Johnzon - Apache’s Upcoming JSON Library

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About the Apache Incubator

"The Incubator project is the entry path into The Apache Software Foundation (ASF) for projects and codebases wishing to become part of the Foundation's efforts." (http://incubator.apache.org/)

The Apache Incubator has two primary goals:

- Ensure all donations are in accordance with the ASF legal standards
- Develop new communities that adhere to our guiding principles

What is Johnzon?

- Lightweight JSON library written in Java
- Core < 90k, 200k for the whole library
- No external dependencies
- Implementation of JSR-353
- Apache 2 License

NOTE JEE, Java SE

What is Johnzon? (cont.)

- Contains also modules which are not defined in JSR-353
  - Object mapper
  - JAX-RS provider
  - Websocket (JSR-356) integration (beta)
  - JSON DSL for mutating documents comfortably (beta)

Status of the project

- Small but engaged, responsive and friendly community
- Stable and production ready

- Performance for Johnzon core is quite well
- Currently incubating within the Apache Incubator
    - and looking for new community members
    - low entrance barrier
- Plan is to graduate soon (start this year)

Roadmap

- Implement JSR-367 (API for JSON Binding/JSON-B)
- Implement JSR-374 (Update of JSR-353)
- Performance enhancements
- Increase test coverage
- JEE certification (once TCK available)

Current users of Johnzon

- Apache TomEE 2
- Apache Tamaya
- Apache Decanter

JSR

The spec part

What is a JSR

- JSR → Java Specification Request
- A formal standardization process
- Community involved
- Controlled by Oracle within the Java community process (JCP)

JSR-353 Basics

- Can be used standalone or within a JEE container
- Provides a streaming API as well as a "Tree Model" API for parsing
- Generator API for generating valid JSON streams

Streaming API

- Pull parser, parse JSON files of any size
- Encoding autodetection

```
JsonParser parser = Json.createParser(new FileReader("file.json"));
while(parser.hasNext() {
    Event event = parser.next();
    if(event == Event.VALUE_STRING) {
    System.out.println(parser.getString());
    }
}
```

Encoding autodetection

- RFC 4627 Chapter 3
- "JSON text SHALL be encoded in Unicode"
- First two character are always ASCII
- So we can use this matrix to detect encoding:

```
00 00 00 xx  UTF-32BE
00 xx 00 xx  UTF-16BE
xx 00 00 00  UTF-32LE
xx 00 xx 00  UTF-16LE
xx xx xx xx  UTF-8
```

(Johnzon does also handle octet-streams with BOM’s correctly)

"Tree Model" API

- Parse JSON to immutable object tree
- Caution: All in-memory

```
JsonReader reader = Json.createReader(new StringReader("[]"));
JsonArray array = reader.readArray();
System.out.println(array.isEmpty());
System.out.println(array.get(0));
jsonReader.close();
```

Generator API

- Write JSON "value by value" into a byte/char stream

```
Writer writer = ...;
JsonGenerator generator = Json.createGenerator(writer);
generator
     .writeStartObject()
         .write("firstName", "Mister")
         .write("lastName", "Spock")
         .write("age", 99)
         .writeStartObject("address")
             .write("streetAddress", "Kolinahr Street 1")
             .write("city", "Vulcan City")
             .write("state", "VU")
             .write("postalCode", "1701")
         .writeEnd()
     .writeEnd();
generator.close();
```

Writer API

- Write the "Tree Model" back into a byte/char stream

```
Outputstream out = ...;
JsonObject jo = ...;
JsonWriter jsonWriter = Json.createWriter(out);
jsonWriter.writeObject(jo);
jsonWriter.close();
```

Configuration

- Key-Value based
- Implementation dependent
- Via factories

```
final JsonReader reader = Json.createReaderFactory(new HashMap<String, Object>() {
            put("org.apache.johnzon.supports-comments", true);
        }).createReader(...);
JsonParser generator = Json.createGeneratorFactory();
JsonGenerator generator = Json.createGeneratorFactory();
```

