Universe on XML data sources

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Business Objects™
an SAP company

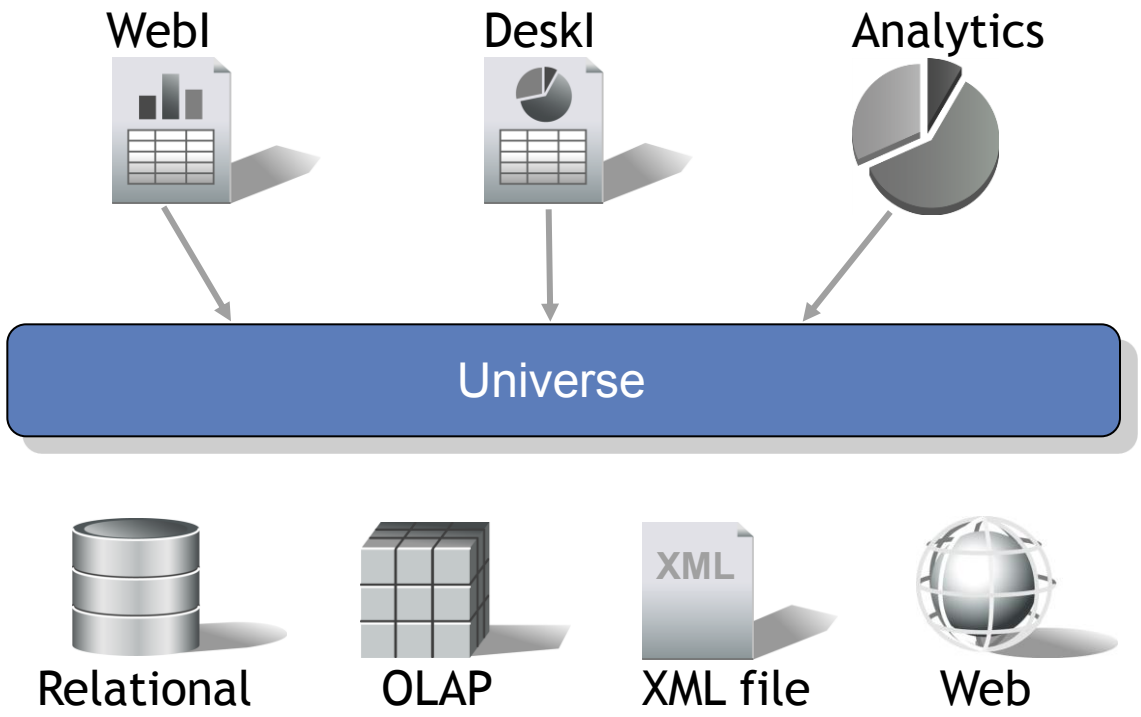
Different kinds of XML data

XML data can be found in a

- XML column
- XML file
- RSS Feed
- Web service
- PMML data mining model
- XBRL document

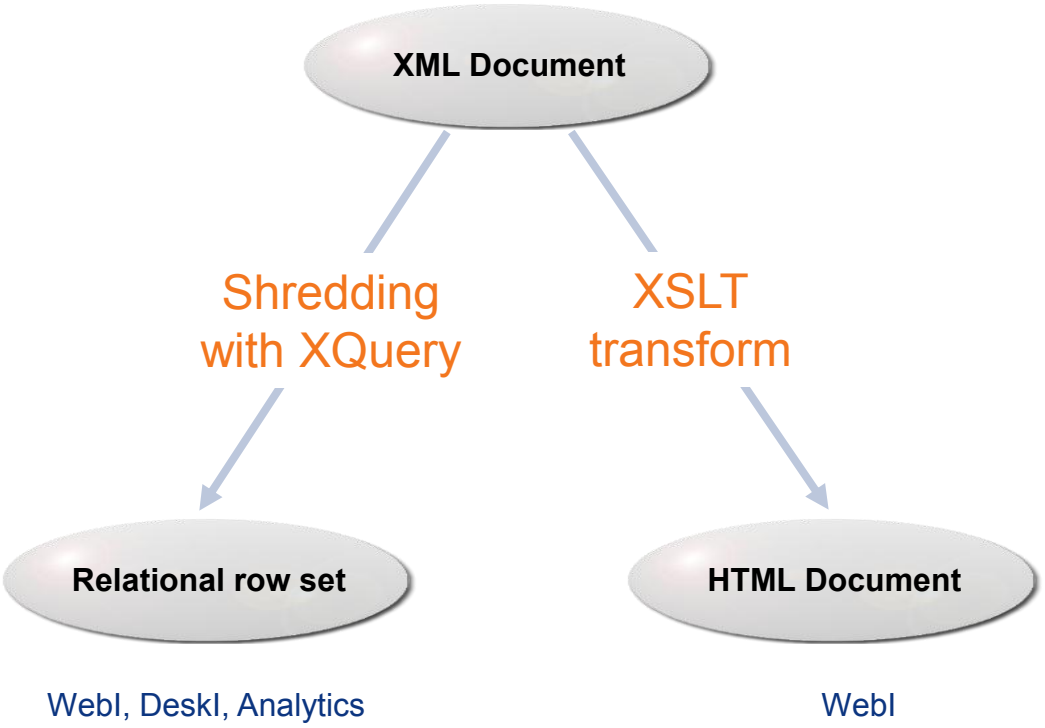
The Business Objects Universe

Querying various data sources and serving multiple clients



Two ways for consuming XML data

We will present two ways to query XML through a Universe

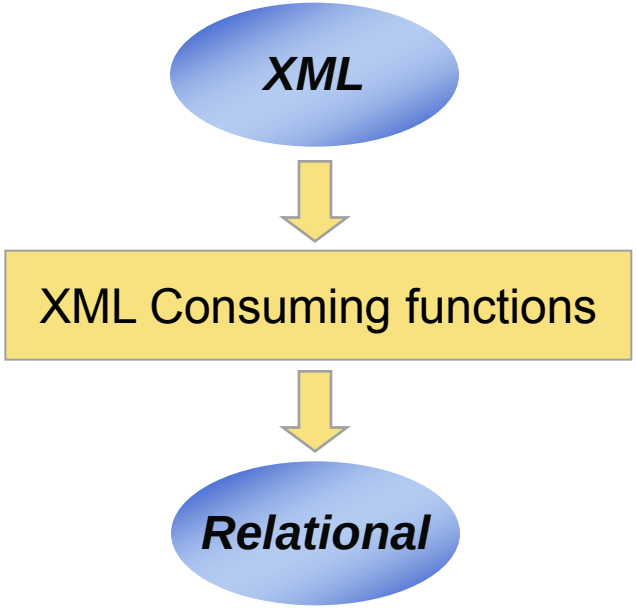


Topics

Business Objects
an SAP company

- From XML to relational
- From XML to HTML
- From relational to HTML
- Mixing relational with XML

