



DB2[®] UDB Extenders for iSeries

XML Extender

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- ▶ Overview
- ▶
- ▶ This course discusses DB2 UDB Extenders for iSeries — what they are and how they are used. The DB2 UDB Extenders for iSeries is shipped as a separate license program 5722-DE1. This means that the Extenders LPP is not a part of the DB2 UDB for iSeries runtime and needs to explicitly be ordered from IBM as a chargeable feature. The OEM pricing will be available for Solution Developers that want to package the DB2 UDB Extenders for iSeries as part of their solution.
- ▶ The V5R1 release contains two extenders:
 - ▶ DB2 UDB XML Extender
 - ▶ DB2 UDB Text Extender
- ▶
- ▶ Both extenders can be thought of as a middleware that resides on top of the DB2 UDB for iSeries database and enhances its functionality by providing a range of user defined types (UDTs), user defined functions (UDFs), and stored procedures.
- ▶
- ▶ Let's first discuss XML Extenders.

Using the Power of DB2 UDB to Support XML

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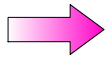
XML represents a fundamental change in computing ... away from proprietary file and data formats to a world of open interchange.

- XML = portable data

DB2 UDB provides stability, scalability and security.

Your mission-critical business data is currently stored in DB2 UDB.

- Where do you store your XML documents?
- How can you convert your business data into XML documents?
- How can you turn the XML data into database data?



Answer: DB2 UDB for iSeries Extenders

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▶ Using the Power of DB2 UDB to Support XML

▶

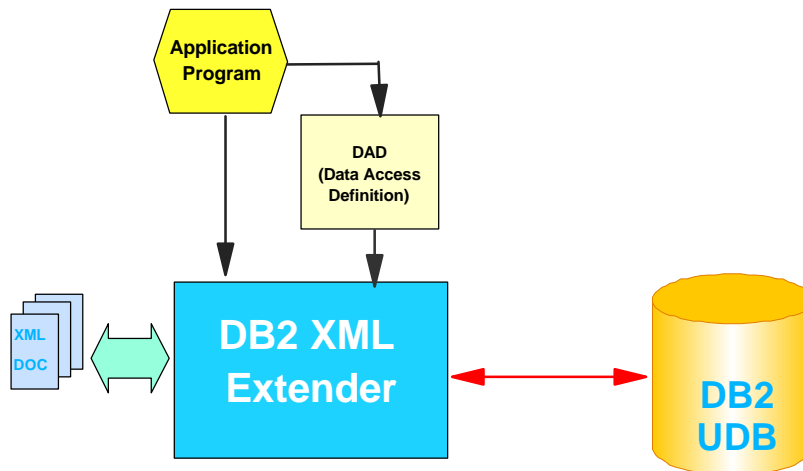
▶ XML is universal not only by its range of applications but also by its ease of use. The text-based nature of XML makes it easy to create tools, and it is also an open, license-free, cross-platform standard which means anyone can create, develop, and use tools for XML.

▶

▶ Although XML solves many problems by providing a standard format for data interchange, some challenges remain. In the real world, application design has always had to address issues such as sharing data between applications, replication, transformation, exporting, and saving of data. These kinds of issues can be addressed only by a database management system. By incorporating XML information and meta-information directly in the database, you can more efficiently obtain the XML results that other applications need. With the content of your structured XML documents in a DB2 UDB database, you can combine structured XML information with traditional relational data. With the help of the XML Extender, the XML documents can be stored entirely in the database columns, or you can setup mapping so that XML documents can be decomposed into existing columns or generated from data in existing columns.

XML Extender Overview

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DB2 XML Extender provides:

- New data types that let you store XML documents in DB2 databases
- New functions that assist you in working with these structured documents

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► XML Extender Overview

►

► There are several components that make up the XML Extender architecture. DB2 UDB is used to store and retrieve XML data and also generates helper side tables that can greatly improve the performance of the XML retrieval process. The extender is used to mediate between DB2 UDB and the application requester.

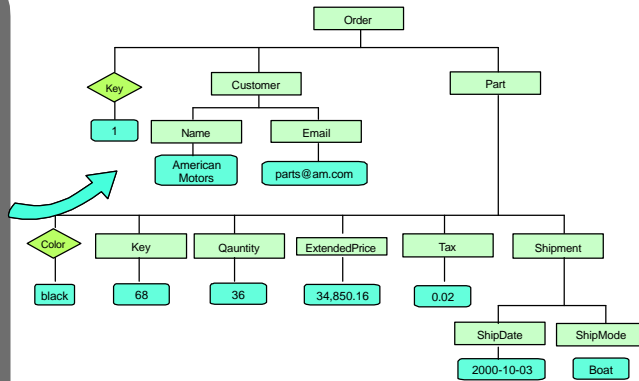
►

► The extender is functional and flexible depending on whether you have relational data that need to be transformed into XML or XML data to store into DB2 UDB tables. The extender contains a rich set of user defined types (UDTs), user defined functions (UDFs), and stored procedures to manage XML data. XML documents can be stored in DB2 UDB databases as character data. They can also be stored as external Integrated Files System (IFS) files that are managed by DB2 UDB. Retrieval UDFs allow you to retrieve either the entire XML document or individual elements or attributes.

