Xquery 3.1
Json

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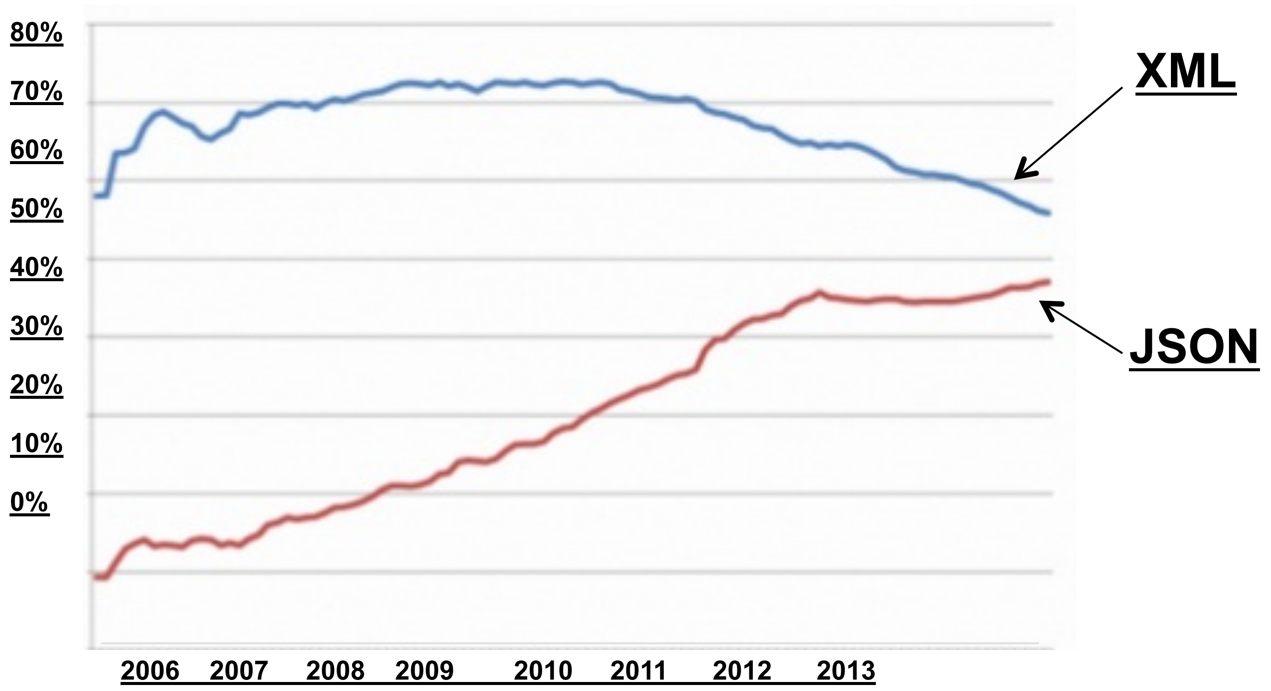
Contents

- JSON
  - XML vs. JSON
- Xquery 3.1
  - New in the data model: **map** and **array**
  - New functions: ***json-doc()*** and ***parse-json()***

    https://www.w3.org/TR/xpath-functions-31/

Trends in XML and JSON usage



Based on directory of 11,000 web APIs listed at Programmable Web, December 2013

JSON: JavaScript Object Notation

- A lightweight data-interchange format
  - Easy for humans to read and write
  - Easy for machines to parse and generate

```
<Book>
   <Title>Parsing Techniques</Title>
   <Authors>
      <Author>Dick Grune</Author>
      <Author>Ceriel J.H. Jacobs</
Author>
   </Authors>
   <Date>2007</Date>
   <Publisher>Springer</Publisher>
</Book>
```

```
{
  "Book":
    {
      "Title": "Parsing Techniques",
      "Authors":
               [ "Dick Grune",
                 "Ceriel J.H. Jacobs" ],
      "Date": "2007",
      "Publisher": "Springer"
    }
}
```