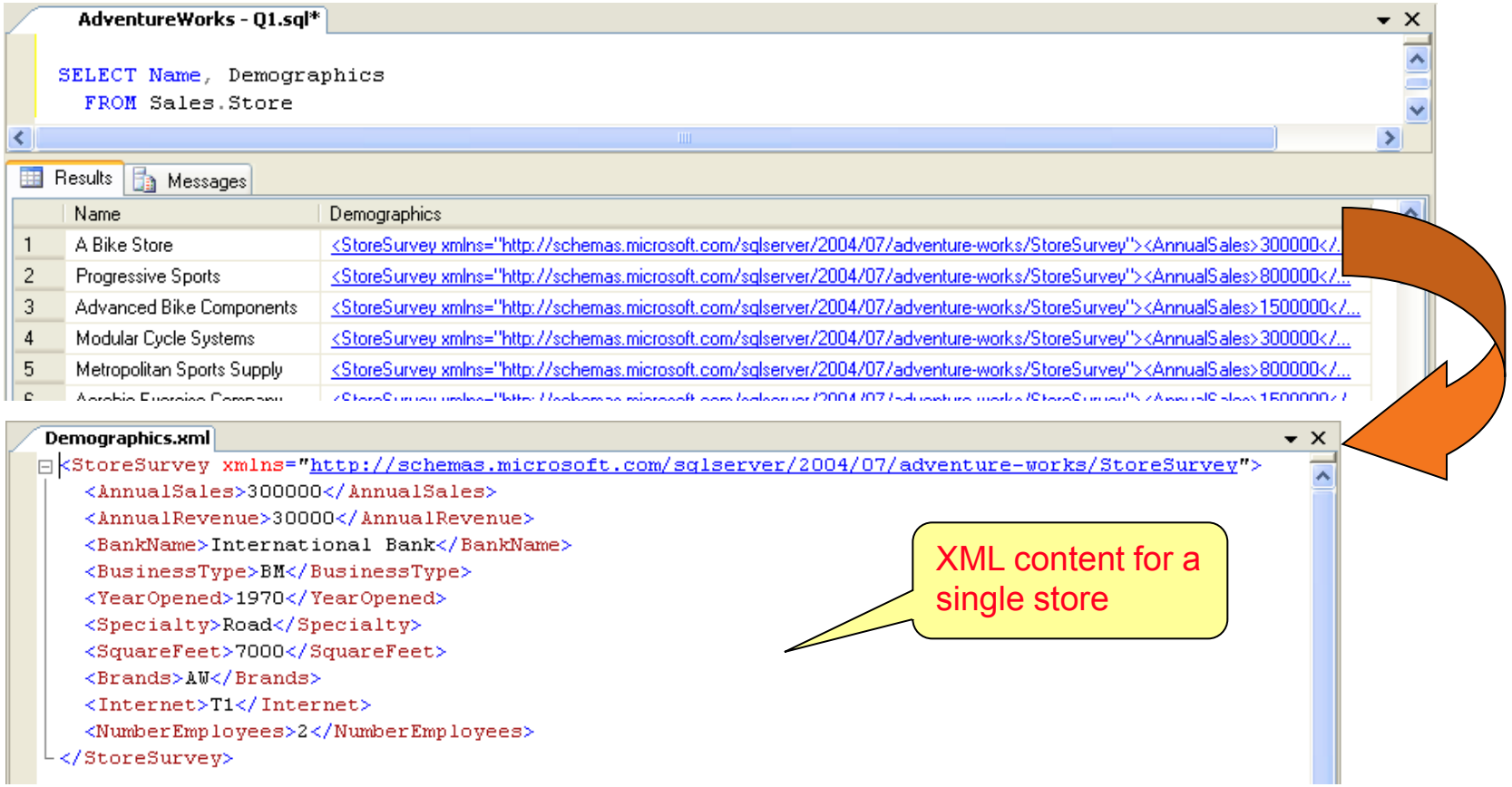
From XML to relational



SQL/XML functions
e.g. XMLTable()

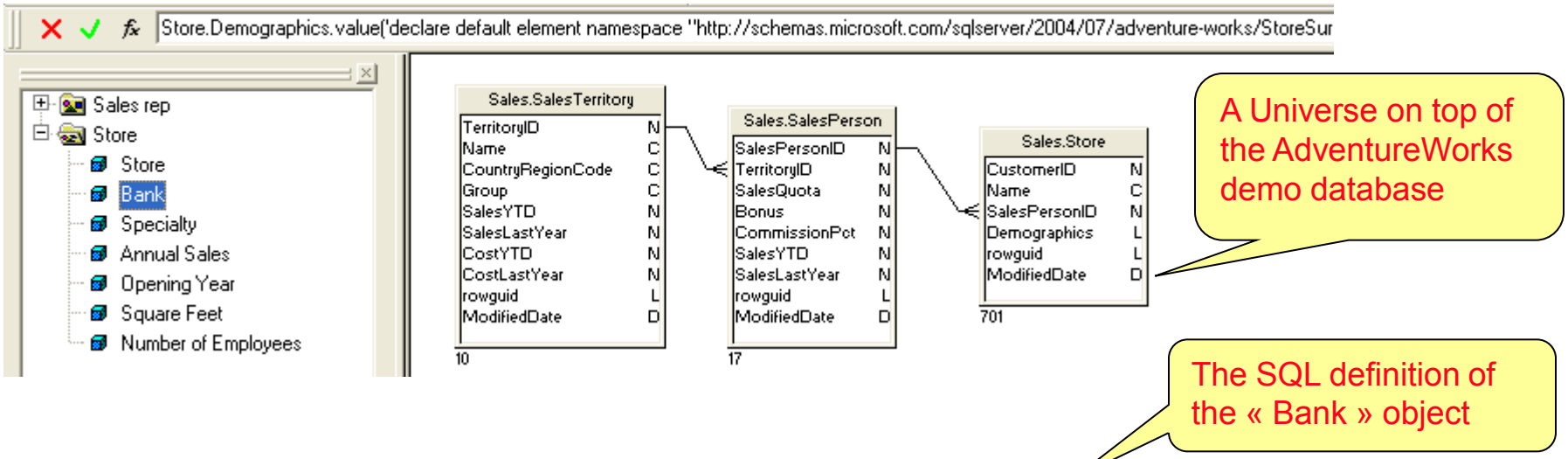
The AdventureWorks demo database

The XML column Store.Demographics



Shredding XML with XQuery against the Microsoft demo database

We define one business object for each XML element that we need to extract




```
Store.Demographics.value('declare default element namespace
"http://schemas.microsoft.com/sqlserver/2004/07/adventure-works/StoreSurvey";
/StoreSurvey[1]/BankName', 'varchar(80)')
```

