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pureXML overview -- Db2 as an XML database

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The pureXML® feature allows you to store well-formed XML documents in database table columns that have the XML data type. By storing XML data in XML columns, the data is kept in its native hierarchical form, rather than stored as text or mapped to a different data model.

Because pureXML data storage is fully integrated, the stored XML data can be accessed and managed by leveraging existing Db2 database server functionality.

The storage of XML data in its native hierarchical form enables efficient search, retrieval, and updates of XML. XQuery, SQL, or a combination of both can be used to query and update XML data. SQL functions that return XML data or take XML arguments (referred to as SQL/XML functions) also enable XML data to be constructed or published from values retrieved from the database.

Querying and updating

XML documents stored in XML columns can be queried and updated using the following methods:

XQuery

XQuery is a generalized language for interpreting, retrieving, and modifying XML data. The Db2 database server allows XQuery to be invoked directly or from within SQL. Because the XML data is stored in Db2 tables and views, functions are provided that extract the XML data from specified tables and views by naming the table or view directly, or by specifying an SQL query. XQuery supports various expressions for processing XML data, for updating existing XML objects such as elements and attributes, and for constructing new XML objects. The programming interface to XQuery provides facilities similar to those of SQL to execute queries and retrieve results.

SQL statements and SQL/XML functions

Many SQL statements support the XML data type. This enables you to perform many common database operations with XML data, such as creating tables with XML columns, adding XML columns to existing tables, creating indexes over XML columns, creating triggers on tables with XML columns, and inserting, updating, or deleting XML documents. The set of SQL/XML functions, expressions, and specifications supported by Db2 database server has been enhanced to take full advantage of the XML data type.

XQuery can be invoked from within an SQL query. In this case, the SQL query can pass data to XQuery in the form of bound variables.

Application development

Support for application development is provided by several programming languages, and through SQL and external procedures:

Programming language support

Application development support of the new pureXML feature enables applications to combine XML and relational data access and storage. The following programming languages support the XML data type:

– C or C++ (embedded SQL or CLI)
– COBOL
– Java™ (JDBC or SQLJ)
– C# and Visual Basic (IBM® Data Server Provider for .NET)
– PHP
– Perl

SQL and external procedures

XML data can be passed to SQL procedures and external procedures by including parameters of data type XML in CREATE PROCEDURE parameter signatures. Existing procedure features support the implementation of procedural logic flow around SQL statements that produce or make use of XML values as well as the temporary storage of XML data values in variables.

Administration

The pureXML feature provides a repository for managing the URI dependencies of XML documents and enables XML data movement for database administration:

XML schema repository (XSR)

The XML schema repository (XSR) is a repository for all XML artifacts required to process XML instance documents stored in XML columns. It stores XML schemas, DTDs, and external entities referenced in XML documents.

Import, export and load utilities

The import, export and load utilities have been updated to support the native XML data type. These utilities treat XML data like LOB data: both types of data are stored outside the actual table. Application development support for importing, exporting and loading XML data is also provided by updated db2Import, db2Export and db2Load APIs. These updated utilities permit data movement of XML documents stored in XML columns that is similar to the data movement support for relational data.

Performance

Several performance oriented features are available to you when working with XML documents stored in XML columns:

Indexes over XML data 2.7

Indexing support is available for data stored in XML columns. The use of indexes over XML data can improve the efficiency of queries issued against XML documents. Similar to a relational index, an index over XML data indexes a column. They differ, however, in that a relational index indexes an entire column, while an index over XML data indexes part of a column. You indicate which parts of an XML column are indexed by specifying an XML pattern, which is a limited XPath expression.

Optimizer

The optimizer has been updated to support the evaluation of SQL, XQuery, and SQL/XML functions that embed XQuery, against XML and relational data. The optimizer exploits statistics gathered over XML data, as well as data from indexes over XML data, to produce efficient query execution plans.

Explain facility

The Explain facility has been updated to support SQL enhancements for querying XML data and to support XQuery expressions. These updates to the Explain facility allow you to see quickly how Db2 database server evaluates query statements against XML data.

Tooling

Support for the XML data type is available in tools including the command line processor, IBM Data Studio, and IBM Database Add-Ins for Microsoft Visual Studio.

Annotated XML schema decomposition

The pureXML feature enables you to store and access XML data as XML, in its hierarchical form, there can be cases where accessing XML data as relational data is required. Annotated XML schema decomposition decomposes documents based on annotations specified in an XML schema.

- **XML data type**
  Use the XML data type to define columns of a table and store XML values. All XML values must be well-formed XML documents. You can use this native data type to store well-formed XML documents in their native hierarchical format in the database alongside other relational data.
- **XML input and output overview**
  The Db2 database server, which manages both relational and XML data, offers various methods for the input and output of XML documents.
- **Comparison of the XML model and the relational model**
  When you design your databases, you must decide whether your data is better suited to the XML model or the relational model. Take advantage of the hybrid nature of Db2 databases that supports both relational and XML data in a single database.
- **XQuery and XPath data model**
  XQuery expressions operate on instances of the XQuery and XPath data model (XDM) and return instances of the data model.
- **Tools that support XML**
  Both IBM and third-party tools provide support for working with the pureXML feature. Shipped with Db2 database server, or available separately for download, the following tools are available to you from IBM:

Related concepts	Related tasks	Related reference	Related information
→ Annotated XML schema decomposition	→ Creating the explain tables	→ Built-in functions	⬈ Best practices: Managing XML Data
→ Application programming language support		→ Restrictions on the pureXML feature	
→ Comparison of the XML model and the relational model			
→ Explain facility			
→ Introduction to querying XML data with SQL			
→ pureXML Samples			
→ pureXML tutorial			
→ XML and XQuery support in SQL procedures			
→ XML data movement			
→ XML data type support in external routines			
→ XML schema repository			
→ XQuery reference			

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