XML document logical structure

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```
<?xml version="1.0"?>
<!DOCTYPE Order SYSTEM
"/dxx/samples/dtd/getstart.dtd">
<Order key="1">
  <Customer>
    <Name>American Motors</Name>
    <Email>parts@am.com</Email>
  </Customer>
  <Part color="black">
    <key>68</key>
    <Quantity>36</Quantity>
    <ExtendedPrice>34850.16</ExtendedPrice>
    <Tax>6.000000e-2</Tax>
    <Shipment>
      <ShipDate>2000-10-03</ShipDate>
      <ShipMode>BOAT </ShipMode>
    </Shipment>
    ....
  </Part>
</Order>
```



- XML document has a tree-like hierarchical structure
- XML uses start and end tags as containers
- XML document must have only one root element

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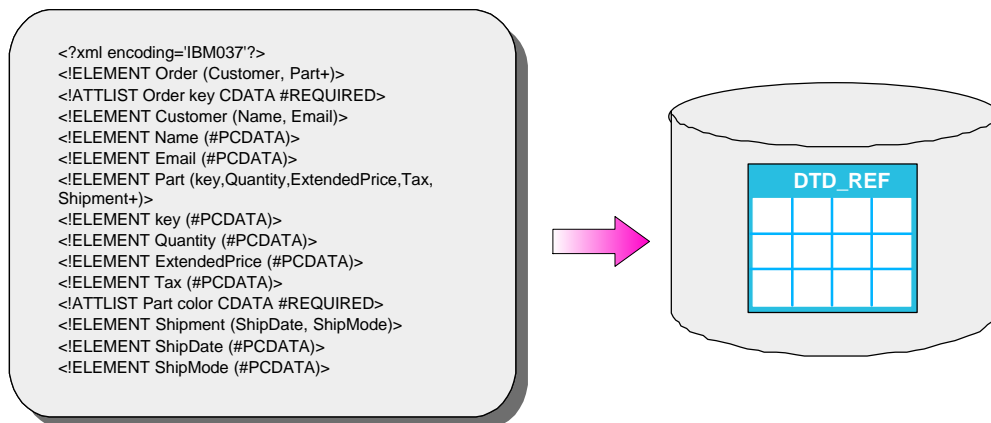
► XML Document Logical Structure

-
- Before we cover the details of the DB2 XML Extender implementation, we need to explain several basic concepts used throughout this presentation.
-
- As you can see from this foil, an XML document has a tree-like structure, with the root element (<Order>) at the top of the tree. All the elements that are inside the root element are also contained within each other. The document must contain one and only one root element. An element is the parent of the elements it contains. The elements that are inside an element are called its children. Similarly, the elements that have the same parent element are called siblings.
-
- In our example; <Order> is parent of all other elements, <Name> is a child of <Customer>, and <Customer> and <Part> are siblings. Going down the element tree, each child element must be fully contained with its parent element. Sibling elements may not overlap.
-

Document Type Definition Repository

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- DTD reference table created when database is enabled for XML
- Each row of the DTD reference table represents a DTD
- Users can insert their own DTDs
- The DTDs used to validate XML documents



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▶ Document Type Definition Repository

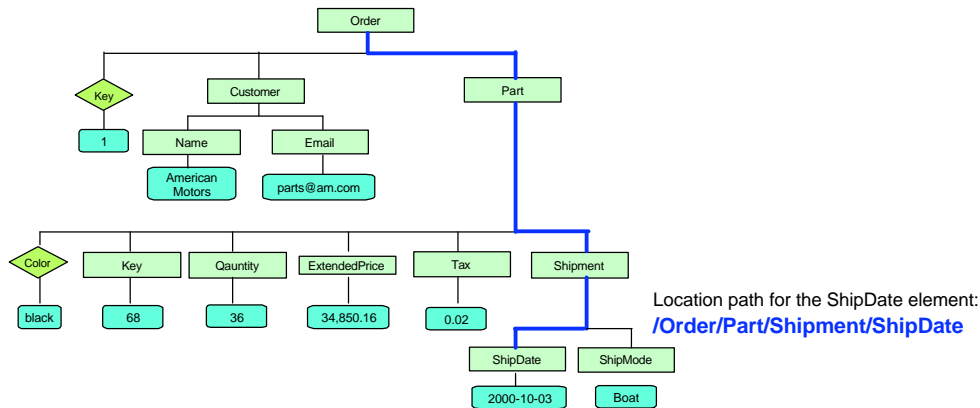
- ▶
- ▶ The Document Type Definition (DTD) specifies the structure of an XML document, thereby allowing XML parsers to understand and interpret the document's contents. The DTD contains the list of tags which are allowed within the XML document and their types and attributes. More specifically, the DTD defines how elements relate to one another within the document's tree structure, and specifies which attributes may be used with which elements. Therefore, the DTD also constrains the element types that can be included in the document and determines its conformance — an XML document which conforms to its DTD is said to be valid.
- ▶
- ▶ DB2 XML Extender provides an XML DTD repository. A DTD reference table called DTD_REF is created at the time when the database is enabled. Enabling the database creates the following objects:
 - The db2xml schema (library).
 - The user-defined types (UDT) — XMLVARCHAR, XMLCLOB, XMLFILE, as well as all required user-defined functions (UDF) and stored procedures
 - The necessary control tables required by DB2 XML Extender such as XML_USAGE and DTD_REF
- ▶
- ▶ Each row in the DTD_REF table contains a DTD with additional metadata information about it. You can insert your own DTDs into this table. The DTDs in this table are used to validate the XML documents.

Location path

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A sequence of XML tags that identify an XML element or attribute:

- Used by XML Extender to map an XML element or attribute to a DB2 UDB column
- Used by Text Extender for structural text search



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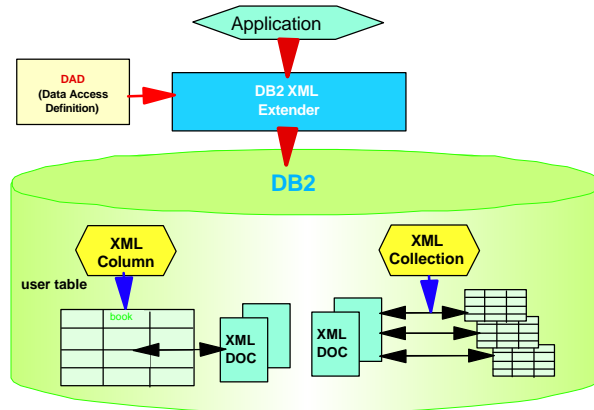
► Location Path

►

- A location path is a sequence of XML tags separated by a forward slash (/) that identifies an XML element or attribute. Location paths are used in the following situations within DB2 XML Extender and DB2 Text Extender:
 - They are given as input to extracting UDFs to identify elements and attributes to be extracted.