Shredding XML with XQuery against the Microsoft demo database

The demograhics XML content decomposed

Australia

Store	Specialty	Annual Sales	Square Feet	Opening Year	Number of Employees	Bank
Bike Part Wholesalers	Touring	800,000	21,000	1999	15	International Security
Budget Toy Store	Mountain	3,000,000	71,000	1998	52	International Bank
Cross-town Parts Shop	Road	800,000	23,000	1990	19	Guardian Bank
Cycle Parts and Accessories	Touring	800,000	20,000	1985	10	International Bank
Eastside Cycle Shop	Touring	800,000	21,000	1988	11	Guardian Bank
Eastward Bike Accessories	Touring	1,500,000	39,000	1974	39	Reserve Security
Expert Cycle Store	Touring	1,500,000	38,000	1995	37	Primary International
Fast Bike Works	Touring	1,000,000	25,000	1971	28	Primary International
First Supplies	Touring	1,000,000	26,000	1996	22	United Security
Fitness Bike Accessories	Touring	1,500,000	39,000	1986	47	Reserve Security
Fitness Discount Store	Touring	800,000	19,000	1993	11	Primary International

Querying an XML file through an IBM DB2 Universe

The definition of the derived table « MENU »

```
SELECT T.NAME, T.DESC, T.PRICE, T.CALORIES
FROM
(
 SELECT
  xmlparse(document
  db2xml.extractCLOB(
  db2xml.xmlfile('D:\public_data\menu.xml'), '//')
  preserve whitespace) as XDOC
   FROM sysibm.sysdummy1
) as X,
xmltable(xmlnamespaces(default 'http://bobjsample.org'),
         '$d/breakfast/food' passing X.XDOC as "d" columns
   NAME       VARCHAR(80) path 'name',
   DESC       VARCHAR(80) path 'description',
   PRICE      VARCHAR(35) path 'price',
   CALORIES   INTEGER     path 'calories'
) AS T
```

Extracting the content of the XML file

Shredding the XML document with XQuery

MENU	
NAME	C
DESC	C
PRICE	C
CALORIES	N

Querying an XML file through an IBM DB2 Universe

The XML file and the BOBJ document built on top

```
<?xml version="1.0" encoding="UTF-8"?>
<breakfast xmlns='http://bobjsample.org'>
  <food>
    <name>Belgian Waffles</name>
    <price>$5.95</price>
    <description>Belgian Waffles with maple syrup</description>
    <calories>650</calories>
  </food>
  <food>
    <name>French Toast</name>
    <price>$4.50</price>
    <description>Thick slices of sourdough bread</description>
    <calories>600</calories>
  </food>
  <food>
    <name>Homestyle Breakfast</name>
    <price>$6.95</price>
    <description>Eggs, bacon, toast and hash browns</description>
    <calories>950</calories>
  </food>
</breakfast>
```

Breakfast Item	Price	Calories
Belgian Waffles	$5.95	650
French Toast	$4.50	600
Homestyle Breakfast	$6.95	950

Consuming Web services
Getting the weather forecast

An IBM DB2 Universe against a SOAP based web service

```
select T.DAY_SEQ, T.DAY_NAME, T.MIN_TEMP_C, T.MAX_TEMP_C
from
 (
  SELECT xmlparse(document DB2XML.SOAPHTTPV(
  'http://www.webservicex.net/WeatherForecast.asmx',
  'http://www.webservicex.net/GetWeatherByPlaceName',
  '<GetWeatherByPlaceName xmlns="http://www.webservicex.net"><PlaceName>'
  || @Prompt('Enter Place','C',,mono,free) || '</PlaceName></GetWeatherByPlaceName>'
  ) preserve whitespace) as XDOC
   FROM sysibm.sysdummy1
 ) as X,
 XMLTABLE(XMLNAMESPACES(DEFAULT 'http://www.webservicex.net'),
          'for $w at $i in
           $d/GetWeatherByPlaceNameResponse/GetWeatherByPlaceNameResult/Details/WeatherData
          return <forecast>
                   <pos>{$i}</pos>
                   <fullday>{$w/Day}</fullday>
                   <tempmax>{$w/MaxTemperatureC}</tempmax>
                   <tempmin>{$w/MinTemperatureC}</tempmin>
                 </forecast>'
          passing X.XDOC as "d" columns
   DAY_NAME       VARCHAR(80)  path 'fullday/Day',
   DAY_SEQ        INTEGER      path 'pos',
   MAX_TEMP_C     FLOAT        path 'tempmax/MaxTemperatureC',
   MIN_TEMP_C     FLOAT        path 'tempmin/MinTemperatureC'
) AS T
```

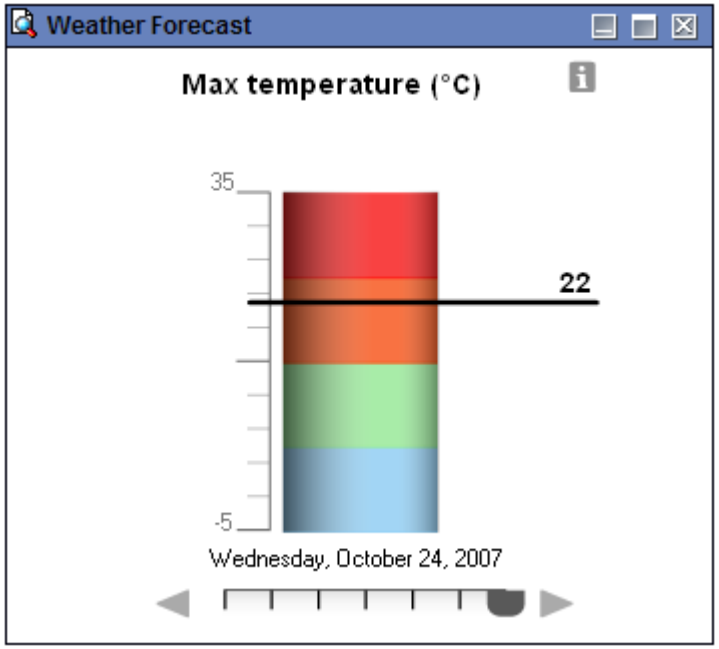
The SOAP requestor function to get web data

