or any combination of these, numeric value equals to 0, and logical expression is false.

Aggregate Functions

1. ARRAY_AGG([DISTINCT] expression): returns an array for input values, including null.
2. AVG([DISTINCT] expression): the average (arithmetic mean) of all input values.
3. COUNT(*): the number of input values.
4. COUNT([DISTINCT] expression): the number of input values for which the value of expression is not null.
5. FIRST(expression): the value of a specified field in the first record, respectively, of the result set returned by a query. Because records are usually returned in no particular order (unless the query includes an ORDER BY clause), the records returned by this functions will be arbitrary.
6. GROUP_CONCAT([DISTINCT] expr_list [order_by_clause] [SEPARATOR str_val]): returns a string result with the concatenated non-NULL values from a group. It returns NULL if there are no non-NULL values. SEPARATOR is followed by the string value that should be inserted between values of result. The default is a comma (','). You can eliminate the separator altogether by specifying SEPARATOR ". The result will be truncated to the maximum length of 8192 sometimes.
7. GROUPING(expression): returns a value of 1 when the expression is added by either the CUBE or ROLLUP operator, or 0 when the expression is not the result of CUBE or ROLLUP. It is used to distinguish the null values that are returned by CUBE and ROLLUP from standard null values. The NULL returned as the result of a CUBE or ROLLUP operation is a special use of NULL.
8. LAST(expression): the value of a specified field in the last record, respectively, of the result set returned by a query. Because records are usually returned in no particular order (unless the query includes an ORDER BY clause), the records returned by this functions will be arbitrary.
9. MAX(expression): the maximum value of expression across all input values.
10. MIN(expression): the minimum value of expression across all input values.
11. STD(expression): the sample standard deviation of the input values.
12. STDDEV(expression): the sample standard deviation of the input values.
13. STRING_AGG([DISTINCT] expression[, delimiter]): returns a string for input values, separated by delimiter.
14. SUM([DISTINCT] expression): the sum of expression across all input values.
15. XMLAGG(expr [order_by_clause]): Returns a collection of XML fragments. Any arguments that return null are dropped from the result.

Chapter 9. OpenAPI Programming

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Extend SQL functions

HXTT PDF supports more than 250 SQL functions. Please email us if you wish to complement some new SQL functions. HXTT PDF supports also user-defined SQL functions, and you should use only this feature to provide special SQL functions in your project.

First, you need to implement `com.hxtt.sql.ExtendedFunctionInterface`.

```
public interface ExtendedFunctionInterface {
    /**
     * Used to verify whether functionName is supported, and has a correct parameter count.
     * @param functionName the name of function
     * @param parameters the parameter list of function, which can be null
     * @return value
     * @throws SQLException if has an incorrect parameter number
     */
    public boolean isExtendedFunction(String functionName, Object[] parameters) throws SQLException;

    /**
     * Used to evaluate function value.
     * @param functionName the name of function
     * @param values the value list of function, which can be null
     * @return value
     * @throws SQLException if failed to calculate the function
     */
    public Object evaluate(String functionName, Object[] values) throws SQLException;

    /**
     * Used to get the SQL type of the value that is expected to be returned when evaluate() is
     called.
     * @param functionName
     * @return the SQL type or Types.NULL if functionName is supported
     */
    public int getType(String functionName);

    /**
     * Used to get the SQL types of the parameter values that are expected to be returned when
     evaluate() is called.
     * return null if function hasn't any parameter, or you wish to use the default SQL types.
     * use Types.NULL for that specific parameter if you wish to get the default SQL type.
     * @param functionName
     * @return the SQL type list or null if functionName is supported
     */
    public int[] getParameterTypes(String functionName);

    /**
     * Used to estimate the maximum number of characters that should be contained in a String
     returned by evaluate(String functionName, Object[] values).
     * Zero is returned if this value object does not represent Types.VARCHAR, Types.BINARY,
     Types.LONGVARCHAR, or Types.LONGBINARY.
     * @param functionName
     * @return maximum size
     * @throws SQLException if functionName is supported
     */
    public int estimateValueSize(String functionName) throws SQLException;
}
```