Johnzon

in particular

Johnzon non JSR-353 Features

- Comments (single line/multiline)
- Configurable buffer sizes
- Different buffer reuse strategies
  - QUEUE - char[] are reused by ConcurrentLinkedQueue (default)
  - BY_INSTANCE - char[] are not reused
  - SINGLETON - char[] are reused by only one global char[]
  - THREAD_LOCAL - char[] are reused by thread (every thread does have its char[] buffer bound to a thread local)

The "Mapper"

- JSON←→Java Binding
- Used by JAX RS provider/Websocket module
- Supports
  - Custom de-/serializers
  - Proper handling of collections and generics
  - @JohnzonConverter and @JohnzonIgnore annotations
  - Works with fields, getter/setter or both
  - Configurable null/empty handling
  - Configurable byte[] handling

The "Mapper" (cont.)

```
final static Mapper mapper = new MapperBuilder().build();
MyObject myObj = ...;
mapper.writeObject(myObj, outputStream);
MyObject myObj2 = mapper.readObject(inputStream, MyObject.class);
```

(Yet some missing default datatypes for Java SE 8 like java.time.*)

The "Mapper" (cont.)

- Works mostly hassle free
- Will be aligned with JSON-B Spec (JSR-367)
- Need some performance tuning

JAX-RS Provider

```
<Service id="johnzon"
         class-name="org.apache.johnzon.jaxrs.ConfigurableJohnzonProvider">
    ignores = com.foo.MyType,com.foo.MyOtherType
    accessMode = method
    supportHiddenAccess = true
    doCloseOnStreams = false
    version = 2
    skipNull = true
    skipEmptyArray = true
</Service>
```

Websockets

- Since Johnzon 0.8 there is a Websocket/JSR-356 integration
- JSON as payload format for WebSocket messages
- https://rmannibucau.wordpress.com/2015/03/24/json-and-websocket-johnzon-to-the-rescue/

Websockets (cont.)

Server

```
@ServerEndpoint(value = "/server", encoders = JohnzonTextEncoder.class,
                                   decoders = JohnzonTextDecoder.class)
public class MyServerEndpoint {
    // same as before
}
```

Client

```
public class MessageDecoder extends JohnzonTextDecoder {
    public MessageDecoder() {
        super(Message.class);
    }
}
// and used like:
@ClientEndpoint(encoders = JohnzonTextEncoder.class, decoders = MessageDecoder.class)
public class ClientEndpointImpl {
    // ...
}
```

Johnzon DSL

- Upcoming with Johnzon 2
- Mutable and navigable JSON Structure
- Fluent API

Johnzon DSL (cont.)

- Looks like:

```
JsonObject jo = ...;
MutableJsonStructure ms = MutableJsonStructureFactory.toMutableJsonStructure(jo);
assertNotSame(ms, ms.copy());
assertFalse(ms.isLeaf("address"));
assertFalse(ms.isLeafNull("firstName"));
assertTrue(ms.exists("phoneNumber"));
assertEquals(1, ms.get("phoneNumber").get(1).getAncestor().getIndex());
assertNull(ms.getParent());
assertEquals("Smith", ms.getLeafAsString("lastName"));
assertEquals("NY", ms.get("address").getLeafAsString("state"));
assertEquals(5, ms.getKeys().size());
assertEquals(5, ms.size());
assertEquals(4, ms.get("address").size());
ms.add("additionalAddress", ms.get("address").copy().remove("city").set("state",
"CA"));
ms.set(ms.copy().remove("phoneNumber"));
assertEquals(5, ms.size());
JsonObject modJo = (JsonObject) ms.toJsonStructure();
```

