JSON in OGC standards - opportunities and challenges

Clemens Portele
OGC Interoperability Day, March 2015, Barcelona
Why is JSON relevant?

“When it comes to the data APIs serve up, XML is still the most used format, but JSON is hot on its heels and growing much faster. Even though there are still more XML APIs, the more recent the API, the more likely it’s serving JSON. In many cases … companies are rapidly moving from XML to JSON.”

Scott Gilbertson, 2011
Why is JSON relevant?

ProgrammableWeb, 2013
Why is JSON relevant?

“Early in the rise of JSON, it seemed the format was popular simply because it was easier to parse in a browser. More recently, the focus has been on XML's greater complexity and larger payload. ‘JSON more efficient over carrier mobile networks and less memory intensive to process on mobile and embedded devices,’ tweeted Simon Prickett.”

Adam DuVander, 2012
Why is JSON relevant?

“So these days, if you want to interchange tuples or tables of tuples or numbers and strings, you have JSON. If you want to do nontrivial publishing automation, use XML. If you want to interchange smart bitmaps of page images, there’s PDF. I personally think we’re probably done with inventing low-level textual interchange formats.”

Tim Bray, 2013
http://www.tbray.org/ongoing/When/201x/2013/02/10/XML-at-15
Why is JSON relevant?

“Choose wisely. There are good reasons for using JSON, and there are still good reasons for using XML. … XML’s strength is extensibility and the avoidance of namespace clashes. … JSON is purposefully limited and therefore much lighter than XML. I suspect that, most of the time, data can be modelled with hashes and lists comprising simple data types, making JSON the preferred route.”

“The biggest reason that JSON is now being used over XML is that JSON is inherently more efficient.”

Sean Lindo, 2013
Is there anything that needs to be done to support JSON in OGC standards?

From OGC Web Feature Service version 1.1

Example GetFeature:

<table>
<thead>
<tr>
<th>Client</th>
<th>Web Feature Server (WFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFS Request</td>
<td>Opaque Feature Store</td>
</tr>
<tr>
<td></td>
<td>WFS Response</td>
</tr>
</tbody>
</table>

Returns GML, but using the outputFormat parameter it can also return JSON, e.g. GeoJSON.
Is there anything that needs to be done to support JSON in OGC standards? Yes!

- Most OGC implementation standards are firmly based on
  - XML
  - RPC (Remote-Procedure-Call) patterns

- Over the years OGC and others have built a rich library of XML implementations for many concepts related to geographic information
OGC Web Services typically based on sending and receiving XML messages/documents

How to address?
Define JSON representations for messages/documents?

Concerns:
- A lot of work!
- A one-to-one translation of documents may not be appropriate
- Web developers expect RESTful APIs

From OGC Web Feature Service version 1.1
Capabilities documents

- The entry point to all OGC web services
- Rich description of what this OGC web service offers
- Needs to be understood by a client to correctly construct the next messages in the interaction with the service

Concerns:
- Monolithic, very heavy
- Hard to use for non-OGC-experts as it is not obvious how to construct the next messages – not very web-friendly
Schema documents

- XML Schema (or Schematron, Relax-NG)
- Schema validation is essential for XML as used by OGC

- JSON usually not described by schemas
- Work on JSON Schema exists, but not much used and standardization of the draft is not progressing
- More useful for describing the JSON objects than for validation
XML Path expressions

- In many places in OGC standards use XPath to reference specific elements in an XML document
- Example: Queries

- XPath will likely be ambiguous in a JSON context
- Need to translate path expressions to something that is understood by JSON developers
- No equivalent to XPath in JSON
Linking

- Linking between resources a key concept in many OGC standards
- Usually using XLink

- Until recently no built-in support for links in JSON
- New standard: JSON-LD
- Promising approach that preserves the simplicity of JSON
Exceptions

- Exception messages are sent using XML
- Consistent JSON encoding of exceptions needed
## Support for Resources

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>XML</th>
<th>JSON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>GML and GML application schemas</td>
<td>GeoJSON or GeoServices JSON, but restricted to simpler structures Only draft rules for application schemas in JSON exist</td>
</tr>
<tr>
<td>Geometry</td>
<td>GML</td>
<td>GeoJSON or GeoServices JSON, but limited to Simple Features geometries</td>
</tr>
<tr>
<td>Styling</td>
<td>SLD/SE</td>
<td>GeoServices JSON, but restricted to simpler requirements</td>
</tr>
<tr>
<td>Metadata</td>
<td>ISO 19139 XML</td>
<td>?</td>
</tr>
<tr>
<td>...</td>
<td>Many XML grammars for geographic resources</td>
<td>Partly GeoServices JSON, but typically restricted to simpler requirements</td>
</tr>
</tbody>
</table>
Automated mapping between XML and JSON and vice versa?

Challenges:

- Different concepts
  - Linking: JSON-LD vs XLink
  - Schema: JSON Schema (?) vs XML Schema / Relax NG
  - Path expressions: ? vs XPath
  - Namespaces not a concept in JSON, but central in XML used by OGC; maybe JSON-LD contexts can be leveraged

- Pre-existing JSON encodings like GeoJSON
- Which conversion rule between XML and JSON to pick: there are several
- JSON derived from XML often feels wrong
The best way to support JSON in OGC?

- Properly JSON-enable existing OGC web service standards or to develop new RESTful APIs?
- Both options are a significant task
- Investigated in the OGC Testbed 11 by Joan Maso
The best way to support JSON in OGC?

My take:

- Separate standards would probably be better
- Service interfaces should be RESTful, closely linked to the OGC strategy on this topic
- Adopt existing practices that work over developing things from scratch
- Consistency with abstract specifications of OGC/ISO required
- Informed by XML-based standards, but avoid legacy and XML artefacts
- Start simple and extend what works
Questions?

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