Let us see a sample:

```
import com.hxtt.sql.ExtendedFunctionInterface;
import java.sql.SQLException;
import java.sql.Types;

/**
 * Show how to complement some sql functions.
```

```

* This sample complements toString(value) and random() for demo purpose
*/
public class Functions implements ExtendedFunctionInterface {
    public Functions() {
    }

    /**
     * Used to verify whether functionName is supported, and has a correct parameter count.
     * @param functionName the name of function
     * @param parameters the parameter list of function, which can be null
     * @return value
     * @throws SQLException if has an incorrect parameter number
     */
    public boolean isExtendedFunction(String functionName, Object[] parameters) throws SQLException
    {
        if (functionName.equalsIgnoreCase("toString")) {
            if (parameters != null && parameters.length == 1) {
                return true;
            }
            else {
                throw new SQLException("Invalid parameter value in toString function");
            }
        }
        else if (functionName.equalsIgnoreCase("random")) {
            if (parameters == null) {
                return true;
            }
            else {
                throw new SQLException("Invalid parameter value in random function");
            }
        }
        return false;
    }

    /**
     * Used to evaluate function value.
     * @param functionName the name of function
     * @param values the value list of function, which can be null
     * @return value
     * @throws SQLException if failed to calculate the function
     */
    public Object evaluate(String functionName, Object[] values) throws SQLException {
        if (functionName.equalsIgnoreCase("toString")) {
            return values[0] + "";
        }
        else if (functionName.equalsIgnoreCase("random")) {
            return new Double(Math.random());
        }
        throw new SQLException("Inner Error:");
    }

    /**
     * Used to get the SQL type of the value that is expected to be returned when evaluate() is
     called.
     * @param functionName
     * @return the SQL type or Types.NULL if functionName is supported
     */
    public int getType(String functionName) {
        if (functionName.equalsIgnoreCase("toString")) {
            return Types.VARCHAR;
        }
        else if (functionName.equalsIgnoreCase("random")) {
            return Types.DOUBLE;
        }
        return Types.NULL;
    }

    /**
     * Used to get the SQL types of the parameter values that are expected to be returned when
     evaluate() is called.
     * return null if function hasn't any parameter, or you wish to use the default SQL types.
     * use Types.NULL for that specific parameter if you wish to get the default SQL type.
     * @param functionName
     * @return the SQL type list or null if functionName is supported
     */
    public int[] getParameterTypes(String functionName) {
        if (functionName.equalsIgnoreCase("toString")) {
            return new int[] {
                Types.VARCHAR};
        }
    }
}

```

```

        return null;
    }

    /**
     * Used to estimate the maximum number of characters that should be contained in a String
     * returned by evaluate(String functionName,Object[] values).
     * Zero is returned if this value object does not represent Types.VARCHAR, Types.BINARY,
     * Types.LONGVARCHAR, or Types.LONGBINARY.
     * @param functionName
     * @return maximum size
     * @throws SQLException if functionName is supported
     */
    public int estimateValueSize(String functionName) throws SQLException {
        if (functionName.equalsIgnoreCase("tostring")) {
            return 20;
        }
        else if (functionName.equalsIgnoreCase("random")) {
            return 8;
        }
        return 10;
    }
}

```

Then you can use `com.hxtt.sql.OpenAPI.registerExtendedFunction("Functions");` to register Functions class. Then you can use those user-defined functions in SQL. For instance, "select abs(random()),tostring(date) from test;".