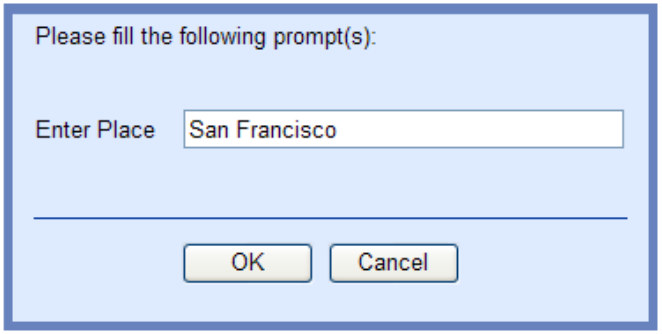
Shredding the XML document with XQuery

WEATHER	
DAY_SEQ	N
DAY_NAME	C
MIN_TEMP_C	N
MAX_TEMP_C	N

Consuming Web services
Getting the weather forecast

A dashboard analytic on top of the IBM DB2 Universe





An Oracle PMML data mining model

Output from dbms_data_mining.get_model_details_xml()

```
- <PMML version="2.1">
    <Header copyright="Copyright (c) 2004, Oracle Corporation. All rights reserved." />
  - <DataDictionary numberOfFields="9">
      <DataField name="AFFINITY_CARD" optype="categorical" />
      <DataField name="AGE" optype="continuous" />
      <DataField name="BOOKKEEPING_APPLICATION" optype="continuous" />
      <DataField name="CUST_MARITAL_STATUS" optype="categorical" />
      <DataField name="EDUCATION" optype="categorical" />
      <DataField name="HOUSEHOLD_SIZE" optype="categorical" />
      <DataField name="OCCUPATION" optype="categorical" />
      <DataField name="YRS_RESIDENCE" optype="continuous" />
      <DataField name="Y_BOX_GAMES" optype="continuous" />
    </DataDictionary>
  - <TreeModel modelName="DT_SH_CLAS_SAMPLE" functionName="classification"
    + <Extension name="buildSettings">
    + <MiningSchema>
    - <Node id="0" score="0" recordCount="1500">
        <True />
        <ScoreDistribution value="0" recordCount="1120" />
        <ScoreDistribution value="1" recordCount="380" />
      + <Node id="1" score="0" recordCount="712">
      + <Node id="2" score="0" recordCount="788">
      </Node>
    </TreeModel>
  </PMML>
```

The attributes of the decision tree model

The hierarchy of nodes

Turning the PMML tree into relational

The definition of the derived table « DT_DYNL »

```
SELECT
Z.NODE, Z.PARENT, Z.LEVELN, Z.NSCORE, Z.NPREDICATE, Z.NSURROGATE, Z.RECORDS,
SYS_CONNECT_BY_PATH(NODE, '/') as PATH
FROM
(SELECT
   lpad(to_char(X.node_id),2,0) as NODE, lpad(to_char(X.parent_node_id),2,0) as PARENT,
   X.score as NSCORE, X.record_count as RECORDS, X.node_level as LEVELN,
   to_char(dbms_xmlgen.convert(X.predicate.getclobval(), 1)) as NPREDICATE,
   to_char(dbms_xmlgen.convert(X.surrogate.getclobval(), 1)) AS NSURROGATE
 FROM
 XMLTABLE('
 for $n in /PMML/TreeModel//Node
 let $pn := /PMML/TreeModel//Node[Node/@id=$n/@id]
    return
   <Tag id="{$n/@id}" parent_id="{$pn/@id}" score="{$n/@score}"
record_count="{$n/@recordCount}" depth="{count($n/ancestor::*)-2}">
     <Predicate>
       {
         if ($n/SimplePredicate instance of element(SimplePredicate)) then
           concat(
             string($n/SimplePredicate/@field),string(' '),
             if ($n/SimplePredicate/@operator = "greaterThan") then

...  removed part  ...

   </Tag>
   ' PASSING dbms_data_mining.get_model_details_xml(@Prompt('Mining
Model','C','Mining Models\Model Name',mono,free))
   COLUMNS
     "NODE_ID"         NUMBER   PATH '/Tag/@id',
     "PARENT_NODE_ID"  NUMBER   PATH '/Tag/@parent_id',
     "SCORE"           NUMBER   PATH '/Tag/@score',
     "RECORD_COUNT"    NUMBER   PATH '/Tag/@record_count',
     "NODE_LEVEL"      NUMBER   PATH '/Tag/@depth',
     "PREDICATE"       XMLType PATH '/Tag/Predicate/text()',
     "SURROGATE"       XMLType PATH '/Tag/Surrogate/text()'
  ) X
) Z
WHERE LEVEL > 1 AND Z.LEVELN = LEVEL-1
CONNECT BY PRIOR NODE = PARENT
```

XQuery flwor

The XMLTable() function

Calling the function get_model_details_xml()

The Oracle hierarchical operator « connect by »

DT_DYNL	
NODE	C
PARENT	C
LEVELN	N
NSCORE	N
NPREDICATE	C
NSURROGATE	C
RECORDS	N
PATH	C

The PMML model rendered in DeskI

The decision tree visualized in BOBJ documents

Decision Tree Model: DT_SH_CLAS_SAMPLE

Hierarchical Structure	Score	Negative answers	Positive answers	Percent Negative	Percent Positive	Predicate
Node00	No	1120	380	74.7 %	25.3 %	
L.. Node01	No	382	330	53.7 %	46.3 %	CUST_MARITAL_STATUS isIn "Married"
L.. Node09	Yes	67	179	27.2 %	72.8 %	EDUCATION isIn "Assoc-A" "Bach." "Masters" "PhD" "Prof
L.. Node10	No	315	151	67.6 %	32.4 %	EDUCATION isIn "10th" "11th" "12th" "1st-4th" "5th-6th" "7th
L.. Node02	No	738	50	93.7 %	6.3 %	CUST_MARITAL_STATUS isIn "Divorc." "Mabsent" "Mar
L.. Node03	No	143	31	82.2 %	17.8 %	EDUCATION isIn "Assoc-A" "Bach." "Masters" "PhD" "Prof
L.. Node04	No	66	4	94.3 %	5.7 %	YRS_RESIDENCE <= 3.5
L.. Node05	No	41	4	91.1 %	8.9 %	AGE > 25.5
L.. Node12	No	22	4	84.6 %	15.4 %	AGE <= 28.5
L.. Node13	No	19	0	100.0 %	0.0 %	AGE > 28.5
L.. Node11	No	25	0	100.0 %	0.0 %	AGE <= 25.5
L.. Node14	No	77	27	74.0 %	26.0 %	YRS_RESIDENCE > 3.5
L.. Node06	No	595	19	96.9 %	3.1 %	EDUCATION isIn "10th" "11th" "12th" "1st-4th" "5th-6th" "7th
L.. Node07	No	475	7	98.5 %	1.5 %	YRS_RESIDENCE <= 4.5
L.. Node08	No	244	7	97.2 %	2.8 %	AGE > 26.5
L.. Node16	No	44	0	100.0 %	0.0 %	BOOKKEEPING_APPLICATION <= .5
L.. Node17	No	200	7	96.6 %	3.4 %	BOOKKEEPING_APPLICATION > .5
L.. Node15	No	231	0	100.0 %	0.0 %	AGE <= 26.5
L.. Node18	No	120	12	90.9 %	9.1 %	YRS_RESIDENCE > 4.5

Decision Tree Model: DT_SH_CLAS_SAMPLE

Hierarchical Structure	Score	Records	% Negative versus % Positive
Node00	No	1500	
L.. Node01	No	712	
L.. Node09	Yes	246	
L.. Node10	No	466	
L.. Node02	No	788	
L.. Node03	No	174	
L.. Node04	No	70	
L.. Node05	No	45	
L.. Node12	No	26	
L.. Node13	No	19	
L.. Node11	No	25	
L.. Node14	No	104	
L.. Node06	No	614	
L.. Node07	No	482	
L.. Node08	No	251	
L.. Node16	No	44	
L.. Node17	No	207	
L.. Node15	No	231	
L.. Node18	No	132	