 - They are used to specify the mapping file between an XML element or attribute and a DB2 UDB column when defining the indexing scheme in the Document Access Definition (DAD) for XML Columns.
 - They are used by the Text Extender for structural-text search.
 - The following is the location path syntax supported by DB2 XML Extender:
 - ◆ / — Represents the XML root element
 - ◆ /tag1 — Represents the element tag1 under root
 - ◆ /tag1/tag2/.../tagn — Represents an element with the name tagn as the child of the descending chain from root, tag1, tag2, through tagn-1
 - ◆ //tagn — Represents any element with the name tagn, where double slashes(//) denote zero or more arbitrary tags
 - ◆ /tag1//tagn — Represents any element with the name tagn, a child of an element with the name tag1 under root, where double slashes (//) denote zero or more arbitrary tags
 - ◆ /tag1/tag2/@attr1 — Represents the attribute attr1 of an element with the name tag2, which is a child of element tag1 under root
 - ◆ /tag1/tag2[@attr1="5"] — Represents an element with the name tag2 whose attribute attr1 has the value 5; tag2 is a child of element with the name tag1 under root
 - ◆ /tag1/tag2[@attr1="5"]/.../tagn — Represents an element with the name tagn, which is a child of the descending chain from root, tag1, tag2, through tagn-1, where the attribute attr1 of tag2 has the value 5

Two Access and Storage Methods

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XML column:

- Store and retrieve entire XML documents as DB2 UDB column data
- XML data represented by XML column

XML Collection:

- Decompose XML document into a collection of relational tables
- Compose XML documents from a collection of relational tables

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▶ Two Access and Storage Methods

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▶ The DB2 XML Extender provides you with the ability to use DB2 UDB to store, manage, query, and update XML data. There are two basic techniques used: the XML column method and the XML collection method.

▶

▶ Using the XML column method, you can use DB2 UDB tables to store XML documents in columns that have been enabled for XML, or you can store them as external files. The XML data can then be retrieved, updated, and searched. Furthermore, you can extract XML element or attribute values into secondary tables, called side tables, which, when indexed, provide fast XML element and attribute search capabilities.

▶ Columns that have been enabled for XML are known as XML columns, and can be implemented as one of the three user-defined types provided with the XML Extender:

- XMLVARCHAR
- XMLCLOB
- XMLFILE

▶

▶ The XML collection method allows you to compose XML documents from existing DB2 UDB data or decompose XML documents into DB2 UDB data, that is, store untagged element or attribute values in DB2 UDB tables. This method is useful for Business-to-Business (B2B) or Electronic Data Interchange (EDI) applications, particularly if the contents of XML documents are frequently updated.

XML Columns Scenario

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Scenarios suitable for XML Columns:

- XML documents already exist or come from some external source:
 - You want to store them in DB2 UDB for integrity or for archive and auditing purpose.
 - You prefer to store documents in native XML format.
- XML documents are read mostly:
 - Performance of update is not critical.
 - Range search is needed based on the values of XML elements or attributes.
- The documents have elements with large text block and you want to use Text Extender for structural text search.

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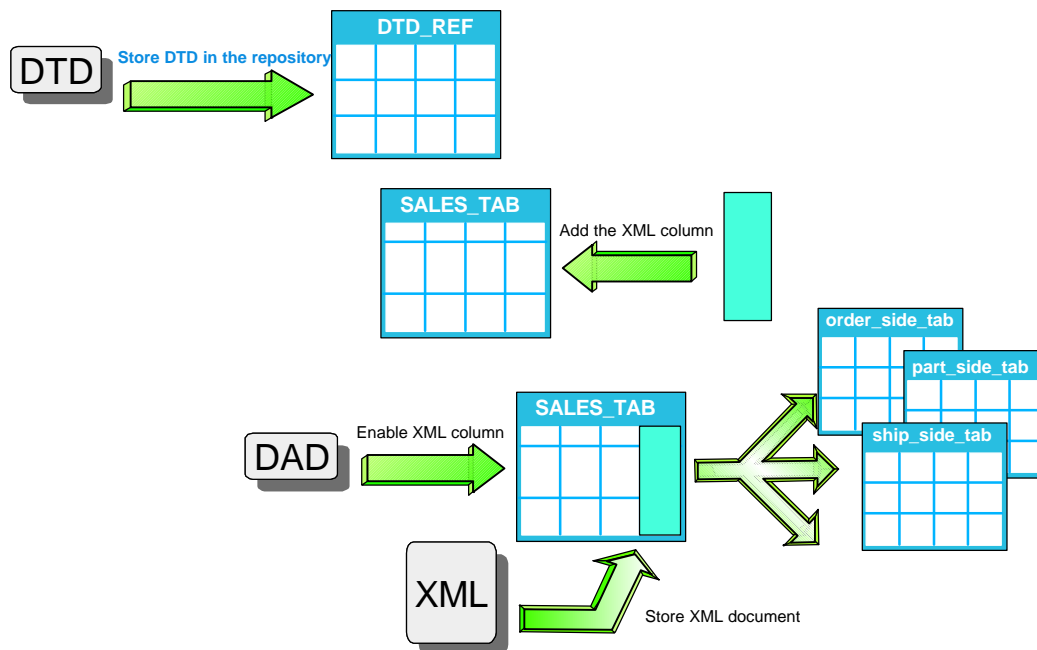
► XML Column Scenario

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- As mentioned earlier, using the XML Columns method allows you to store the entire XML document, as it is, in a column. We recommend choosing the XML Columns method if one or more of the following criteria are met:
 - The XML documents already exist — for example, you want to archive documents such as newspaper articles, orders, and so on.
 - The XML documents are read-often and updated-rarely.
 - The performance of the update is not critical.
 - You want to store the intact XML documents.
 - You want to keep the XML documents externally from DB2 UDB in a local file system.
 - You know what elements or attributes will be frequently searched. To perform efficient searches on these documents, you can decide to create indexes in side tables on the elements or attributes that you need to access more often.

XML column setup

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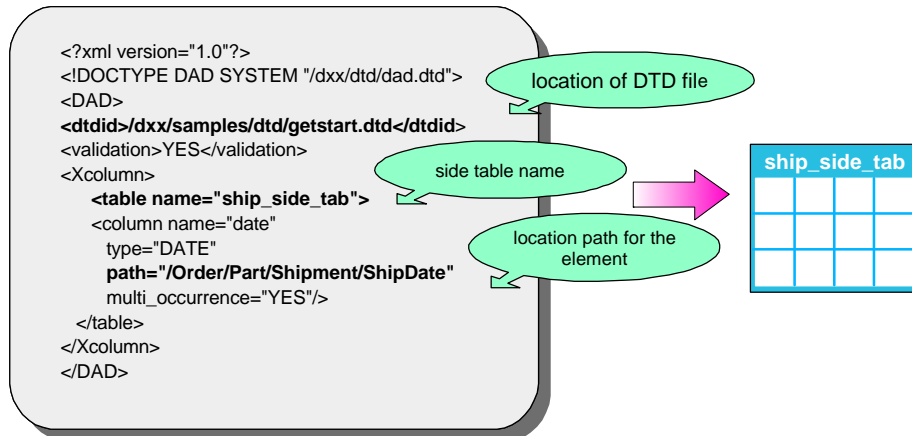
► XML Column Setup

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- This foil presents the steps required to store an XML document in a XML column. We assume that the database is already XML-enabled.
- 1. If you plan to validate the XML documents, you should store the appropriate DTD document in the DTD repository.
- 2. The next step is to decide in which table you will store the XML documents. You can create a new table with an XML Column or just alter an existing table to add an XML Column. DB2 XML Extender provides you with three new user-defined types located in the db2xml schema (library) to store your XML documents as column data:
 - XMLVARCHAR — You can store an XML document in the database, with a maximum size of 32 KB.
 - XMLCLOB — The XML document is also stored in the database, but its maximum size is 2 GB.
 - XMLFILE — This UDT allows you to keep the document on the local file.
- 3. Create the Document Access Definition (DAD) file. The DAD file, itself an XML document, specifies how the XML documents that you store in the database are to be handled. In the case of XML Columns, the DAD file is only needed if you want to validate your XML documents before storing them, or if you want to index elements or attributes in side tables. The side tables are additional tables created by DB2 XML Extender to improve performance when searching elements or attributes in an XML Column.
- 4. If you created a DAD file for an XML Column, it is necessary that you tell the DB2 XML Extender which XML Column and which table this file relates. When you enable an XML Column, DB2 XML Extender:
 - Parses the DAD file
 - Creates the side tables with the desired columns corresponding to the elements and attributes

Document Access Definition (DAD)

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- XML document itself
 - Defines the location of key files such as DTD
 - Defines the mapping between XML document and relational tables
- Used for both XML Column and XML Collection



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► Document Access Definition (DAD)

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► Before creating the DAD file, you should:

- Decide which elements or attributes you often want to search in your XML documents.
- For each element or attribute that you want to index in a side table, define:
 - The location path to represent it — use the XPath data model to map XML structure (the element and attribute) to the relational tables (the columns). In our example, we map <ShipDate> element to a date column located in the ship_side_tab table. The location path for the element is: /Order/Part/Shipment/ShipDate.
 - The data type your element or attribute should be converted to. In your XML documents, all of the element's content and attributes value are considered character data. But in the side tables, you can use any DB2 UDB data types. In the example, we map the ShipDate into a DATE data type.
 - Consider whether there are multiple occurrences or not. This must match the declaration in the DTD validating your XML documents. The multi_occurrence attribute for the <ShipDate> element is set to YES, which means that there can be several shipments for one part.
- For each multiple occurring element or attribute, you need to create a new side table if you want to extract their value for indexing.
- Decide whether you want the validation to occur or not. This decision can be based on the following considerations:
 - The validation has a small performance impact.
 - You may not want to validate XML documents that you know are valid.
 - The validation by DB2 XML Extender can only occur at the time the XML documents are stored into the XML table and not afterwards.

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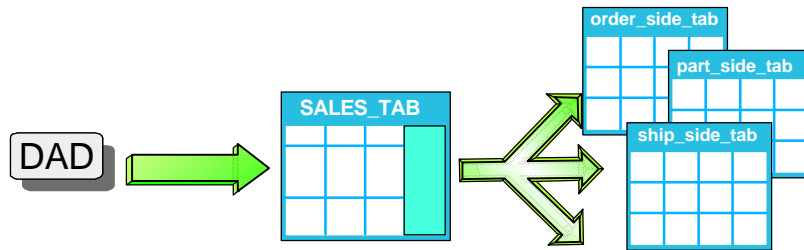
Side tables

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Additional tables created by the XML Extender

- Based on the DAD specification
- Improve performance when searching elements or attributes in an XML column

Creating indexes on side tables further enhances the performance



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▶ Side Tables

▶

- ▶ As mentioned earlier, side tables are additional tables created by the XML Extender to improve performance when searching elements or attributes in an XML column. The side tables are created at the time when the XML column is enabled. The definition of the side tables is specified in the DAD associated with a given XML column. Note that side tables are not mandatory.

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- ▶ To further enhance the performance for the search requests, you may create indexes over the side tables.

XML Column Storage and Access Means

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User Distinct Types (UDTs) provided by the XML Extender:

- XMLFile — External file name
- XMLVarchar — For internal short document
- XMLCLOB — For internal long document

User Defined Functions (UDFs) provided by the XML Extender:

- Storage
 - XMLVarcharFromFile(), XMLClobFromFile(), XMLFileFromVarchar(), XMLFileFromClob
- Retrieval
 - Default cast functions varchar(XMLVarChar), clob(XMLClob) varchar(XMLFile) or Content(XMLObj, XMLFile)
- Update
 - Default cast functions or storage UDFs
- Extract the content of an element or attribute
 - Convert XML data to SQL data types
 - ExtractVarchar(XMLCol, LocationPath), extractCLOB(XMLCol, LocationPath), ...

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► XML Column Storage and Access Means

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- The XML Extender user-defined types (UDTs) are data types that are used for XML columns and XML collections. All the UDTs have the schema (library) name DB2XML. The XML Extender creates UDTs for storing and retrieving XML documents.
-
- The XML Extender provides functions for storing, retrieving, searching, and updating XML documents, and for extracting XML elements or attributes. XML user-defined functions (UDFs) can be used for XML columns, but not for XML collections. There are four types of the XML Extender functions:
 - Storage functions — Use storage functions to insert XML documents into a DB2 database. You can use the default casting functions of a UDT directly in INSERT or SELECT statements. Additionally, the XML Extender provides UDFs to take XML documents from sources other than the UDT base data type and convert them to the specified UDT. For instance, XMLVarcharFromFile() reads an XML document from a server file and returns the document as an XMLVARCHAR type.
 - Retrieval functions — The XML Extender provides an overloaded function Content(), which is used for retrieval. This overloaded function refers to a set of retrieval functions that have the same name, but behave differently based on where the data is being retrieved. You can also use the default casting functions to convert an XML UDT to the base data type.
 - Update function — The Update() function modifies the element content or attribute value and returns a copy of an XML document with an updated value that is specified by the location path. The Update() function allows the application programmer to specify the element or attribute that is to be updated.
 - Extracting functions — Extracting functions extract and convert the element content or attribute value from an XML document to the data type that is specified by the function name.

XML column example

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Storing the DTD in the DTD repository