Create/Remove/Start/Stop Server Programmatically

If you wish to create,remove,start a GUI server for remote connections from your application, you can call four functions of `com.hxtt.sql.admin.Admin` class:

```

public String createServer(String serverConfigName,String serverConfigURL,boolean serverAutoStart,boolean
isServerLog,String serverLogFilePath) throws Exception
public void removeServer(String serverName)
public void startServer(String serverName)throws SQLException
public void stopServer(String serverName)throws SQLException

```

For instance:

```

try {
    com.hxtt.sql.admin.Admin admin = new com.hxtt.sql.admin.Admin();
    admin.show();//It can be invisible too.

    String createResult =
admin.createServer("test1","jdbc:pdf://192.168.1.1:1027/mnt/pdf/files",true,true,"/tmp/test1.log");

    if (createResult!=null)
        System.out.println("Failure to create this server for " + createResult);

    admin.startServer("test1");
    admin.stopServer("test1");
    admin.stopServer("test4");
    admin.removeServer("test1");
}
catch (SQLException e) {
    System.out.println(e.getMessage());
}

```

On LINUX and UNIX, if you got "Cannot connect to X11 window server. The environment variable DISPLAY is not set.", you should use `-Djava.awt.headless=true` to run Java in headless mode. On OS/400, if you got still a `java.awt.HeadlessException` thrown with `-Djava.awt.headless=true`, you should read [Run HXTT PDFServer as Windows Service or Linux\(Solaris\) Daemon](#) to consider running directly `com.hxtt.sql.admin.HxttService`. If you wish Create/Remove/Start/Stop Server Programmatically without GUI or invisible GUI, call four same functions of `com.hxtt.sql.admin.HxttService` class:

```

public String createServer(String serverConfigName,String serverConfigURL,boolean serverAutoStart,boolean
isServerLog,String serverLogFilePath) throws Exception
public void removeServer(String serverName)
public void startServer(String serverName)throws SQLException
public void stopServer(String serverName)throws SQLException

```

For instance:

```

    try {
        com.hxtt.sql.admin.HxttService admin = new com.hxtt.sql.admin.HxttService();

        String createResult =
admin.createServer("test1","jdbc:pdf://192.168.1.1:1027/mnt/pdffiles",true,true,"/tmp/test1.log");

        if (createResult!=null)
            System.out.println("Failure to create this server for " + createResult);

        admin.startServer("test1");

        admin.stopServer("test1");

        admin.stopServer("test4");

        admin.removeServer("test1");

    }
    catch (SQLException e) {
        System.out.println(e.getMessage());
    }

```

Customer Connection

First, let us know the relation of TCP/IP connection and java.sql.Connection. java.sql.Connection objects can share TCP/IP connection. The max number of alive TCP/IP connections between one client and one server is 20, but maybe more than 1000 alive java.sql.Connection objects are using those 20 TCP/IP connections. One java.sql.Connection object maybe build 0, 1, or more than one TCP/IP connections too.

If you haven't read [SSL Connection](#), please read.

To construct your customer connection, you need to implement two interface(com.hxtt.sql.common.SocketLayer and com.hxtt.sql.common.ServerSocketLayer). For SocketLayer, you should have one construction method(public YourSocketLayer(String host, int port)throws IOException). For ServerSocketLayer, you should have one construction method(public YourServerSocketLayer(int port, int backlog, InetAddress bindAddr) throws IOException). Then you can use:

```
java -Dhxtt.socketclass=yourPackage.YourServerSocketLayer -cp yourClassPath com.hxtt.sql.admin.Admin
```

Or

```
java -Dhxtt.socketclass=yourPackage.YourSocketLayer -cp yourClassPath com.hxtt.sql.admin.Admin
```

Or

```
java -Dhxtt.socketclass=yourPackage.YourServerSocketLayer -cp yourClassPath yourApplication
```

Or

```
java -Dhxtt.socketclass=yourPackage.YourSocketLayer -cp yourClassPath yourApplication
```

hxtt.socketclass can be used for client connection property too. The class name should be yourPackage.*Socket* and yourPackage.*ServerSocket* so that HXTT PDFServer can guess the other class name according to one class name. com.hxtt.sql.common.SocketLayer and com.hxtt.sql.common.ServerSocketLayer are pasted below. A simple sample for ip filter, id verification, and XOR encrypt/decrypt, is showed below too. To keep code neat, there's no remark since you can find all functions in java.net.Socket or java.net.ServerSocket. If you need help, please email us.

```

/***** SocketLayer.java *****/
package com.hxtt.sql.common;

import java.io.IOException;
import java.net.SocketException;
import java.net.InetAddress;