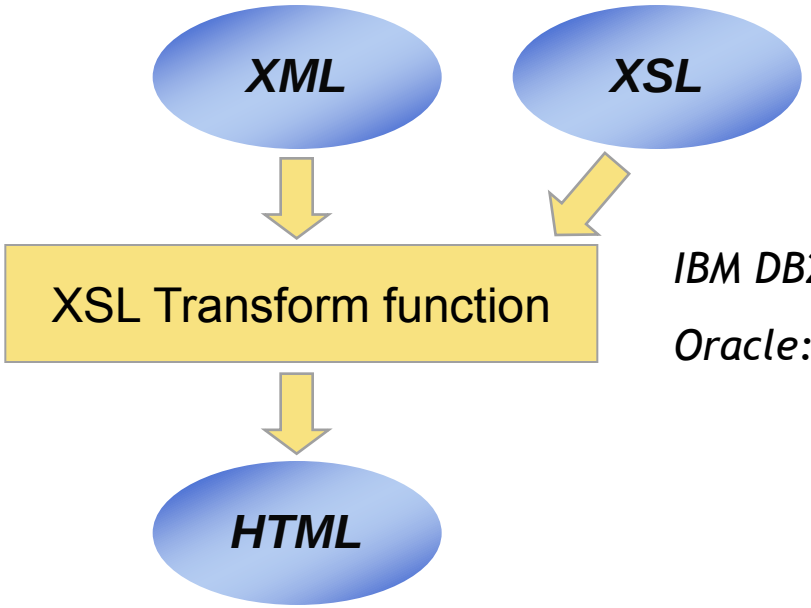
% Positive % Negative

Topics

Business Objects
an SAP company

- From XML to relational
- From XML to HTML
- From relational to HTML
- Mixing relational with XML

From XML to HTML



IBM DB2: XSLTransformToClob()

Oracle: XMLTransform()

The Oracle OE demo database

The warehouses.warehouse_spec XML column

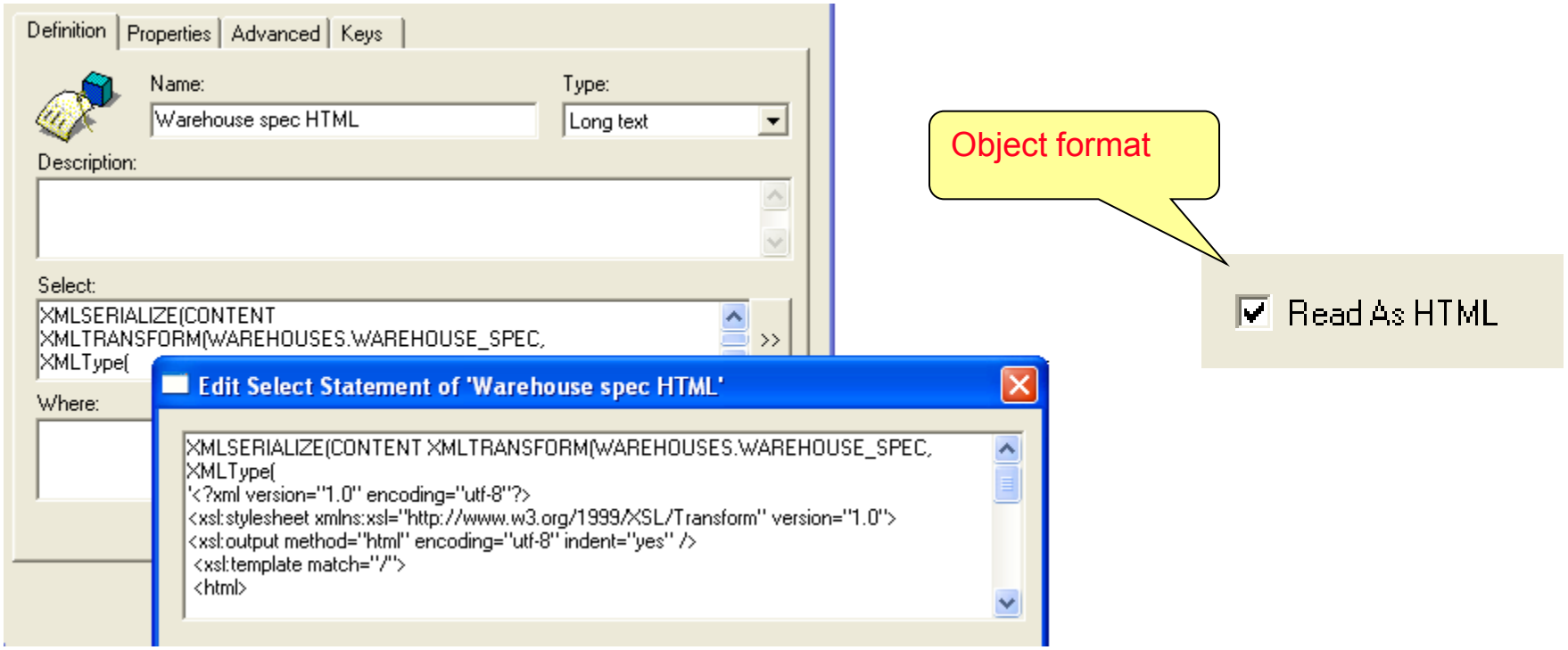
```
SQL> select warehouse_spec from warehouses where warehouse_id=1;

WAREHOUSE_SPEC
--------------------------------------------------------------------
<?xml version="1.0"?>
<Warehouse>
<Building>Owned</Building>
<Area>25000</Area>
<Docks>2</Docks>
<DockType>Rear load</DockType>
<WaterAccess>Y</WaterAccess>
<RailAccess>N</RailAccess>
<Parking>Street</Parking>
<VClearance>10 ft</VClearance>
</Warehouse>
```