```
INSERT into db2xml.dtd_ref values('/dxx /samples /dtd /getstart.dtd',
db2xml.XMLClobFromFile('/dxx /samples /dtd /getstart.dtd'),0,'user1',
'user1','user1')
```

Preparing the DAD file

```
...
<Xcolumn>
<table name="ship_side_tab">
<column name="shipdate"
type="DATE"
path="/Order/Part/Shipment/ShipDate"
multi_occurrence="NO"/>
</table>
</Xcolumn>
...
```

Adding the XML column

```
ALTER TABLE SALES_TAB ADD COLUMN ORDER DB2XML.XMLVARCHAR
```

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▶ XML Column Example

▶

▶ See this foil and the next for an example of an XML Column method.

XML column example (continued)

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Enabling the XML column (QShell)

```
dxxadm enable_column PWD2 sales_tab order
/dxxsamples/dad/getstart_xcolumn.dad -v sales_order_view -r invoice_num
```

Note: The column ORDER located in the SALES_DB.SALES_TAB is enabled.
The side table SHIP_SIDE_TABLE is created based on the DAD specification. The default view SALES_ORDER_VIEW is created. The primary key for the side table is INVOICE_NUM.

Storing the XML document

```
INSERT INTO SALES_TAB (INVOICE_NUM,SALES_PERSON,ORDER)VALUES('123456',
'Joe Doe',db2xml.XMLVarcharFromFile('/dxx /samples/xml/getstart.xml'))
```

Verifying the content of side tables

