XPath

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Как выбирать данные из загруженных XML-документов?

- Существуют специальные ***стандартизированные языки***, ориентированные на выборку таких данных:

- XPath – язык для построения навигационных выражений
- XQuery – язык для построения запросов (использует XPath)

XPath

- XPath - это синтаксис для определения фрагментов XML-документа
- XPath использует специальные выражения для навигации по XML-документу
- XPath содержит библиотеку стандартных функций
- XPath рекомендован к использованию консорциумом W3C

Примечание: World Wide Web Consortium (W3C) международное сообщество, которое развивает открытые стандарты для обеспечения долгосрочного роста Интернета.

XPath - терминология

- Nodes
- Atomic values
- Parent
- Children
- Siblings
- Ancestors
- Descendants

Пример XML-документа

- <?xml version="1.0" encoding="UTF-8"?>

  <bookstore>
  <book>
  <title lang="en">Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
  </book>
- . . .
  </bookstore>

Nodes

<bookstore> (root element node)

<author>J K. Rowling</author> (element node)

lang="en" (attribute node)

Atomic values

- J K. Rowling

  en

- 2005

Parent

- **book** -> title
- **book** -> author
- **book** -> year
- **book** -> price

Children

- **title** -> book
- **author** -> book
- **year** -> book
- **price** -> book

Siblings

- title
- author
- year
- price

Ancestors

- title -> **book**
- title -> **bookstore**

Descendants

- bookstore -> **book**
- bookstore -> **title**
- bookstore -> **author**
- bookstore -> **year**
- bookstore -> **price**

Выборка узлов

Expression	Description
nodename	Selects all nodes with the name "*nodename*"
/	Selects from the root node
//	Selects nodes in the document from the current node that match the selection no matter where they are
.	Selects the current node
..	Selects the parent of the current node
@	Selects attributes

Примеры (выборка узлов)

Path Expression	Result
bookstore	Selects all nodes with the name "bookstore"
/bookstore	Selects the root element bookstore **Note:** If the path starts with a slash (/) it always represents an absolute path to an element!
bookstore/book	Selects all book elements that are children of bookstore
//book	Selects all book elements no matter where they are in the document
bookstore//book	Selects all book elements that are descendant of the bookstore element, no matter where they are under the bookstore element
//@lang	Selects all attributes that are named lang

Примеры (предикаты)

Path Expression	Result
/bookstore/book[1]	Selects the first book element that is the child of the bookstore element. **Note:** In IE 5,6,7,8,9 first node is[0], but according to W3C, it is [1]. To solve this problem in IE, set the SelectionLanguage to XPath: *In JavaScript: xml*.setProperty("SelectionLanguage","XPath");
/bookstore/book[last()]	Selects the last book element that is the child of the bookstore element
/bookstore/book[last()-1]	Selects the last but one book element that is the child of the bookstore element
/bookstore/book[position()<3]	Selects the first two book elements that are children of the bookstore element
//title[@lang]	Selects all the title elements that have an attribute named lang
//title[@lang='eng']	Selects all the title elements that have an attribute named lang with a value of 'eng'
/bookstore/book[price>35.00]	Selects all the book elements of the bookstore element that have a price element with a value greater than 35.00
/bookstore/book[price>35.00]/title	Selects all the title elements of the book elements of the bookstore element that have a price element with a value greater than 35.00

Шаблоны

Wildcard	Description
*	Matches any element node
@*	Matches any attribute node
node()	Matches any node of any kind

Примеры (использование шаблонов)

Path Expression	Result
/bookstore/*	Selects all the child nodes of the bookstore element
//*	Selects all elements in the document
//title[@*]	Selects all title elements which have any attribute

XPath Operators

Operator	Description	Example
|	Computes two node-sets	//book | //cd
+	Addition	6 + 4
-	Subtraction	6 - 4
*	Multiplication	6 * 4
div	Division	8 div 4
=	Equal	price=9.80
!=	Not equal	price!=9.80
<	Less than	price<9.80
<=	Less than or equal to	price<=9.80
>	Greater than	price>9.80
>=	Greater than or equal to	price>=9.80
or	or	price=9.80 or price=9.70
and	and	price>9.00 and price<9.90
mod	Modulus (division remainder)	5 mod 2

Примеры (выражения XPath)

- /bookstore/book/title
- /bookstore/book[1]/title
- /bookstore/book/price[text()]
- /bookstore/book[price>35]/price
- /bookstore/book[price>35]/title

Как использовать XPath в СУБД?