Benchmark

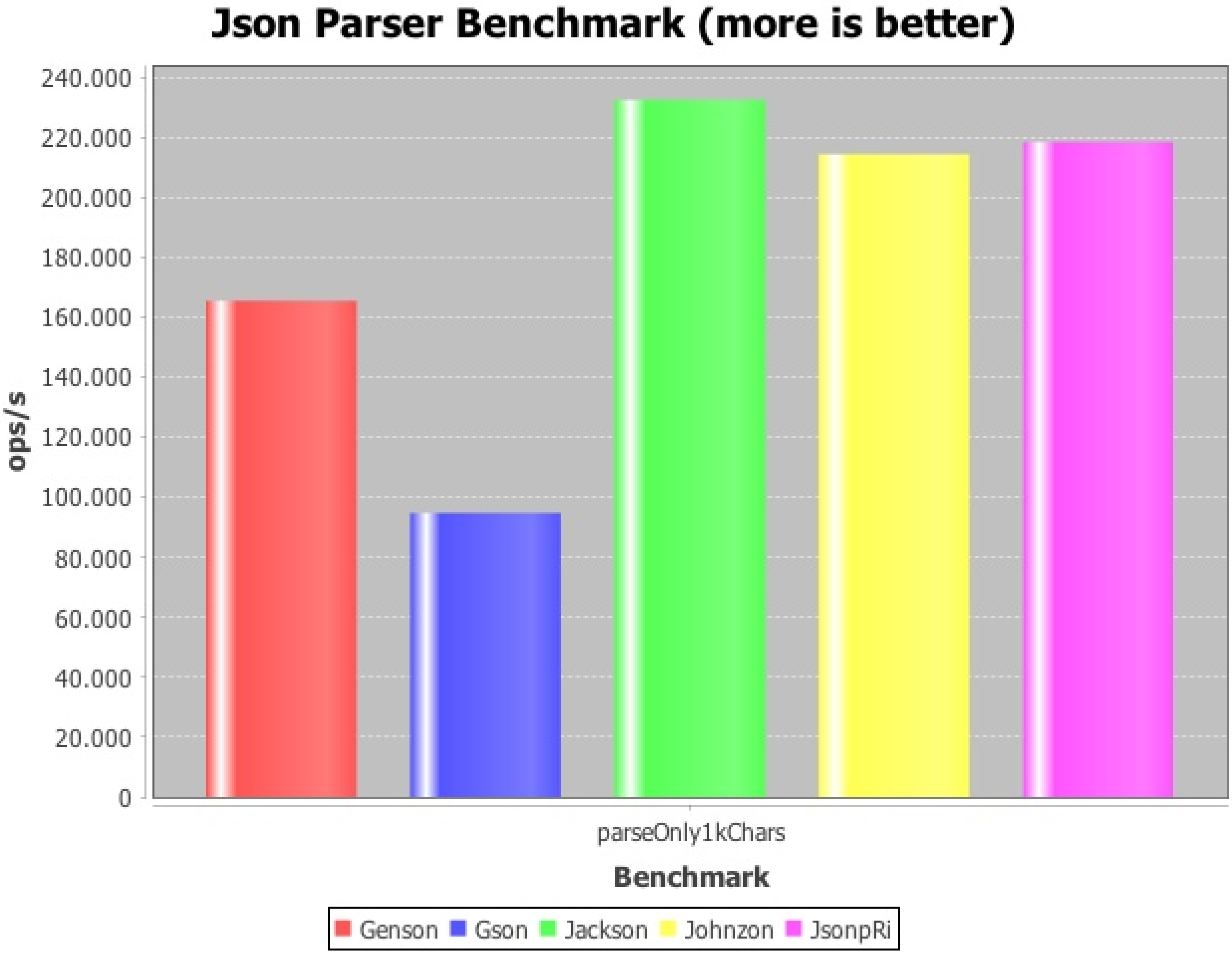
- JMH based benchmark suite
- Bytes, Chars (UTF-8/UTF-16)

- Measurements
  - Parse Only
  - Read to "Tree Model"
  - Generate JSON
  - Serialize
  - Deserialize