XML to JSON

- Threre are web converters

  http://www.freeformatter.com/xml-to-json-converter.html

```
<Book id="MCD">
    <Title>Modern Compiler Design</Title>
    <Author>Dick Grune</Author>
    <Publisher>Springer</Publisher>
</Book>
```

```
{
   "@id": "MCD",
   "Title": "Modern Compiler Design",
   "Author": "Dick Grune",
   "Publisher": "Springer"
}
```

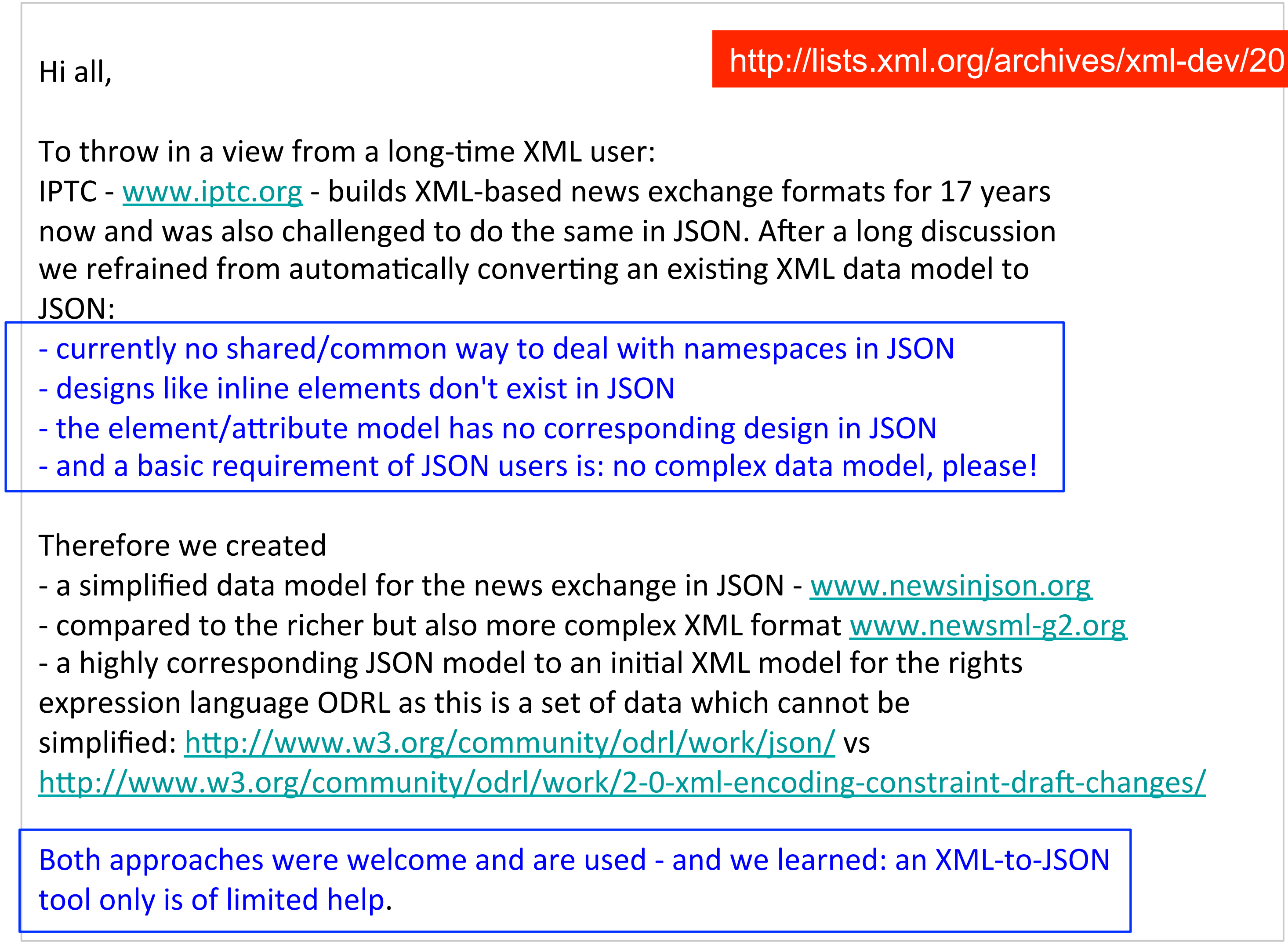
- But …

XML to JSON

- No attributes in JSON
- No namespaces in JSON
  - JSON is a reaction against the complexity of XML and namespaces is one of the biggest culprits, in terms of complexity
- No equivalent of XSLT in JSON
  - JSON people believe that text documents should be processed by a general purpose language such as Java or JavaScript, not a domain-specific language such as XSLT

XML to JSON

http://lists.xml.org/archives/xml-dev/201412/msg00022.html



Hi all,

To throw in a view from a long-time XML user:
IPTC - www.iptc.org - builds XML-based news exchange formats for 17 years now and was also challenged to do the same in JSON. After a long discussion we refrained from automatically converting an existing XML data model to JSON:

- currently no shared/common way to deal with namespaces in JSON
- designs like inline elements don't exist in JSON
- the element/attribute model has no corresponding design in JSON
- and a basic requirement of JSON users is: no complex data model, please!

Therefore we created
- a simplified data model for the news exchange in JSON - www.newsinjson.org
- compared to the richer but also more complex XML format www.newsml-g2.org
- a highly corresponding JSON model to an initial XML model for the rights expression language ODRL as this is a set of data which cannot be simplified: http://www.w3.org/community/odrl/work/json/ vs
http://www.w3.org/community/odrl/work/2-0-xml-encoding-constraint-draft-changes/

Both approaches were welcome and are used - and we learned: an XML-to-JSON tool only is of limited help.

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XML vs. JSON

- **JSON** is the best tool for sharing data
  - Data is stored in arrays and records
    - XML stores data in trees (DOM)