```
SELECT * FROM SHIP_SIDE_TAB
```

Searching the XML document

```
SELECT DISTINCT SALES_PERSON FROM SALES_TAB S,SHIP_SIDE_TAB P
WHERE SHIPDATE > DATE('2000-01-01') AND
S.INVOICE_NUM=P.INVOICE_NUM
```

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► XML Column Example (continued)

XML Collections Scenario

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Scenarios suitable for XML Collections:

- You have data in your existing relational tables and you want to compose XML documents using your existing data based on DTD.
- You want to create different view of your relational data using different mapping scheme.
- The XML documents come from other source and you want to store pure data.
- A small part of your XML documents need to be updated often, and update performance is critical.
- You like to store the data of entire incoming XML documents but often only want to retrieve a subset of them.
- Your XML documents are large in size, which exceed 2 GB, and you must decompose them.

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► XML Collections Scenario

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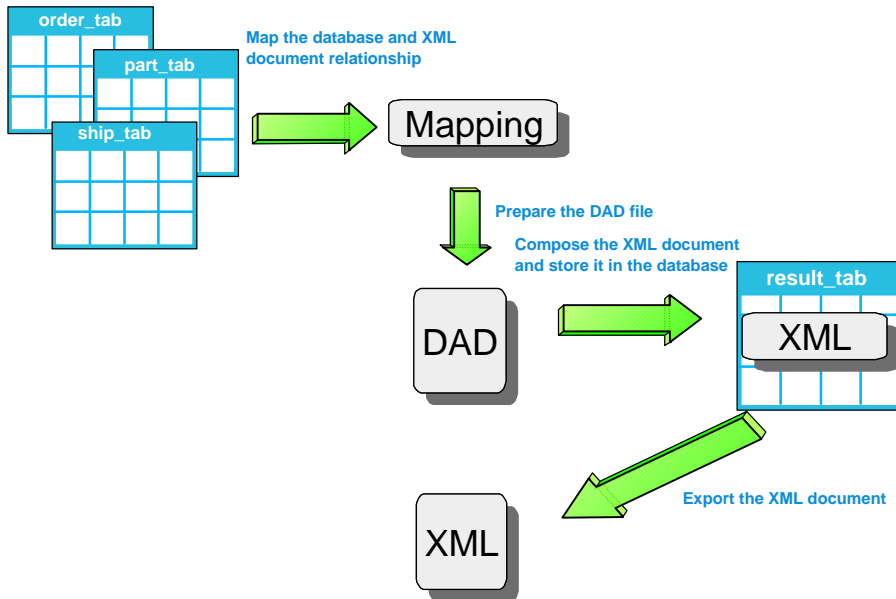
► Using the XML Collections method allows you to map XML document structures to DB2 UDB tables, so that you can compose XML documents from existing DB2 UDB data or decompose XML documents into DB2 tables.

►

► Take a minute to review the scenarios suitable for the XML Collection method on this foil.

XML collection: composing a document

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► XML Collection: Composing a Document

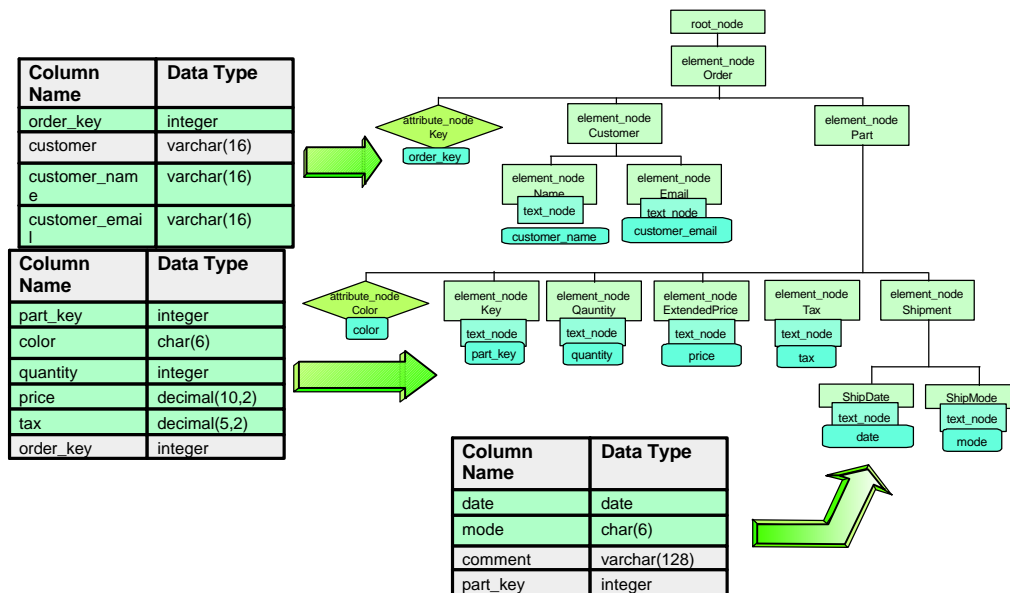
► This foil illustrates the steps required to compose a XML document from the underlying database tables. You can compose XML documents using stored procedures. To use these stored procedures, you must create a DAD file, which specifies the mapping between the XML document and the DB2 table structure.

1. Map the structure of the XML document to the relational tables that contain the contents of the element and attribute values (see next foil).
2. Create the appropriate DAD file. For XML collections, the DAD file maps the structure of the XML document to the DB2 tables from which you either compose the document or to where you decompose the document. For example, if you have an element called `<ShipDate>` in your XML document, you might need to map `<ShipDate>` to a column called `Ship_Date`. You define the relationship between the XML data and the relational data in the DAD.
3. Compose the XML document by calling the `dxxGenXML()` stored procedure. The stored procedure constructs XML documents using data that is stored in the XML collection tables that are specified by the `<Xcollection>` in the DAD file and inserts each XML document as a row into the result table. The appropriate DAD is passed to the stored procedure as one of the input parameters.
4. Retrieve the XML document for the result table and store it in the IFS or send it over the Internet to your Business Partner or customer.

Relational tables to XML mapping

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- A column is mapped to an element_node or an attribute_node



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► Relational table to XML Mapping

►

► If you are using an XML collection, you must select a mapping scheme that defines how XML data is represented in a relational database. Because XML collections must match a hierarchical structure that is used in XML documents with a relational structure, you should understand how the two structures compare.

►

► This foil shows how the hierarchical structure can be mapped to relational table columns. A shaded column from the database table is directly mapped to a particular element in the composed XML document. For instance, the CUSTOMER_NAME columns will be mapped to the <Name> element.

►

► Note: in this hierarchy, <Name> is a child of <Customer>.

Mapping methods

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SQL mapping

- Uses SQL statement element to specify the SQL query to retrieve DB2 data
- Can be used only for composing XML documents

RDB_node mapping

- Uses an XML Extender-unique element called RDB_node
- Used to specify tables, columns, conditions, and order for XML data
- Can be used for both composing and decomposing

RDB_node example:

```
<RDB_node>  
<table name="order_tab"/>  
<table name="part_tab"/>  
<table name="ship_tab"/>  
<condition>order_tab.order_key=part_tab.order_key  
AND part_tab.part_key=ship_tab.part_key </condition>  
</RDB_node>
```

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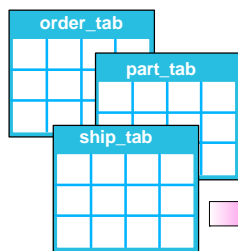
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► Mapping Methods

- The mapping scheme is specified in the <Xcollection> element in the DAD file. The XML Extender provides two types of mapping schemes: SQL mapping and Relational Database (RDB_node) mapping. Both methods use the XPath model to define the hierarchy of the XML document.
- SQL mapping — Allows direct mapping from relational data to XML documents through a single SQL statement and the XPath data model. SQL mapping is used for composition; it is not used for decomposition. SQL mapping is defined with the SQL_stmt element in the DAD file. The content of the SQL_stmt is a valid SQL statement. The SQL_stmt maps the columns in the SELECT clause to XML elements or attributes that are used in the XML document. When defined for composing XML documents, the column names in the SQL statement's SELECT clause are used to define the value of an attribute_node or a content of text_node. The FROM clause defines the tables containing the data; the WHERE clause specifies the join and search condition. The SQL mapping gives DB2 UDB users the power to map the data using SQL. When using SQL mapping, you must be able to join all tables in one SELECT statement to form a query. If one SQL statement is not sufficient, consider using RDB_node mapping. To tie all tables together, the primary key and foreign key relationship is recommended among these tables.
- RDB_node mapping — Defines the location of the content of an XML element or the value of an XML attribute so that the XML Extender can determine where to store or retrieve the XML data. This method uses the XML Extender-provided RDB_node, which contains one or more node definitions for tables, optional columns, and optional conditions. The tables and columns are used to define how the XML data is to be stored in the database. The condition specifies the criteria for selecting XML data or the way to join the XML collection tables.

DAD with SQL mapping

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DB2 column mapped to an element_node or an attribute node

SELECT statement for SQL mapping