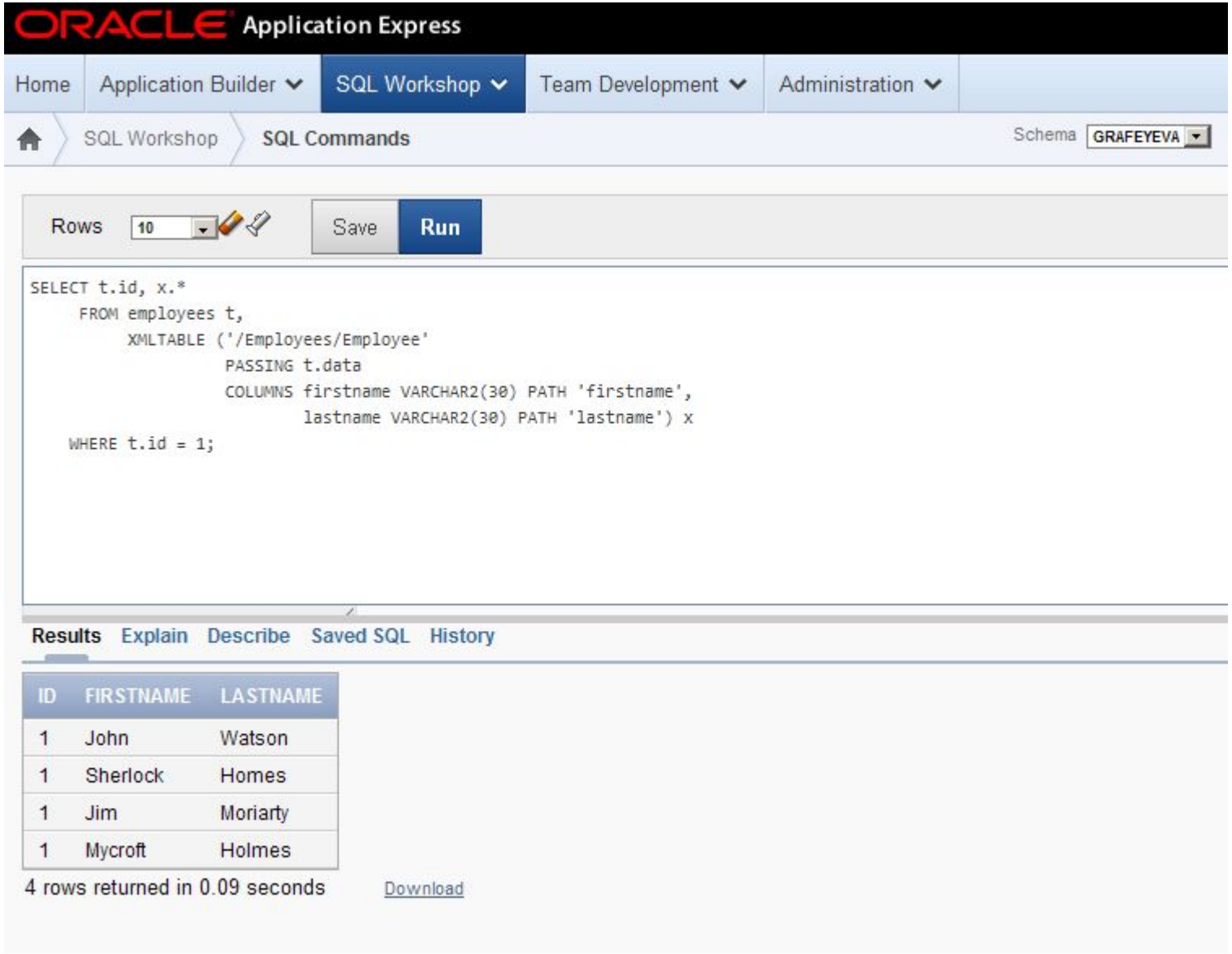
- В СУБД существуют специальные функции, ориентированные на выборку данных, которые используют выражения XPath.
- К примеру, функция XMLTable в ORACLE:

- XMLTable('<XPath-expression> | <XQuery>'
- PASSING <xml column>
- COLUMNS <new column name> <column type> PATH ‘<XPath-expression>’
- …
-)