Transforming XML into HTML against the Oracle demo database

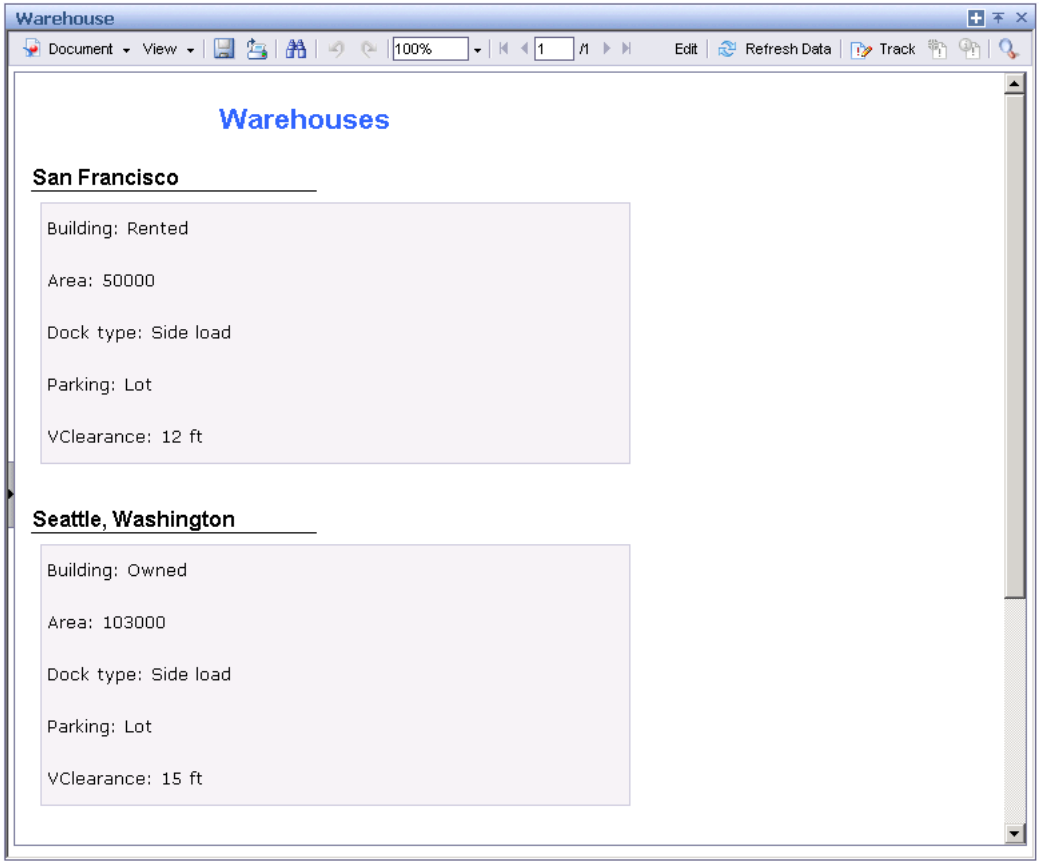
We define an object on the warehouse_spec XML column

We include the xsl stylesheet as part of the object definition



Transforming XML into HTML against the Oracle demo database

The warehouse spec rendered as HTML in WebI



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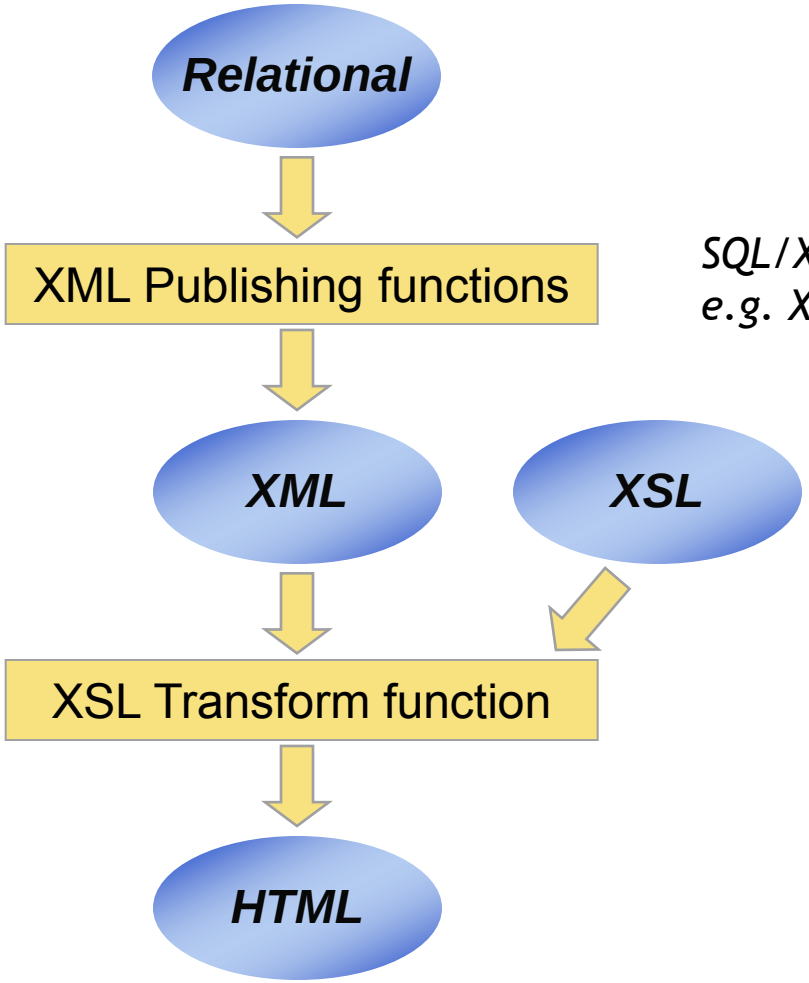
From relational to HTML



SQL/XML functions
e.g. XMLElement()

Generating an XML document from the DB2 sample database

```
CREATE VIEW ACTIVITY
AS
with
PRJR as (
SELECT
  PROJECT.PROJNAME as PROJECT,
  PRJ_OWNER.FIRSTNME ||' '|| PRJ_OWNER.LASTNAME as MANAGER,
  PROJECT.PRSTDATE as START_DATE,
  sum((EMPPROJACT.EMENDATE - EMPPROJACT.EMSTDATE) * EMPPROJACT.EMPTIME) as DAYS_SPENT,
  RANK() OVER (ORDER BY sum((EMPPROJACT.EMENDATE - EMPPROJACT.EMSTDATE) * EMPPROJACT.EMPTIME) DESC) as PRANK
FROM
  EMPPROJACT,
  EMPLOYEE  PRJ_OWNER,
  PROJECT
WHERE
  EMPPROJACT.PROJNO=PROJECT.PROJNO
  AND PROJECT.RESPEMP=PRJ_OWNER.EMPNO
GROUP BY
  PROJECT.PROJNAME,
  PRJ_OWNER.FIRSTNME || ' '  || PRJ_OWNER.LASTNAME,
  PROJECT.PRSTDATE
)
SELECT 'Projects' as TOPIC, XMLDOCUMENT(XMLElement(NAME "activity", XMLAgg( XMLELEMENT(NAME "project",
       XMLForest(PROJECT as "pname", MANAGER as "manager", START_DATE as "begin",
                 DAYS_SPENT as "days", PRANK as "rank"))))) as XDOC
FROM
  PRJR
;
```