```

```

public interface SocketLayer {
    public boolean isClosed();
    public void close() throws IOException;

    public void write(byte b[], int off, int len) throws IOException;
    public void flush() throws IOException;

    public int read(byte b[], int off, int len) throws IOException;

    public int getSoTimeout() throws SocketException;
    public void setSoTimeout(int timeout) throws SocketException;

    public InetAddress getLocalAddress();
    public int getLocalPort();

    public InetAddress getInetAddress();
    public int getPort();
}

```

```

/***** ServerSocketLayer.java *****/
package com.hxtt.sql.common;

```

```

import java.net.Socket;
import java.io.IOException;
import java.net.SocketException;

```

```

public interface ServerSocketLayer{
    public boolean isClosed();
    public void close() throws IOException;

    public SocketLayer accept() throws IOException;

    public void setSoTimeout(int timeout) throws SocketException;
}

```

```

/***** XorSocketLayer.java *****/
package demo;

```

```

import java.net.Socket;
import java.io.OutputStream;
import java.io.InputStream;
import java.io.IOException;

```

```

import java.net.SocketException;
import java.net.InetAddress;

```

```

import com.hxtt.sql.common.SocketLayer;

```

```

public class XorSocketLayer implements SocketLayer{
    private Socket socket;
    private InputStream in;
    private OutputStream out;

    public XorSocketLayer(String host, int port) throws IOException {
        Socket socket=new java.net.Socket(host, port);

        //just a check demo
        try{
            check(socket);
        }catch(IOException ioe){
            socket.close();
            throw ioe;
        }

        init(socket);
    }

    private void check(Socket socket) throws IOException{
        if(socket.getInetAddress().getHostAddress().startsWith("192.168.10")
            || socket.getInetAddress().getHostAddress().startsWith("127.0.0.1"))
        ){
            socket.getOutputStream().write("1234".getBytes("ISO8859_1"));
        }else{
            throw new IOException("Prevent logon based upon IP address");
        }
    }

    protected XorSocketLayer(Socket socket) throws IOException {
        init(socket);
    }
}

```

```

private void init(Socket socket) throws IOException{
    this.socket = socket;
    try{
        in = socket.getInputStream();
        out = socket.getOutputStream();
    } catch (IOException ioe){
        socket.close();
        throw ioe;
    }
}

public boolean isClosed() {
    //Valid for JDK1.4.X
    return socket.isClosed();
//    return false; //For older JDK1.3.X, JDK1.2.X,...
}

public void close() throws IOException{
    out = null;
    in = null;
    socket.close();
}

public void write(byte b[], int off, int len) throws IOException{
    for(int i=0;i< len;i++){
        out.write( (b[off+i] ^ pattern) & 0xFF);
    }
}

public void flush() throws IOException {
    out.flush();
}

private static final byte pattern=(byte)0x21;

public int read(byte b[], int off, int len) throws IOException {
    int numBytes = in.read(b, off, len);

    if (numBytes <= 0)
        return numBytes;

    for (int i = 0; i < numBytes; i++) {
        b[off + i] = (byte) ( b[off + i] ^ pattern) & 0xFF);
    }

    return numBytes;
}

public int getSoTimeout() throws SocketException{
    return socket.getSoTimeout();
}

public void setSoTimeout(int timeout) throws SocketException{
    socket.setSoTimeout(timeout);
}

public InetAddress getLocalAddress(){
    return socket.getLocalAddress();
}

public int getLocalPort(){
    return socket.getLocalPort();
}

public InetAddress getInetAddress(){
    return socket.getInetAddress();
}

public int getPort(){
    return socket.getPort();
}

}

/***** XorServerSocketLayer.java *****/
package demo;

import java.io.*;
import java.net.*;