Пример(XPath + ORACLE)

- Выборка всех имен и фамилий из xml-документа Employees :

```
SELECT t.id, x.*
    FROM employees t,
        XMLTABLE ('/Employees/Employee'
                PASSING t.data
                COLUMNS firstname VARCHAR2(30) PATH 'firstname',
                                lastname VARCHAR2(30) PATH 'lastname') x
  WHERE t.id = 1;
```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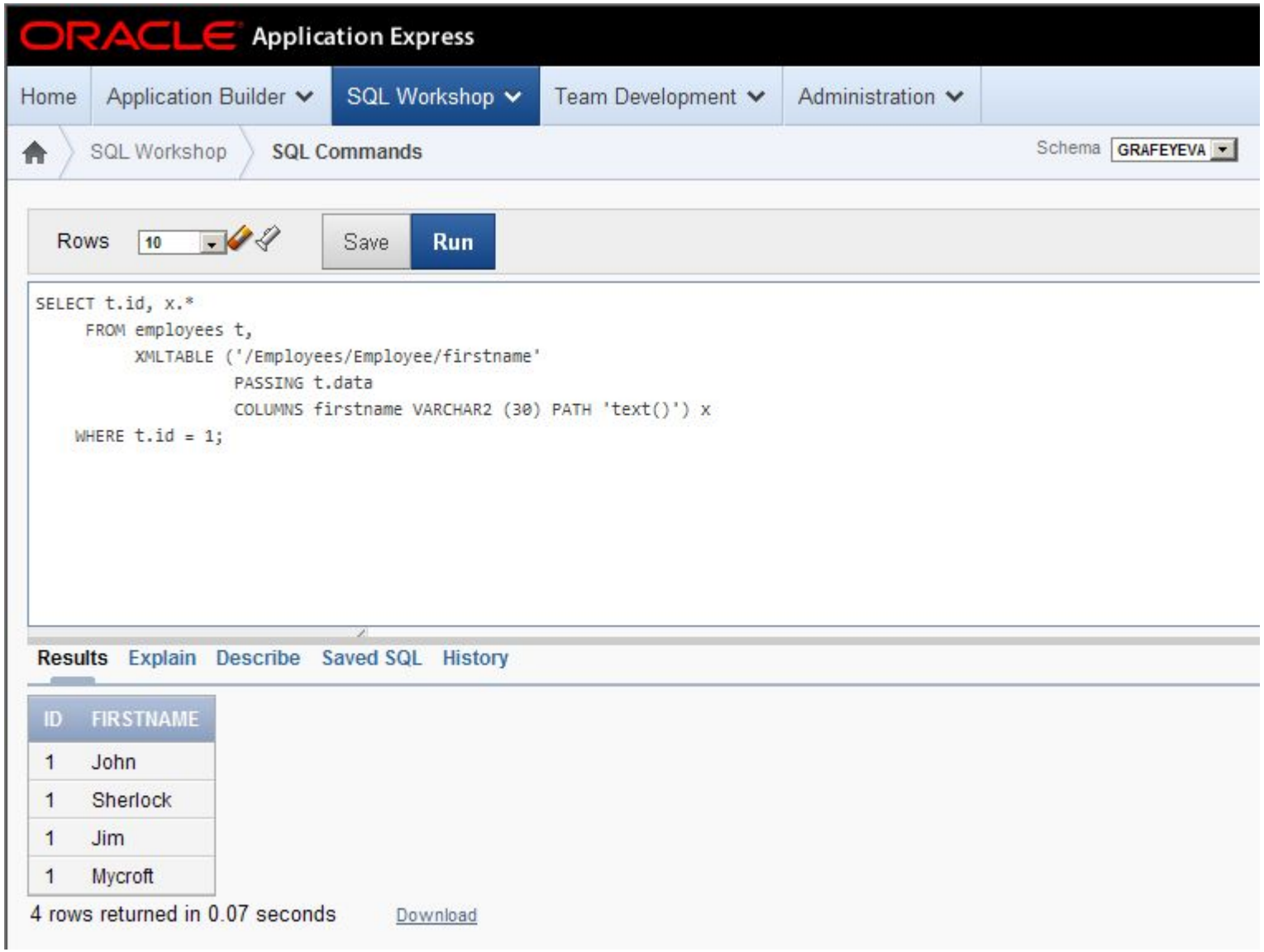
Team Development
Administration
SQL Workshop
SQL Commands
Schema GRAFEYEVA
Rows 10
Save
Run
SELECT t.id, x.*
FROM employees t,
XMLTABLE ('/Employees/Employee'
PASSING t.data
COLUMNS firstname VARCHAR2(30) PATH 'firstname',
lastname VARCHAR2(30) PATH 'lastname') x
WHERE t.id = 1;
Results
Explain
Describe
Saved SQL
History
ID FIRSTNAME LASTNAME
1 John Watson
1 Sherlock Homes
1 Jim Moriarty
1 Mycroft Holmes
4 rows returned in 0.09 seconds
Download