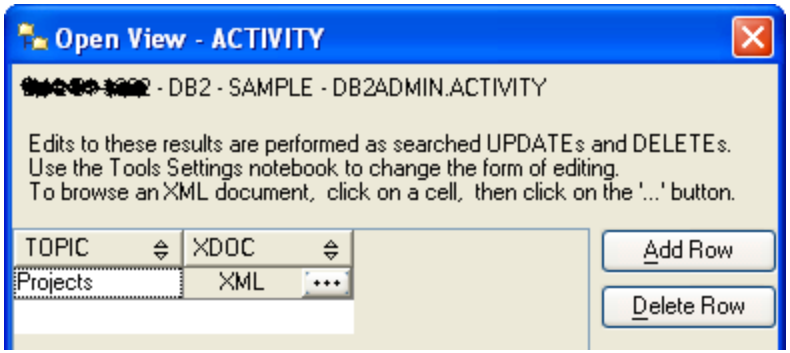
Building a view

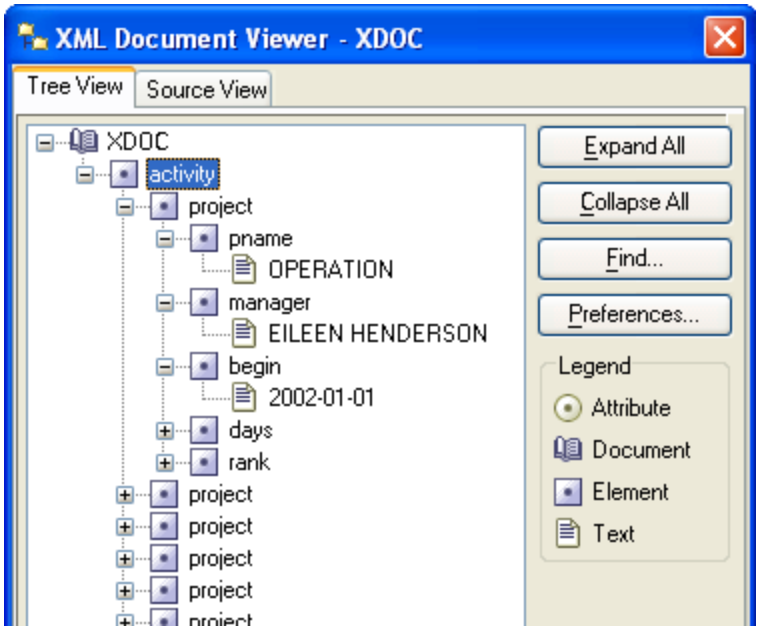
Aggregating and ranking activity data by projects

Generating XML

Generating an XML document from the DB2 sample database

The ‘activity ’ view returns an XML document as illustrated here in the DB2 Control Center





XSL templates

We create a table for storing XSL templates

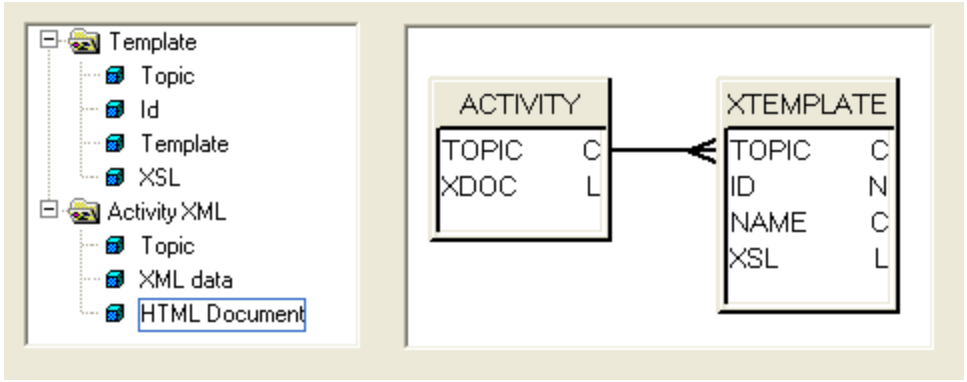
```
create table XTEMPLATE
(
 TOPIC varchar(80),
 ID    integer,
 NAME  varchar(80),
 XSL   CLOB(4k)
)
;
```

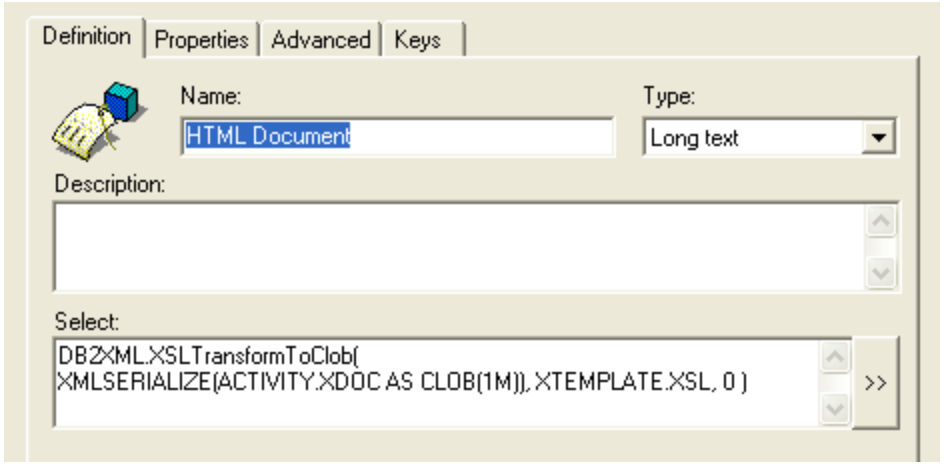
XSL templates
Filling the ‘xtemplate’ table

```
INSERT INTO XTEMPLATE VALUES ( 'Projects', 1, 'Alphabetical List', DB2XML.XMLCLOB(
'<?xml version="1.0" encoding="utf-8"?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">
<xsl:output method="html" encoding="utf-8" indent="yes" />
 <xsl:template match="/">
 <html>
  <style>
    .txt { font-family: Verdana, sans-serif; font-size: xx-small; vertical-align: center; text-align:left;
padding: .5em; background-color: beige;}
    .num { font-family: Verdana, sans-serif; font-size: xx-small; vertical-align: center; text-align:right;
padding: .5em; background-color: beige;}
    .hdr { font-family: Verdana, sans-serif; font-size: smaller;vertical-align: center; text-align:left;
padding: .5em; background-color: #9bd49d;}
    .ctr { font-family: Verdana, sans-serif; font-size: xx-small; vertical-align: center; text-align:center;
padding: .5em; background-color: beige;}
  </style>
   <body>
    <table>
       <tr>
         <th class="hdr">Project Name</th>
         <th class="hdr">Start Date</th>
         <th class="hdr">Manager</th>
         <th class="hdr">Days Spent</th>
       </tr>
         <xsl:for-each select="activity/project">
         <xsl:sort select="name" data-type="text" order="ascending"/>
       <tr>
       <td Class="txt"><em><xsl:value-of select="pname"/></em></td>
       <td Class="ctr"><xsl:value-of select="begin"/></td>
       …
```