```
....
<DAD>
<validation>NO</validation>
<Xcollection>
<SQL_stmt>select o.order_key, customer_name, customer_email,
p.part_key, color, quantity, price, tax, ship_id, date, mode from order_tab
o, part_tab p, (select rrn(ship_tab) as ship_id, date, mode, part_key from
ship_tab) s where o.order_key = 1 and p.price > 20000 and p.order_key =
o.order_key and s.part_key = p.part_key ORDER BY order_key, part_key,
ship_id</SQL_stmt>
<prolog>?xml version="1.0"?</prolog>
<doctype>!DOCTYPE Order SYSTEM
"/dxx/samples/dtd/getstart.dtd"</doctype>
<root_node>
<element_node name="Order">
<attribute_node name="key">
<column name="order_key"/>
</attribute_node>
.....
</element_node>
</root_node>
</Xcollection>
</DAD>
```

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► DAD with SQL Mapping

►

► Follow these guidelines to create the SQL statement for mapping the relational data to the XML document:

- Columns are specified in top-down order, by the hierarchy of the XML document structure.
- The columns for an entity are grouped together, and each group has an object ID column: order_key, part_key.
- The object ID column is the first column in each group. For example, order_key precedes the columns related to the order element and part_key precedes columns for the part element.
- The SHIP_TAB table does not have a single key column, and therefore, the rrn() DB2 UDB built-in function is used to generate the ship_id column.
- The object ID columns are then listed in top-down order in an ORDER BY statement. The columns in an ORDER BY statement should not be qualified by any schema and table name and should match the column names in the SELECT clause.

►

► Note also that the columns in ORDER BY clause should not be qualified and they should match the column names in the SELECT clause. This iSeries-specific restriction for the ORDER BY clause will be lifted in a future release of DB2 UDB for iSeries.

XML collection example

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Steps to compose XML from DB2 data with SQL mapping

1. Prepare DAD

Specify SQL for SQL mapping

```
<SQL_stmt>select o.order_key, customer_name, customer_email, p.part_key,  
color, quantity, price, tax, ship_id, date, mode  
from order_tab o, part_tab p, (select  
  rr(ship_tab) as ship_id, date, mode, part_key from ship_tab) s  
where o.order_key = 1 and p.price > 20000  
and p.order_key = o.order_key  
and s.part_key =p.part_key  
ORDER BY order_key, part_key, ship_id</SQL_stmt>
```

...

Define <element_node> tag for each element in XML document

```
<element_node name="ShipMode">  
<text_node>  
<column name="mode" />  
</text_node>  
</element_node>
```

...

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► XML Collection Example

►

► See this foil and the next for an example of an XML collection method.

XML collection example (continued)

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2. Compose the XML document using the dxxGenXML stored procedure

```
dxxGenXML(  
CLOB(100K) DAD,           /*CLOB containing the DAD file */  
char(UDB_SIZE ) resultTabName, /*result table name, contains one column */  
integer overrideType     /*flag to indicate the type of the override */  
varchar(1024)override,   /*overrides the condition in the DAD file */  
integer maxRows,        /*maximum number of rows in the result table */  
integer numRows,       /*number of generated rows */  
long returnCode,       /*return code */  
varchar(1024)returnMsg) /*message text returned in case of error */  
...
```

3. Export the XML document

```
SELECT db2xml.Content(db2xml.xmlvarchar(doc),  
'/dxx /samples /cmd /getstart.xml')FROM RESULT_TAB
```

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► XML Collection Example (continued)

Additional Information

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- **DB2 UDB Extenders Site**

ibm.com/software/data/db2/extenders/

- **DB2 UDB for iSeries home page**

ibm.com/eserver/iseries/db2

- **ITSO Pubs (ibm.com/redbooks)**

Integrating XML with DB2 XML Extender and DB2 Text Extender (SG24-6130)

DB2 UDB for AS/400 Object Relational Support (SG24-5409)

DB2 UDB for AS/400 Advanced Database Functions (SG24-4249-02)

The XML Files: Using XML and XSL with IBM WebSphere 3.0 (SG24-5479)

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▶ Additional Information

▶

▶ Make sure that you check out these web sites for additional information regarding DB2 Extenders.