Пример(XPath + ORACLE)

- Выборка имен всех сотрудников:

```
SELECT t.id, x.*
    FROM employees t,
        XMLTABLE ('/Employees/Employee/firstname'
                PASSING t.data
                COLUMNS firstname VARCHAR2 (30) PATH 'text()') x
   WHERE t.id = 1;
```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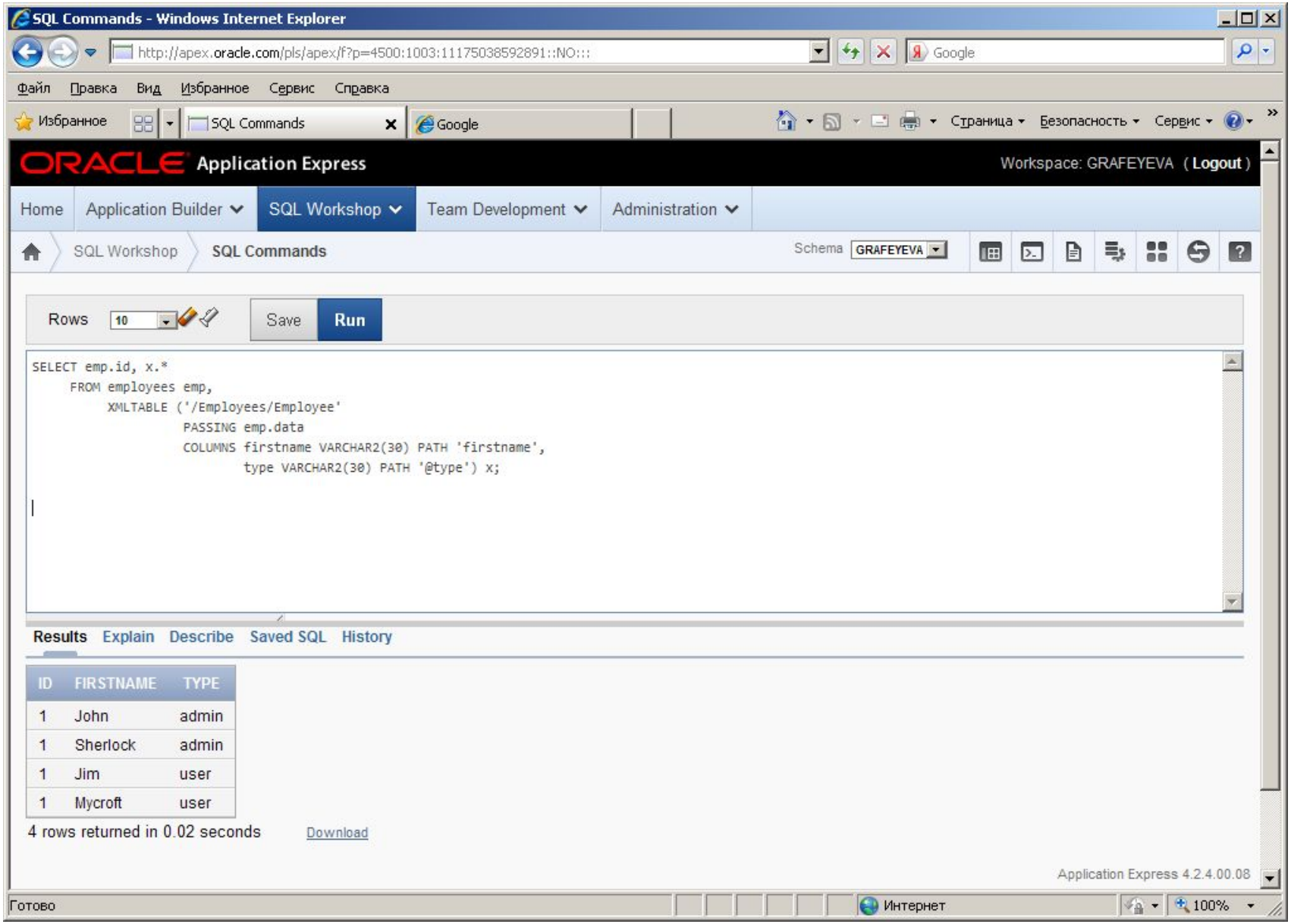
SQL Commands
Schema GRAFEYEVA
Rows 10
Save
Run
SELECT t.id, x.*
FROM employees t,
XMLTABLE ('/Employees/Employee/firstname'
PASSING t.data
COLUMNS firstname VARCHAR2 (30) PATH 'text()') x
WHERE t.id = 1;
Results
Explain
Describe
Saved SQL
History
ID FIRSTNAME
1 John
1 Sherlock
1 Jim
1 Mycroft
4 rows returned in 0.07 seconds
Download