  - Data transfers are much easier when the data is stored in a structure that is familiar to object-oriented languages
  - This makes it very easy to import data from a JSON file into Perl, Ruby, Javascript or Python

XML vs. JSON

- **XML** is the right tool for sharing documents
  - It holds any data type and can be used to transport full documents with formatting information included
    - XML is best used when transporting something like a patient chart or text document with markup included
  - XML's strength is extensibility and the avoidance of namespace clashes

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  - New functions: ***json-doc()*** and ***parse-json()***

https://www.w3.org/TR/xpath-functions-31/

XQuery 3.1

- Support for **consuming** JSON data
- Support for maps and arrays in the Data model
  - Allowing for a more natural representation of JSON data in XQuery expressions

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XQuery 3.1. Installation steps

- Oxygen XML Editor: **18.1**
- **Saxon 9.7 XSLT and XQuery Transformer**
  - Install the add-on for **Saxon-EE 9.7 (External)**. Go to menu > Help > "Install new add-ons", pick the "default" update site (https://www.oxygenxml.com/InstData/Addons/default/updateSite.xml) and install **Saxon 9.7 XSLT and XQuery Transformer**.
  - Restart Oxygen
    - Note: Debugging XSLT/XQuery transformations based on this engine is NOT supported.
- **XQuery Transformation**
  - After restarting Oxygen, edit the transformation scenario (or create a new one) and select from the Transformer combo **Saxon-EE XQuery 9.7.0.x (External)**. Press the **"Advanced options"** button (cogwheel), and select your Saxon configuration file. Associate the scenario with the XQuery file

```
<?xml version="1.0"?>
<configuration edition="EE" xmlns="http://saxon.sf.net/ns/configuration">
    <xquery version="3.1"/>
</configuration>
```

config.xml file

Data model: map

- It is a collection of key/value pairs
  - Within a map, each key is unique and the order of the entries has no particular significance
- Can be constructed by
  - a map constructor : **map**{ }
  - a built-in function
  - parsing a JSON
- Namespace with built-in functions for querying and manipulating