Turning XML into HTML

A Universe against the ‘activity’ view and the ‘xtemplate’ table



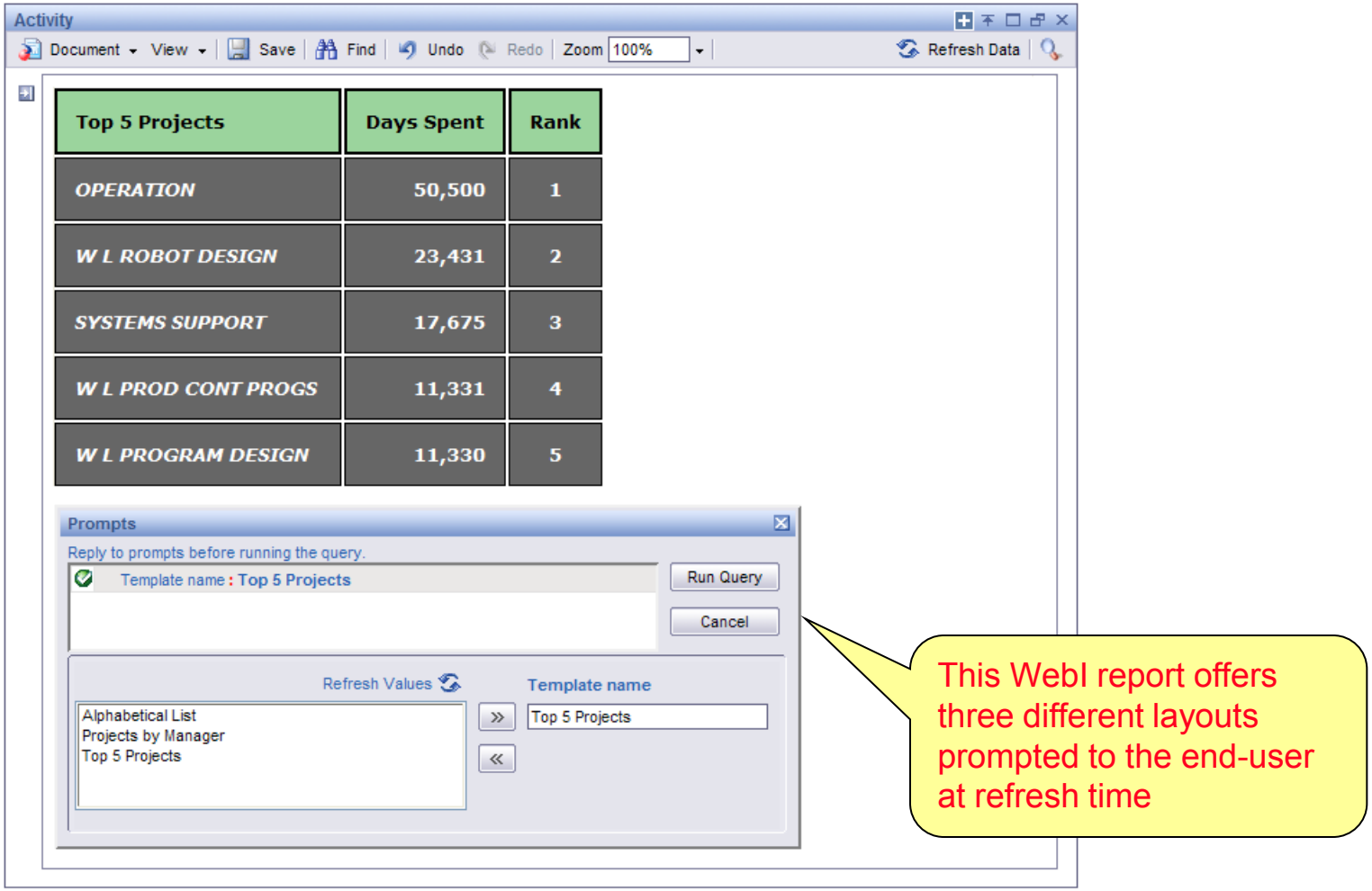


Turning XML into HTML

Viewing the HTML document in WebI

Project Name	Start Date	Manager	Days Spent
OPERATION	2002-01-01	EILEEN HENDERSON	50,500
W L ROBOT DESIGN	2002-01-01	BRUCE ADAMSON	23,431
SYSTEMS SUPPORT	2002-01-01	THEODORE SPENSER	17,675
W L PROD CONT PROGS	2002-02-15	ELIZABETH PIANKA	11,331
W L PROGRAM DESIGN	2002-01-01	JENNIFER LUTZ	11,330
WELD LINE AUTOMATION	2002-01-01	CHRISTINE HAAS	10,700
APPLICATIONS SUPPORT	2002-01-01	WING LEE	10,100
DB/DC SUPPORT	2002-01-01	JASON GOUNOT	10,100
GENERAL ADMIN SYSTEMS	2002-01-01	EVA PULASKI	10,100
SCP SYSTEMS SUPPORT	2002-01-01	RAMLAL MEHTA	10,100
W L PROGRAMMING	2002-01-01	IRVING STERN	10,100
USER EDUCATION	2002-01-01	SALLY KWAN	5,750
OPERATION SUPPORT	2002-01-01	JOHN GEYER	2,525
ACCOUNT PROGRAMMING	2002-01-01	MARIA PEREZ	2,469
PAYROLL PROGRAMMING	2002-01-01	JAMES JEFFERSON	2,038
PERSONNEL PROGRAMMING	2002-01-01	DANIEL SMITH	1,181
QUERY SERVICES	2002-01-01	SALLY KWAN	950
WELD LINE PLANNING	2002-01-01	MICHAEL THOMPSON	814

Turning XML into HTML



Topics

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an SAP company

- From XML to relational
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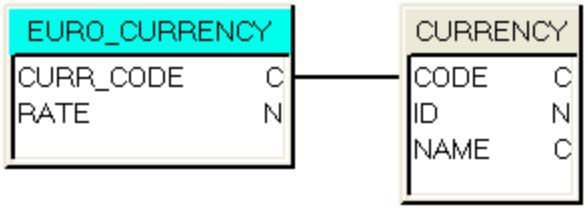
- **Mixing relational with XML**

Combining relational data with RSS feeds

In an Oracle Universe, we define a derived table on top of a RSS feed

We then join it to a relational table that contains the labels



SQL definition of the derived table

```
select substr(TXT,9,3) as CURR_CODE,
to_number(replace(substr(TXT,14,8),',',')) as RATE
from XMLTABLE('/rss/channel/item' passing
HTTPURITYPE('http://currencysource.com/RSS/EUR.xml').getxml()
columns
  TXT  varchar2(100)  path '/item/title'
)
```

Combining relational data with RSS feeds

An heterogeneous query joining together a relational table and RSS feed data

Name	Currency Code	Exchange Rate
Argentine Peso	ARS	4.055063
Australian Dollar	AUD	1.586423
Bahrain Dinar	BHD	0.505268
Botswana Pula	BWP	8.386356
Brazilian Real	BRL	2.604100
Brunei Dollar	BND	2.067317
Canadian Dollar	CAD	1.437496
Chilean Peso	CLP	708.973400
Chinese Yuan	CNY	10.241670
Colombian Peso	COP	2,635.310000
Cyprus Pound	CYP	0.583304
Czech Koruna	CZK	28.661120
Danish Krone	DKK	7.432293
Euro	EUR	1.000000
Hungarian Forint	HUF	247.545100
Icelandic Krona	ISK	84.679480
Indian Rupee	INR	55.050430

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