Пример(XPath + ORACLE)

- Имена и категории сотрудников:

```
SELECT emp.id, x.*
    FROM employees emp,
        XMLTABLE ('/Employees/Employee'
                PASSING emp.data
                COLUMNS firstname VARCHAR2(30) PATH 'firstname',
                                type VARCHAR2(30) PATH '@type') x;
```


SQL Commands - Windows Internet Explorer
http://apex.oracle.com/pls/apex/f?p=4500:1003:11175038592891::NO:::
Google
Файл Правка Вид Избранное Сервис Справка
Избранное
SQL Commands
Google
Страница Безопасность Сервис
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Workspace: GRAFEYEVA (Logout)
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Team Development
Administration
SQL Workshop
SQL Commands
Schema GRAFEYEVA
Rows 10
Save
Run
SELECT emp.id, x.*
FROM employees emp,
XMLTABLE ('/Employees/Employee'
PASSING emp.data
COLUMNS firstname VARCHAR2(30) PATH 'firstname',
type VARCHAR2(30) PATH '@type') x;
Results
Explain
Describe
Saved SQL
History
ID FIRSTNAME TYPE
1 John admin
1 Sherlock admin
1 Jim user
1 Mycroft user
4 rows returned in 0.02 seconds
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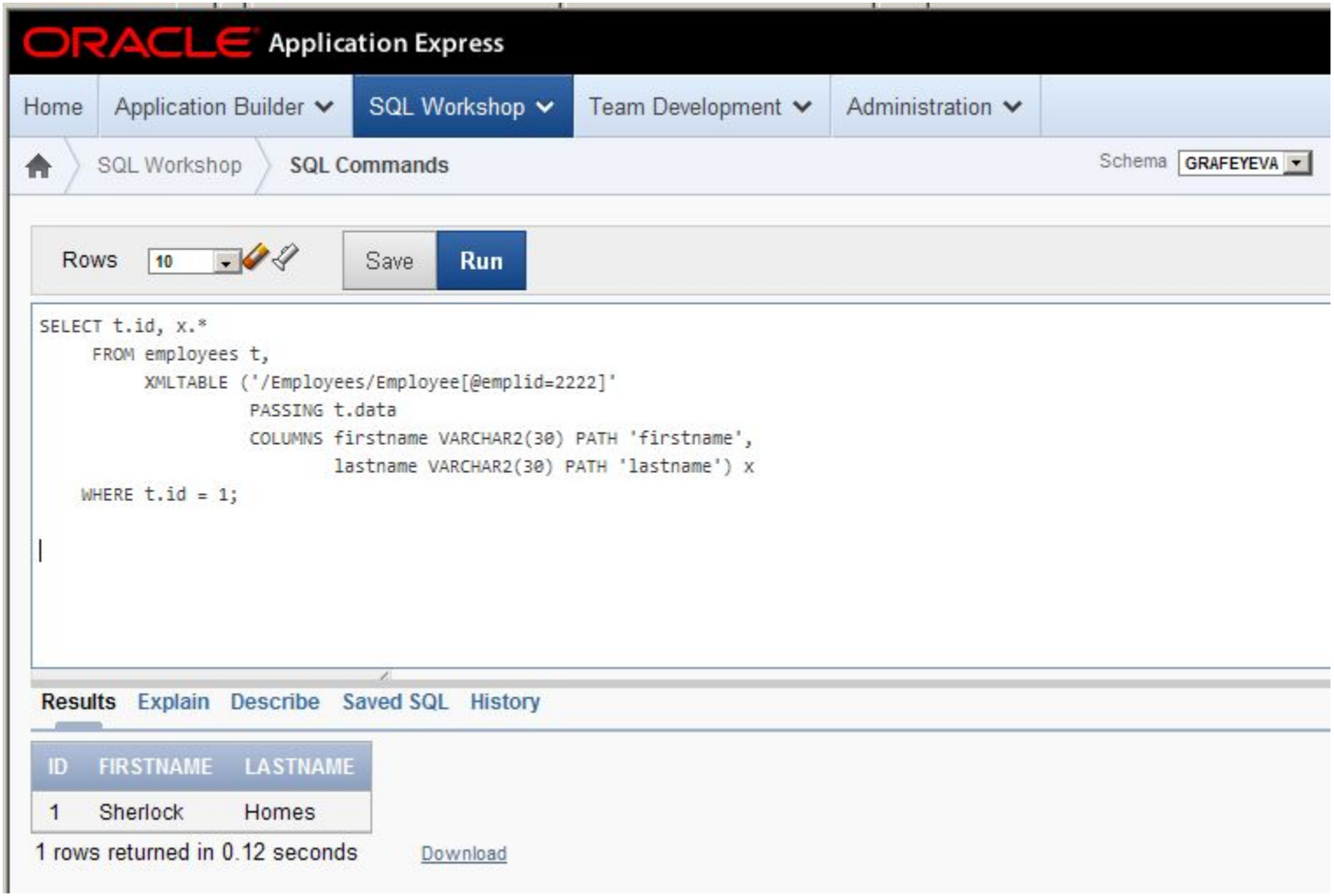
Application Express 4.2.4.00.08
Готово
Интернет
100%

