XPath is a major element in the XSLT standard.

XPath can be used to navigate through elements and attributes in an XML document.

* XPath stands for XML Path Language
* XPath uses "path like" syntax to identify and navigate nodes in an XML document
* XPath contains over 200 built-in functions
* XPath is a major element in the XSLT standard
* XPath is a W3C recommendation

## XPath Standard Functions

XPath includes over 200 built-in functions.

There are functions for string values, numeric values, booleans, date and time comparison, node manipulation, sequence manipulation, and much more.

Today XPath expressions can also be used in JavaScript, Java, , PHP, Python, C and C++, C# ,and lots of other languages.

# **XPath Nodes**

## XPath Terminology

### **Nodes**

In XPath, there are seven kinds of nodes: element, attribute, text, namespace, processing-instruction, comment, and document nodes.

XML documents are treated as trees of nodes. The topmost element of the tree is called the root element.

Look at the following XML document:

<?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>

### **Atomic values**

Atomic values are nodes with no children or parent.

Example of atomic values:

J K. Rowling

"en"

### **Items**

Items are atomic values or nodes.

## Relationship of Nodes

### **Parent**

Each element and attribute has one parent.

In the following example; the book element is the parent of the title, author, year, and price:

<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

### **Children**

Element nodes may have zero, one or more children.

In the following example; the title, author, year, and price elements are all children of the book element:

<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

### **Siblings**

Nodes that have the same parent.

In the following example; the title, author, year, and price elements are all siblings:

book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

### **Ancestors**

A node's parent, parent's parent, etc.

In the following example; the ancestors of the title element are the book element and the bookstore element:

<bookstore>

<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

</bookstore>

### **Descendants**

A node's children, children's children, etc.

In the following example; descendants of the bookstore element are the book, title, author, year, and price elements:

<bookstore>

<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

</bookstore>

|  |  |
| --- | --- |
| /catalog | selects the root element |
| /catalog/cd | selects all the cd elements of the catalog element |
| /catalog/cd/price | selects all the price elements of all the cd elements of the catalog element |
| /catalog/cd[price>10.0] | selects all the cd elements with price greater than 10.0 |
| starts with a slash(/) | represents an absolute path to an element |
| starts with two slashes(//) | selects all elements that satisfy the criteria |
| //cd | selects all cd elements in the document |
| /catalog/cd/title | /catalog/cd/artist | selects all the title and artist elements of the cd elements of catalog |
| //title | //artist | selects all the title and artist elements in the document |
| /catalog/cd/\* | selects all the child elements of all cd elements of the catalog element |
| /catalog/\*/price | selects all the price elements that are grandchildren of catalog |
| /\*/\*/price | selects all price elements which have two ancestors |
| //\* | selects all elements in the document |
| /catalog/cd[1] | selects the first cd child of catalog |
| /catalog/cd[last()] | selects the last cd child of catalog |
| /catalog/cd[price] | selects all the cd elements that have price |
| /catalog/cd[price=10.90] | selects cd elements with the price of 10.90 |
| /catalog/cd[price=10.90]/price | selects all price elements with the price of 10.90 |
| //@country | selects all "country" attributes |
| //cd[@country] | selects cd elements which have a "country" attribute |
| //cd[@\*] | selects cd elements which have any attribute |
| //cd[@country='UK'] | selects cd elements with "country" attribute equal to 'UK' |

<?xml version="1.0"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">

<xs:element name="note">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="to" type="xs:string"/>
      <xs:element name="from" type="xs:string"/>
      <xs:element name="heading" type="xs:string"/>
      <xs:element name="body" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>

xs:**string**.

* xs:**decimal**.
* xs:integer.
* xs:**boolean**.
* xs:date.
* xs:time.

<note>

<to>Tove</to>

<from>Jani</from>

<heading>Reminder</heading>

<body>Don't forget me this weekend!</body>

</note>

## DTD File

The following example is a DTD file called "note.dtd" that defines the elements of the XML document above ("note.xml"):

<!ELEMENT note (to, from, heading, body)>
<!ELEMENT to (#PCDATA)>
<!ELEMENT from (#PCDATA)>
<!ELEMENT heading (#PCDATA)>
<!ELEMENT body (#PCDATA)>

<?xml version="1.0" encode=”UNI-16”?>

<CATALOG>

<CD>

<TITLE>Empire Burlesque</TITLE>

<ARTIST>Bob Dylan</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>Columbia</COMPANY>

<PRICE>10.90</PRICE>

<YEAR>1985</YEAR>

</CD>

<CD>

<TITLE>Hide your heart</TITLE>

<ARTIST>Bonnie Tyler</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>CBS Records</COMPANY>

<PRICE>9.90</PRICE>

<YEAR>1988</YEAR>

</CD>

<CD>

<TITLE>Greatest Hits</TITLE>

<ARTIST>Dolly Parton</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>RCA</COMPANY>

<PRICE>9.90</PRICE>

<YEAR>1982</YEAR>

</CD>

<CD>

<TITLE>Still got the blues</TITLE>

<ARTIST>Gary Moore</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Virgin records</COMPANY>

