

# Feeding the Beast – Receiving and Digesting XML Data Feeds in an Oracle Database

Presented by  
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&

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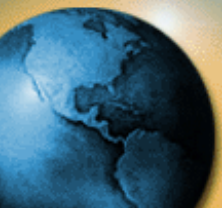
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# Agenda

- Key Concepts Relevant to XML in Oracle
- Evolution of XML in the Oracle Database
- Installation and Configuration of XML DB Repository
- Receiving and Storing XML
- Working with XML Stored in Oracle
- Accessing Relational Data as XML
- Demo



# Key XML Concepts in Oracle

## XML Schema

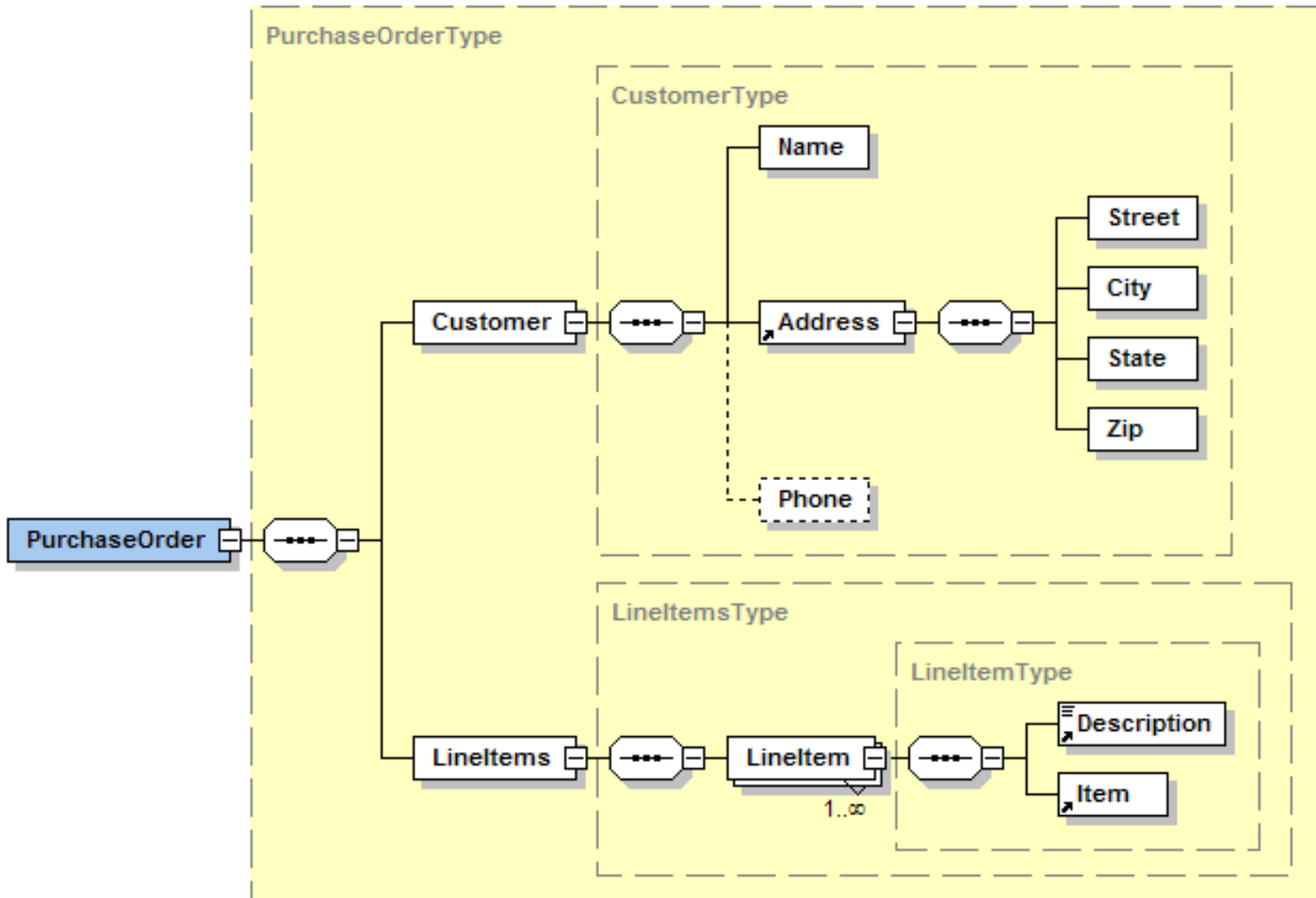
- Constrains and defines a class of XML documents