  http://www.w3.org/2005/xpath-functions/map

Data model: map. Examples

```
xquery version "3.1";
declare namespace
          output = "http://www.w3.org/2010/xslt-xquery-serialization";
declare option output:method "json";
map {
     "ACC": "Accounting",
     "SAL": "Sales",
     "MAR": "Marketing"
}
```

```
map {
     "ACC": map {
                   "name": "Accounting",
                   "code": 300 },
     "SAL": map {
                   "name": "Sales",
                   "code": 310 },
     "MAR": map {
                   "name": "Marketing",
                   "code": 320 }
}
```

Data model: map. Query

```
xquery version "3.1";
declare namespace
                output = "http://www.w3.org/2010/xslt-xquery-serialization";
declare namespace map = "http://www.w3.org/2005/xpath-functions/map";
declare option output:method "json";
let $deptnames := map {
                "ACC": “Accounting",
                “SAL": “Sales",
                “MAR": "Marketing"
                }
return
  map {
    "dept1" : map:get($deptnames, "ACC"),
    "dept2" : $deptnames(“SAL"),
    “dept3” : $deptnames?(“MAR”)
  }
```

$deptnames?MAR

Result

```
{
    "dept1“ :  “Accounting",
    "dept2“ :  “Sales“,
    “dept3” :   “Marketing”
}
```

?: “lookup” operator
Multiple keys can be provided

Data model: map. **for-each()**

```
xquery version "3.1";
declare namespace
          output = "http://www.w3.org/2010/xslt-xquery-serialization";
declare namespace map = "http://www.w3.org/2005/xpath-functions/map";
declare option output:method "text";
let $deptnames :=
          map { "ACC": "Accounting", "SAL": "Sales", "MAR": "Marketing" }
let $func := function($k, $v) {concat('Key: ', $k, ', value: ', $v)}
return
          map:for-each($deptnames, $func)
```

iterates over all the entries in a map, and each entry has two components (key, value)
It returns a **sequence**

must be a function that accepts two arguments

Result

```
Key: ACC, value: Accountin
Key: MAR, value: Marketinc
Key: SAL, value: Sales
```

Functions that operate on maps

- **map:size**: returns the number of entries in a map. For example, map:size($deptnames) returns the integer 3.
- **map:contains**: tests whether a map contains an entry with a particular key. For example, map:contains($deptnames, "ACC") returns true, and map:contains($deptnames, "FOO") returns false.
- **map:keys**: returns a sequence of all the keys in the map, in no particular order. For example, map:keys($deptnames) returns the sequence of three strings ("ACC", “SAL", “MAR").

https://www.w3.org/TR/xpath-functions-31/

Data model: array

- It is an ordered list of values
  - The values are called members,
    - They can be retrieved based on their position number
- Can be constructed by
  - an array constructor : array{ } or [ ]
  - a built-in function
  - parsing a JSON
- Namespace with built-in functions for querying and manipulating

http://www.w3.org/2005/xpath-functions/array

Data model: array. Examples

```
xquery version "3.1";
let $arrayone := [1, 32, "a", "7"]
return
      $arrayone(3)
```

Result

```
a
```

```
xquery version "3.1";
let $arraytwo := array{ 1, "a", 34, 43 }
return
   <item>
     <c>{$arrayfour(3)}</c>
     <c>{$arrayfour(4)}</c>
   </item>
```

Result

```
<item>
    <c>34</c>
    <c>43</c>
</item>
```

[1, (32, 19)] ➡

1	32, 19

array { 1, (32, 19) } ➡

1	32	19

Data model: array. Query

```
declare namespace
          array = "http://www.w3.org/2005/xpath-functions/array";
let $arrayints := [10, 20, 30, 40, 50]
let $nestedarray := [10, [20, 30, 40], 50]
return
<item>
   <int>{array:get($arrayints, 2)}</int>
   <int>{$arrayints(3)}</int>
   <int>{$nestedarray(2)(3)}</int>
   <int>{$arrayints?(2)}</int>
   <int>{$arrayints?(2, 3, 4)}</int>
   <int>{$arrayints?*}</int>
</item>
```