Пример

- Фамилия и имя сотрудника с номером 2222:

```
SELECT t.id, x.*
    FROM employees t,
        XMLTABLE ('/Employees/Employee[@emplid=2222]'
                PASSING t.data
                COLUMNS firstname VARCHAR2(30) PATH 'firstname',
                        lastname VARCHAR2(30) PATH 'lastname') x
   WHERE t.id = 1;
```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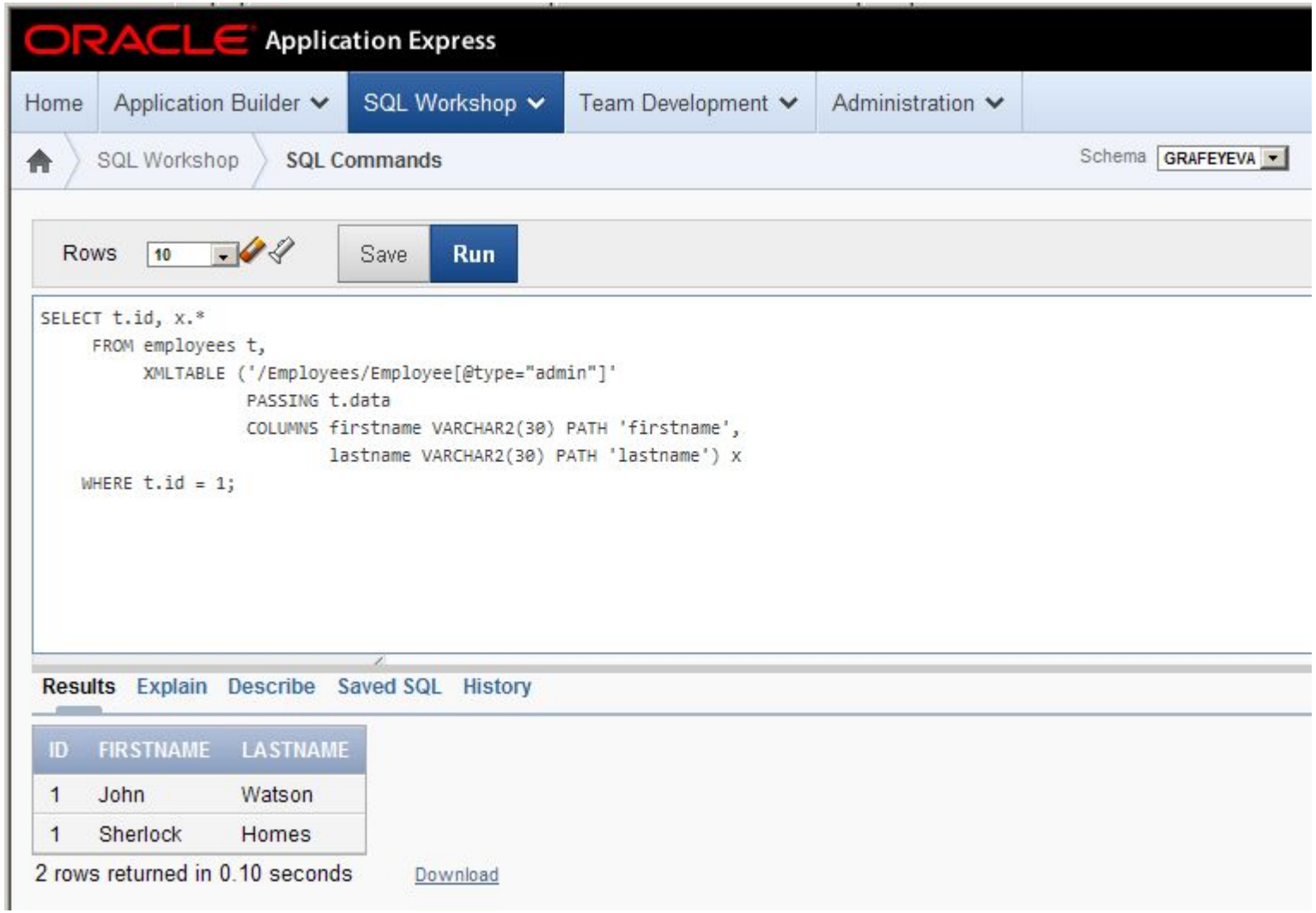
SQL Commands
Schema GRAFEYEVA
Rows 10
Save
Run
SELECT t.id, x.*
FROM employees t,
XMLTABLE ('/Employees/Employee[@emplid=2222]'
PASSING t.data
COLUMNS firstname VARCHAR2(30) PATH 'firstname',
lastname VARCHAR2(30) PATH 'lastname') x
WHERE t.id = 1;
Results
Explain
Describe
Saved SQL
History
ID
FIRSTNAME
LASTNAME
1
Sherlock
Homes
1 rows returned in 0.12 seconds
Download