```

```
import com.hxtt.sql.common.SocketLayer;
import com.hxtt.sql.common.ServerSocketLayer;

public class XorServerSocketLayer implements ServerSocketLayer {
    private ServerSocket serverSocket;

    public XorServerSocketLayer(int port, int backlog, InetAddress bindAddr) throws IOException {
        this.serverSocket=new ServerSocket(port, backlog, bindAddr);
    }

    public boolean isClosed(){
        return serverSocket.getLocalPort()<=0;
    }

    public void close() throws IOException{
        serverSocket.close();
    }

    public SocketLayer accept() throws IOException {
        Socket socket=serverSocket.accept();

        //just a check demo
        try{
            check(socket);
        }catch(IOException ioe){
            socket.close();
            throw ioe;
        }

        return new XorSocketLayer(socket);
    }

    private void check(Socket socket)throws IOException{
        if(socket.getInetAddress().getHostAddress().startsWith("192.168.10")
            || socket.getInetAddress().getHostAddress().startsWith("127.0.0.1")){
            byte[] id=new byte[4];
            int count=socket.getInputStream().read(id);
            if(count!=id.length || !"1234".equals(new String(id))){
                throw new IOException("Prevent logon based upon id");
            }
        }else{
            throw new IOException("Prevent logon based upon IP address");
        }
    }

    public void setSoTimeout(int timeout) throws SocketException {
        serverSocket.setSoTimeout(timeout);
    }
}
```

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Chapter 10. JavaScript Object Notation (JSON) Support

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2. [JSON Functions](#)
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json and jsonb Operators

Operator	Right Operand Type	Description	Example	Example Result
->	int	Get JSON array element (indexed from zero, negative integers count from the end)	cast('["a":"foo"], {"b":"bar"}, {"c":"baz"}]' as json)->2	{"c":"baz"}
->	text	Get JSON object field by key	cast('{"a": {"b":"foo"}}' as json)->'a'	{"b":"foo"}
->>	int	Get JSON array element as text	cast('[1,2,3]' as json)->>2	3
->>	text	Get JSON object field as text	cast('{"a":1,"b":2}' as json)->>'b'	2
#>	text[]	Get JSON object at specified path	cast('{"a": {"b": {"c": "foo"}}}' as json)#>'a,b'	{"c": "foo"}
#>>	text[]	Get JSON object at specified path as text	cast('{"a":[1,2,3],"b":[4,5,6]}' as json)#>>'a,2'	3

JSON Functions

1. CAST(expression AS data_type): converts expression to another data type (json and jsonb). For instance, cast(['guia',"test"] as json), cast('33.56' as json), and cast(['a":"foo"], {"b":"bar"}, {"c":"baz"}]' as jsonb).
2. CONVERT(expression, data_type): converts expression to another data type (json and jsonb). For instance, convert(['guia',"test"], json), convert('null',json), and convert(['a":"foo"], {"b":"bar"}, {"c":"baz"}]' , json).
3. to_json(expression): Returns the value as json. Arrays and composites are converted (recursively) to arrays and objects; otherwise, if there is a cast from the type to json, the cast function will be used to perform the conversion; otherwise, a scalar value is produced. For any scalar type other than a number, a Boolean, or a null value, the text representation will be used, in such a fashion that it is a valid json or jsonb value.
4. to_jsonb(expression): Returns the value as jsonb.
5. jsonb_set(jsonObject, path, new_value[, create_missing_Flag]): Returns the value with the section designated by path replaced by new_value, or with new_value added if create_missing_Flag is true (default is true) and the item designated by path does not exist.