Retrieves a sequence containing every member in the array

Result

```
<item>
   <int>20</int>
   <int>30</int>
   <int>40</int>
   <int>20</int>
   <int>20 30 40</int>
   <int>10 20 30 40 50</int>
</item>
```

Data model: array. Query

```
declare namespace
            output = "http://www.w3.org/2010/xslt-xquery-serialization";
declare option output:method "json";
let $arrayints := [10, 20, 30, 40, 50]
return
     $arrayints
```

Array of integer values

Result

```
[
  10,
  20,
  30,
  40,
  50
]
```

Retrieves a sequence containing every member in the array

```
let $arrayints := [10, 20, 30, 40, 50]
let $sequenceints := $arrayints?*
return
     $sequenceints
```

ERROR: JSON output method cannot handle a sequence of more than one item

Data model: array. **for-each()**

```
declare namespace
          output = "http://www.w3.org/2010/xslt-xquery-serialization";
declare namespace array= "http://www.w3.org/2005/xpath-functions/array";
declare option output:method "text";
let $arrayints := [10, 20, 30, 40, 50]
let $func := function($v) { $v*2 }
return
   <item>
          { array:for-each($arrayints, $func) }
   </item>
```

iterates over all the entries in an array, and each entry has one value.
It returns a **sequence**

must be a function that accepts one argument

Result

```
<item>
     20 40 60 80 100
</item>
```

Functions that operate on arrays

- **array:size**: Returns the number of members in an array. For example, array:size([10, 20, 30]) returns the integer 3.
- **array:head**: Returns the first member of an array. For example, array:head([10, 20, 30]) returns the integer 10.
- **array:append**: Adds one member to the end of the array. For example, array:append([10, 20, 30], 40) returns the array [10, 20, 30, 40].
- **array:filter**: Applies a function to each member in an array and returns an array containing those members for which the function returns true. For example, array:filter([10, 20, 30], function($n) {$n > 15}) returns [20, 30] because those are the members of [10, 20, 30] that are greater than 15.
- **array:flatten**: Turns arrays into sequences of items, recursively flattening any arrays that are within arrays. For example, array:flatten([["a", "b", "c"], ["d", "e", "f"]]) returns a sequence of six strings: "a", "b", "c", "d", "e", "f".
- **array:join**: Merges the members in multiple arrays into a single array, retaining the order. For example, array:join(([10, 20, 30], ["a", "b", "c"])) returns an array with six members: [10, 20, 30, "a", "b", "c"].

https://www.w3.org/TR/xpath-functions-31/

Consuming JSON: *json-doc()*

- It parses an external resource containing JSON and typically returns a map or array

```
xquery version "3.1";
declare namespace
          output = "http://www.w3.org/2010/xslt-xquery-serialization";
declare option output:method "json";
let $var := json-doc('product.json')
return $var
```

Result:

```
{
 "number“ :  557,
 "name“ :  "Fleece Pullover",
 "colorChoices“ :   [
                 "navy",
                 "black"
  ],
 "other“ :  null,
 "is-current“ :  true
}
```

The content of **product.json**

Consuming JSON: ***parse-json()***

- It parses a string supplied in JSON format and typically returns a map or array

```
xquery version "3.1";                                          a map
let $var := parse-json( ' { "name": “john" ,
                              "age": 52 ,
                              "department": "accounting" } ' )
return  <name> { $var?name } </name>
```

Result

```
<name>john</name>
```

Consuming JSON: ***parse-json()***

a map containing a nested map

```
let $var := parse-json( ' { "employee":
                                   {  "name": “john" ,
                                      "age": 52,
                                      "department": "accounting"
                                   }
                              } ' )
return <name> { $var?employee?name } </name>
```

Result

```
<name>john</name>
```