### Purchase Order XML Document (po.xml)

```
<PurchaseOrder xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="http://psinc2-1:8080/demo/xsd/po.xsd">
  :
  <LinItems>
    <LinItem ItemNumber="1">
      <Description>Oracle Database 10g DBA Handbook</Description>
      <Item Id="0072231459" Price="37.79" Quantity="5" />
    </LinItem>
    <LinItem ItemNumber="2">
      <Description>Oracle Database 10g Linux Administration</Description>
      <Item Id="0072230533" Price="32.99" Quantity="3" />
    </LinItem>
  </LinItems>
  :
</PurchaseOrder>
```

# Key XML Concepts in Oracle

## Purchase Order Schema (po.xsd)



# Key XML Concepts in Oracle

## Purchase Order Schema (po.xsd)

```
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:xdb="http://xmlns.oracle.com/xdb"
  version="1.0">
  :
  <xs:complexType name="LineItemsType" xdb:SQLType="XDBPO_LINEITEMS_TYPE">
    <xs:sequence>
      <xs:element name="LineItem" type="LineItemType" maxOccurs="unbounded"
        xdb:SQLName="LINEITEM" xdb:SQLCollType="XDBPO_LINEITEM_COLLECTION"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="LineItemType" xdb:SQLType="XDBPO_LINEITEM_TYPE">
    <xs:sequence>
      <xs:element ref="Description"/>
      <xs:element ref="Item"/>
    </xs:sequence>
    <xs:attribute name="ItemNumber" type="xs:integer" xdb:SQLName="ITEMNUMBER"
      xdb:SQLType="NUMBER"/>
  </xs:complexType>
  <xs:element name="Description" xdb:SQLName="DESCRIPTION" xdb:SQLType="VARCHAR2"
    xdb:defaultTable="">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:maxLength value="256"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
```

# Key XML Concepts in Oracle

## XPath

- Standard expression language for accessing elements and navigating hierarchical structure of an XML document
- Native in 10gR2

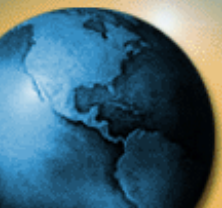
```
SELECT XMLQuery('for $i in fn:doc("/public/employees/emp.xml")  
RETURN $i'  
RETURNING CONTENT) AS RESULT FROM DUAL;
```

```
<EMPLOYEES>  
<EMPLOYEE>  
  <EMPNO>100</EMPNO>  
  <ENAME>King</ENAME>  
  <SAL>24000</SAL>  
</EMPLOYEE>  
<EMPLOYEE>  
  <EMPNO>101</EMPNO>  
  <ENAME>Smith</ENAME>  
  <SAL>17000</SAL>  
</EMPLOYEE>  
</EMPLOYEES>
```

# Key XML Concepts in Oracle

## XSL Transformation (XSLT)

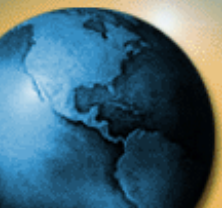
- Extensible StyleSheet Language (XSL) – the markup for formatting of XML
- XSLT transforms structure of an XML document (XML to XML, XML to HTML, XML to ...)



# Evolution of XML in Oracle

## Oracle 8i

- XML Development Kit (XDK) included parsers, class generators, and XSQL servlet
- XML SQL Utility to generate XML from SQL, JDBC queries; insert, update, delete XML stored in the database
- Internet File System (iFS) provided file system like access to Oracle; support for FTP, HTTP, Windows Explorer interfaces



# Evolution of XML in Oracle

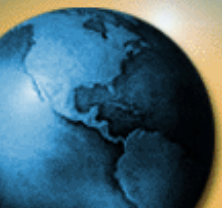
## Oracle 9i

- Native XMLType datatype with 2 main storage options: LOB and structured object-relational
- XML DB Repository
  - True native XML capability in the database
  - Hierarchical structure, mapping path names (URI's) to XMLType database objects
  - Consistent data model for both structured and unstructured data; accessible via XML or SQL
  - Other features: Access Control (ACL), Foldering, WebDAV and FTP protocols, Basic Versioning

# Evolution of XML in Oracle

## Oracle 10g

- Native XML Query (XQuery) Support
- Schema Based Metadata
- Increased Standards Compliance



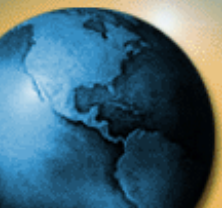
# Installation and Configuration

- Included as part of a default install with Database Configuration Assistant (DBCA)
- Dropped and re-installed by dropping XDB schema, dropping tablespace, and running catalog script catqm.sql
- Main configuration file stored as resource in XML DB at /xdbconfig.xml; can be updated directly, through API in DBMS\_XDB package, or via Enterprise Manager
- Default ports for FTP (2100) and WebDAV/HTTP (8080) protocol servers

# Receiving and Storing XML

## Storage

- LOB Option
  - Maintains content fidelity with original XML (including white spaces)
  - Whole document stored together as a CLOB
- Structured Option
  - Maintains DOM fidelity
  - XML decomposed (shredded) into object-relational tables or views