Пример

- Фамилии и имена администраторов:

```
SELECT t.id, x.*
    FROM employees t,
        XMLTABLE ('/Employees/Employee[@type="admin"]'
                PASSING t.data
                COLUMNS firstname VARCHAR2(30) PATH 'firstname',
                        lastname VARCHAR2(30) PATH 'lastname') x
    WHERE t.id = 1;
```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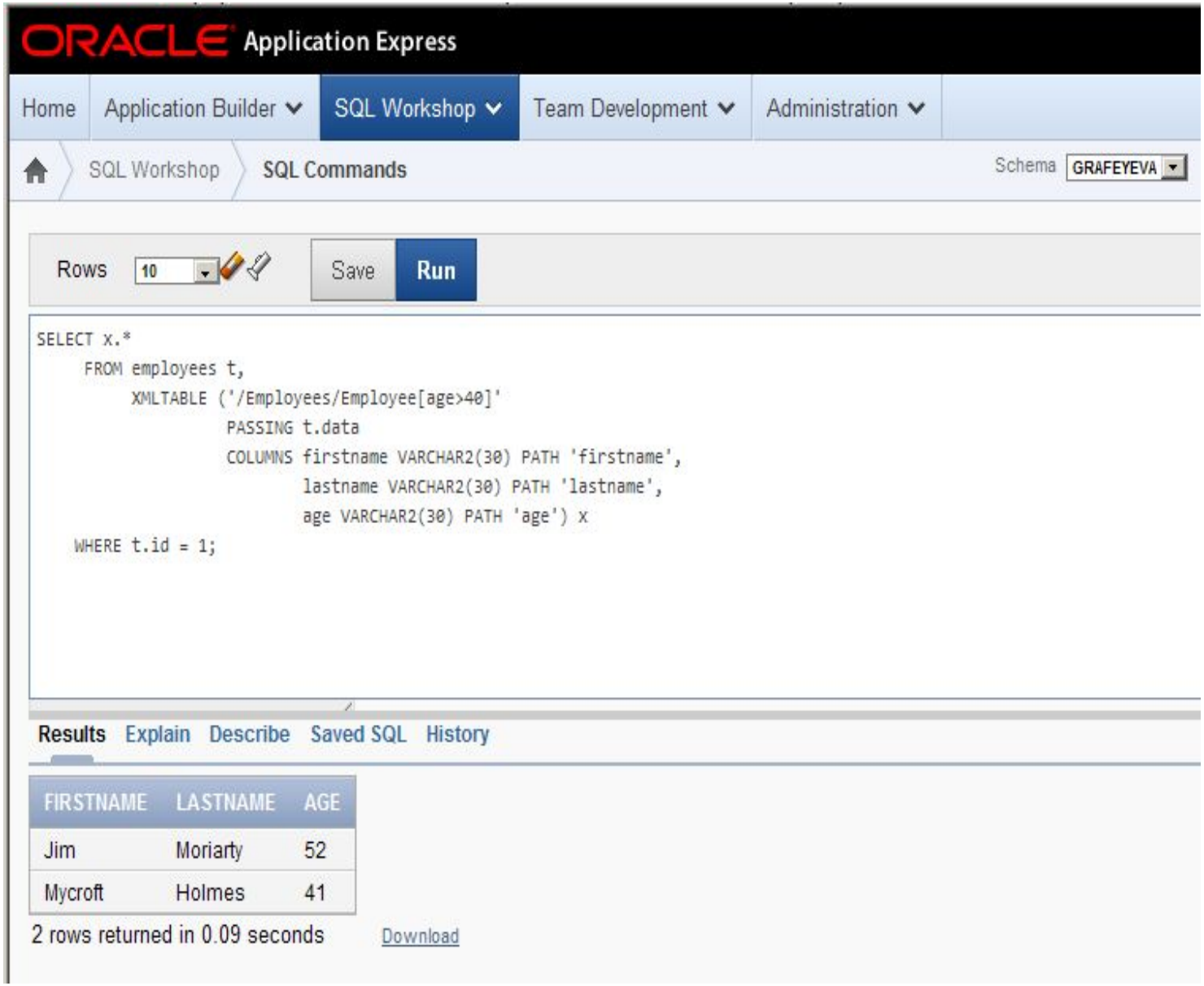
SQL Commands
Schema GRAFEYEVA
Rows 10
Save
Run
SELECT t.id, x.*
FROM employees t,
XMLTABLE ('/Employees/Employee[@type="admin"]'
PASSING t.data
COLUMNS firstname VARCHAR2(30) PATH 'firstname',
lastname VARCHAR2(30) PATH 'lastname') x
WHERE t.id = 1;
Results
Explain
Describe
Saved SQL
History
ID FIRSTNAME LASTNAME
1 John Watson
1 Sherlock Homes
2 rows returned in 0.10 seconds
Download

Пример

- Фамилии и имена сотрудников старше 40 лет:

```
SELECT x.*
    FROM employees t,
        XMLTABLE ('/Employees/Employee[age>40]'
                PASSING t.data
                COLUMNS firstname VARCHAR2(30) PATH 'firstname',
                    lastname VARCHAR2(30) PATH 'lastname',
                    age VARCHAR2(30) PATH 'age') x
    WHERE t.id = 1;
```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Schema GRAFEYEVA
Rows 10
Save
Run
SELECT x.*
FROM employees t,
XMLTABLE ('/Employees/Employee[age>40]'
PASSING t.data
COLUMNS firstname VARCHAR2(30) PATH 'firstname',
lastname VARCHAR2(30) PATH 'lastname',
age VARCHAR2(30) PATH 'age') x
WHERE t.id = 1;
Results
Explain
Describe
Saved SQL
History
FIRSTNAME LASTNAME AGE
Jim Moriarty 52
Mycroft Holmes 41
2 rows returned in 0.09 seconds
Download

Полезные ссылки

- http://www.w3schools.com/xml
- http://www.w3schools.com/xpath