JSON sample

```

DECLARE v_json_obj json default '{"a":"foo"}, {"b":"bar"}, {"c":"baz"}';
select v_json_obj, v_json_obj->2;

set v_json_obj=to_json(true);
select v_json_obj;

select cast(['{"a":"foo"}, {"b":"bar"}, {"c":"baz"}]' as json)->2 # output {"c":"baz"}
select cast(['{"a":"foo"}, {"b":"bar"}, {"c":"baz"}]' as jsonb)->2 # maybe output {"c":"baz"}

select cast('{"a": {"b":"foo"}, "c":{"a": "aaa"}}' as json)->'a' # output {"b":"foo"}

select cast(['{"a":"foo"}, {"b":"bar"}, {"c":"baz"}]' as json)->>2 # output {"c":"baz"}
select cast('{"a": {"b":"foo"}, "c":{"a": "aaa"}}' as json)->>'a' # output {"b":"foo"}

select cast('{"a": {"b":{"c": "foo"}}}' as json)#> 'a,b' # output {"c": "foo"}

```

```
select cast('{"a": {"b":{"c": "foo"}}}' as json)#>> '{a,b}' # output {"c": "foo"}
```

```
SELECT cast('{"bar": "baz", "balance":      7.77, "active":false}' as json);  
SELECT cast('{"bar": "baz", "balance":      7.77, "active":false}' as jsonb);
```

```
SELECT convert('null',json);  
SELECT cast('33.56' as json);  
SELECT cast('"abcdef"' as json);  
SELECT convert('["guia","test"]', json);  
SELECT cast(null as json);
```

```
select to_json('Fred said "Hi."');  
select to_json(true);
```

```
select to_jsonb(true);
```

```
select jsonb_set(' [{"f1":1,"f2":null},2]', '{0,f3}', '[2,3,4]');
```

```
select jsonb_set(' [{"f1":1,"f2":null},2,null,3]', '{0,f1}', '[2,3,4]', false);
```

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Chapter 11. XML Support

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2. [XML Functions](#)
3. [XML sample](#)

Declaration of XML Types

```
DECLARE v_xml_obj xml default '<?xml version="1.1"?><foo/>';
select v_xml_obj;

set v_xml_obj=xmlattributes('tom' as name);
select v_xml_obj;
```

XML Functions

1. XMLPARSE ({ DOCUMENT | CONTENT } string1): Returns a value of type xml. If string1 resolves to null, then the function returns null. If you specify DOCUMENT, then string1 must resolve to a singly rooted XML document. If you specify CONTENT, then string1 must resolve to a valid XML value.
2. XMLSERIALIZE ({ DOCUMENT | CONTENT } value_expr [[AS] type]): Returns a string or LOB containing the contents of value_expr. If you specify DOCUMENT, then the value_expr must be a valid XML document. If you specify CONTENT, then the value_expr need not be a singly rooted XML document. However it must be valid XML content. The data type specified can be a string type (VARCHAR) or CLOB . The default is CLOB.
3. XMLCOMMENT(string1): Returns an XML comment with the specified text as content. The text cannot contain "--" or end with a "-" so that the resulting construct is a valid XML comment. If the argument is null, the result is null.
4. XMLELEMENT([NAME] name [, XMLATTRIBUTES(value [[AS] attname] [, ...])] [, content, ...]): Returns an XML element with the given name, attributes, and content.
5. XMLATTRIBUTES(value [[AS] attname] [, ...]): Returns attribute values.
6. XMLFOREST(value [[AS] elementname] [, ...]): Returns an XML fragment that is the concatenation of these converted arguments.
7. XMLCONCAT(expr[,...]): Returns an XML content fragment. Null values are omitted; the result is only null if there are no nonnull arguments.
8. XMLPI(NAME name [, value_expr]): Return an XML processing instruction using name and optionally the evaluated result of value_expr. A processing instruction is commonly used to provide to an application information that is associated with all or part of an XML document. The application uses the processing instruction to determine how best to process the XML document. The optional value_expr must resolve to a string. If you omit value_expr, then a zero-length string is the default. The value returned by the function takes this form: Name cannot specify xml in any case combination for identifier, and cannot contain the consecutive characters ?>.
9. XMLAGG(expr [order_by_clause]): Returns a collection of XML fragments. Any arguments that return null are dropped from the result.