# Receiving and Storing XML

## Storage (cont.)

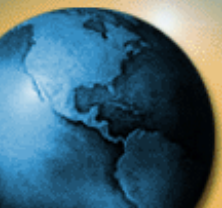
- Pros/Cons

LOB Storage Advantages	Structured Storage Advantages
<ul style="list-style-type: none"><li>•Flexibility in handling schema changes</li><li>•Maintains byte for byte consistency with original document</li></ul>	<ul style="list-style-type: none"><li>•DML performance</li><li>•Can take advantage of existing SQL features such as indexes and constraints</li><li>•Less space required as compared to LOB storage</li></ul>
LOB Storage Disadvantages	Structured Storage Disadvantages
<ul style="list-style-type: none"><li>•Less DML performant</li><li>•Limited access to SQL features</li><li>•Can have significant space requirements</li></ul>	<ul style="list-style-type: none"><li>•Limited flexibility in handling schema changes; changes may require altering underlying object tables and types</li><li>•White spaces, trailing lines, and some data formatting is lost</li></ul>

# Receiving and Storing XML

## Loading

- SQL
  - Direct DML into XMLType tables and columns
- XML DB Repository Protocols
  - Zero client (Oracle) access to XML DB resources via standard Internet protocols
- Existing Oracle Utilities
  - SQL\*Loader / Data Pump
  - XDK (XML SQL Utility)



# Working with XML Stored in Oracle

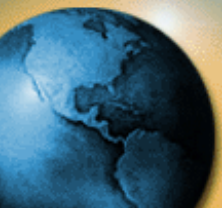
## SQL Access

- SQL XML combines functional extensions to SQL, like `existsNode()` and `extract()`, with XPath notation
  - Return all purchase orders from customer 'ACME'

```
select value(x) from purchaseorders x
```

```
where existsNode(value(x),
```

```
  '/PurchaseOrder[Customer="ACME"]') = 1
```



# Working with XML Stored in Oracle

## SQL Access (cont.)

- Create a relational view of your XML

```
create view purchaseorder_header_v (customer, street,  
city, state, zip) as
```

```
select extractValue(value(po),  
'/PurchaseOrder/Customer'),
```

```
extractValue(value(po), '/PurchaseOrder/Street'),
```

```
extractValue(value(po), '/PurchaseOrder/City'),
```

```
extractValue(value(po), '/PurchaseOrder/State'),
```

```
extractValue(value(po), '/PurchaseOrder/Zip')
```

```
from purchaseorder po;
```

# Working with XML Stored in Oracle

## SQL Access (cont.)

- XML DB Repository content exposed through RESOURCE\_VIEW and PATH\_VIEW

- Change owner of folder '/demo'

```
update resource_view
```

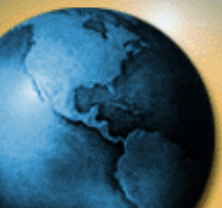
```
set res = updatexml(res, '/Resource/Owner/text()',  
'XMLDEMO')
```

```
where any_path = '/demo'
```

- Return list of resources below '/demo' folder

```
select path from path_view
```

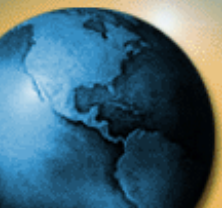
```
where under_path(res, 1, '/demo') = 1
```



# Accessing Relational Data as XML

## Methods Within XML DB

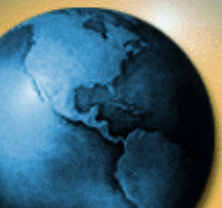
- SQL XML Functions
  - Based on emerging (and evolving) standards
  - Examples: XMLElement, XMLForest, XMLAgg
- SQL Functions
  - Oracle-specific SQL extensions
  - Examples: SYS\_XMLGEN, XMLSequence
- PL/SQL Package (DBMS\_XMLGEN)
  - Maps SQL query result sets into XML
  - Typically as <row> elements within a <rowset>



# Accessing Relational Data as XML

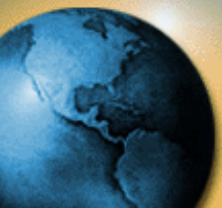
## Methods “External” to XML DB

- XDK for Java
  - XSQL Pages Publishing Framework
  - XML SQL Utility
- URI/URL Based Access
  - UriType derived object types
    - DBUriType - URI that references relational data
    - HttpUriType – URL that references remote pages and files
    - XDBUriType – URI that references resources within XML DB Repository
  - DBUri Servlet



# Demo

## “Simple XML Based Order Management Process”



# Resources

This presentation and associated demo and scripts will be available at:

VOUG Website: [www.voug.org](http://www.voug.org)

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