<PRICE>10.20</PRICE>

<YEAR>1990</YEAR>

</CD>

<CD>

<TITLE>Eros</TITLE>

<ARTIST>Eros Ramazzotti</ARTIST>

<COUNTRY>EU</COUNTRY>

<COMPANY>BMG</COMPANY>

<PRICE>9.90</PRICE>

<YEAR>1997</YEAR>

</CD>

<CD>

<TITLE>One night only</TITLE>

<ARTIST>Bee Gees</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Polydor</COMPANY>

<PRICE>10.90</PRICE>

<YEAR>1998</YEAR>

</CD>

<CD>

<TITLE>Sylvias Mother</TITLE>

<ARTIST>Dr.Hook</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>CBS</COMPANY>

<PRICE>8.10</PRICE>

<YEAR>1973</YEAR>

</CD>

<CD>

<TITLE>Maggie May</TITLE>

<ARTIST>Rod Stewart</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Pickwick</COMPANY>

<PRICE>8.50</PRICE>

<YEAR>1990</YEAR>

</CD>

<CD>

<TITLE>Romanza</TITLE>

<ARTIST>Andrea Bocelli</ARTIST>

<COUNTRY>EU</COUNTRY>

<COMPANY>Polydor</COMPANY>

<PRICE>10.80</PRICE>

<YEAR>1996</YEAR>

</CD>

<CD>

<TITLE>When a man loves a woman</TITLE>

<ARTIST>Percy Sledge</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>Atlantic</COMPANY>

<PRICE>8.70</PRICE>

<YEAR>1987</YEAR>

</CD>

<CD>

<TITLE>Black angel</TITLE>

<ARTIST>Savage Rose</ARTIST>

<COUNTRY>EU</COUNTRY>

<COMPANY>Mega</COMPANY>

<PRICE>10.90</PRICE>

<YEAR>1995</YEAR>

</CD>

<CD>

<TITLE>1999 Grammy Nominees</TITLE>

<ARTIST>Many</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>Grammy</COMPANY>

<PRICE>10.20</PRICE>

<YEAR>1999</YEAR>

</CD>

<CD>

<TITLE>For the good times</TITLE>

<ARTIST>Kenny Rogers</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Mucik Master</COMPANY>

<PRICE>8.70</PRICE>

<YEAR>1995</YEAR>

</CD>

<CD>

<TITLE>Big Willie style</TITLE>

<ARTIST>Will Smith</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>Columbia</COMPANY>

<PRICE>9.90</PRICE>

<YEAR>1997</YEAR>

</CD>

<CD>

<TITLE>Tupelo Honey</TITLE>

<ARTIST>Van Morrison</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Polydor</COMPANY>

<PRICE>8.20</PRICE>

<YEAR>1971</YEAR>

</CD>

<CD>

<TITLE>Soulsville</TITLE>

<ARTIST>Jorn Hoel</ARTIST>

<COUNTRY>Norway</COUNTRY>

<COMPANY>WEA</COMPANY>

<PRICE>7.90</PRICE>

<YEAR>1996</YEAR>

</CD>

<CD>

<TITLE>The very best of</TITLE>

<ARTIST>Cat Stevens</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Island</COMPANY>

<PRICE>8.90</PRICE>

<YEAR>1990</YEAR>

</CD>

<CD>

<TITLE>Stop</TITLE>

<ARTIST>Sam Brown</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>A and M</COMPANY>

<PRICE>8.90</PRICE>

<YEAR>1988</YEAR>

</CD>

<CD>

<TITLE>Bridge of Spies</TITLE>

<ARTIST>T'Pau</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Siren</COMPANY>

<PRICE>7.90</PRICE>

<YEAR>1987</YEAR>

</CD>

<CD>

<TITLE>Private Dancer</TITLE>

<ARTIST>Tina Turner</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>Capitol</COMPANY>

<PRICE>8.90</PRICE>

<YEAR>1983</YEAR>

</CD>

<CD>

<TITLE>Midt om natten</TITLE>

<ARTIST>Kim Larsen</ARTIST>

<COUNTRY>EU</COUNTRY>

<COMPANY>Medley</COMPANY>

<PRICE>7.80</PRICE>

<YEAR>1983</YEAR>

</CD>

<CD>

<TITLE>Pavarotti Gala Concert</TITLE>

<ARTIST>Luciano Pavarotti</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>DECCA</COMPANY>

<PRICE>9.90</PRICE>

<YEAR>1991</YEAR>

</CD>

<CD>

<TITLE>The dock of the bay</TITLE>

<ARTIST>Otis Redding</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>Atlantic</COMPANY>

<PRICE>7.90</PRICE>

<YEAR>1987</YEAR>

</CD>

<CD>

<TITLE>Picture book</TITLE>

<ARTIST>Simply Red</ARTIST>

<COUNTRY>EU</COUNTRY>

<COMPANY>Elektra</COMPANY>

<PRICE>7.20</PRICE>

<YEAR>1985</YEAR>

</CD>

<CD>

<TITLE>Red</TITLE>

<ARTIST>The Communards</ARTIST>

<COUNTRY>UK</COUNTRY>

<COMPANY>London</COMPANY>

<PRICE>7.80</PRICE>

<YEAR>1987</YEAR>

</CD>

<CD>

<TITLE>Unchain my heart</TITLE>

<ARTIST>Joe Cocker</ARTIST>

<COUNTRY>USA</COUNTRY>

<COMPANY>EMI</COMPANY>

<PRICE>8.20</PRICE>

<YEAR>1987</YEAR>

</CD>

</CATALOG>