XML sample

```
select xmlcomment('hello');
select xmlcomment('<!--hello-->');

select xmlattributes('tom' as name);

SELECT xmlelement(name cat);

SELECT xmlelement(name cat, xmlattributes('tom' as name));

SELECT xmlelement(name cat, xmlattributes('tom' as name), 'Tom is ', 'ca', 't');
```

```
SELECT xmlelement(name "cat$tom", xmlattributes('Demo for invalid XML name' as "a&b"));
SELECT xmlelement(name cat, xmlattributes('tom' as name), 'Tom is ', 'ca', 't');
SELECT xmlelement(name cat, xmlattributes('tom' as name), xmlelement(name abc), xmlcomment('test'),
xmlelement(name xyz));
SELECT XMLELEMENT("test", XMLELEMENT("test1", XMLATTRIBUTES(1 "test1_attribute"), NULL),
XMLELEMENT("test2", XMLATTRIBUTES(' "test2_attribute"), ''), XMLELEMENT("test3", XMLATTRIBUTES(NULL
"test3_attribute"), ':'));
SELECT XMLELEMENT("TEST", '123', XMLELEMENT("AA", XMLATTRIBUTES('1235678' "test_attribute"),
XMLELEMENT("BB", XMLATTRIBUTES('z' "attr", NULL "Go"), 'XXX'), XMLELEMENT("CC", 'XX')),
'qwe')
SELECT XMLCONCAT(XMLELEMENT("First", 'John'), XMLELEMENT("Last", 'Morgan')) AS "Name";
SELECT xmlconcat('<abc/>', '<bar>foo</bar>');
SELECT xmlconcat('<?xml version="1.1"?><foo/>', '<?xml version="1.1" standalone="no"?><bar/>');
```

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Chapter 12. Array Support

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Declaration of Array Types

An array data type is named by appending square brackets ([]) to the data type name of the array elements, and all the elements are of the same data type. The array subscript numbers are written within square brackets. It uses a one-based numbering convention for arrays, that is, an array of n elements starts with array[1] and ends with array[n].

```
DECLARE v_pay_by_month decimal(12,2)[12];
set v_pay_by_month[2]=123.45;
select v_pay_by_month[2] as feb;
select v_pay_by_month;
```

Array Functions

1. CAST(expression AS array): converts expression to array. For instance, cast('{20000, 25000, 25000, 25000}' as array).
2. CONVERT(expression, data_type): converts expression to another data type (json and jsonb). For instance, convert('{{"breakfast", "consulting"}, {"meeting", "lunch"}}', array).
3. to_array(expression): Returns the value as array. For instance, to_array('{{"breakfast", "consulting"}, {"meeting", "lunch"}}').
4. array_assign(anyArrayElement,expression): Returns an array with supplied value. For instance, array_assign(to_array('{{"breakfast", "consulting"}, {"meeting", "lunch"}}')[2],to_array('{{"lunch", "meeting"}}').
5. array_ndims(anyArrayElement): Returns the number of dimensions of the array.
6. SPLIT(string1, string2): split string1 according to delimiter string2, and return an String[] object (Types.ARRAY). Special SPLIT(expression,") will return strings which contains only Letter and Digit. Special SPLIT(expression,null) will split string into length=1 strings, which is only Letter or Digit.

Array sample

```
SELECT cast('{20000, 25000, 25000, 25000}' as array);
SELECT convert('{{"breakfast", "consulting"}, {"meeting", "lunch"}}', array);
select to_array('{{"meeting", "lunch"}, {"training", "presentation"}}');

select to_array('{{"meeting", "lunch"}, {"training", "presentation"}}')[1][2];

select array_assign(to_array('{{"breakfast", "consulting"}, {"meeting", "lunch"}}')[2],to_array('{{"lunch", "meeting"}}');
```

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