NOTE Not included within Apache Scope because of JMH licensing issue

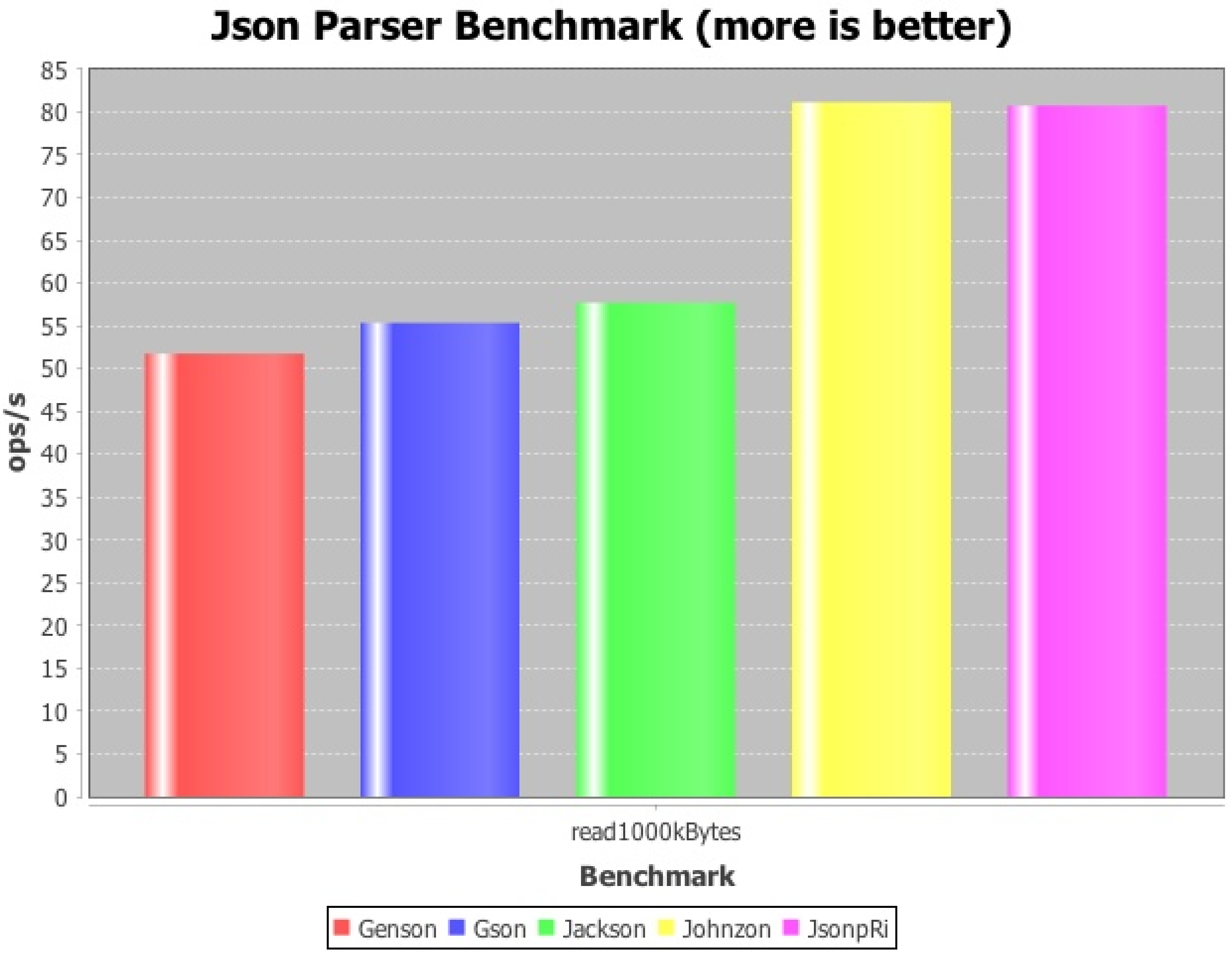
Benchmark (cont.)

- Small size JSON



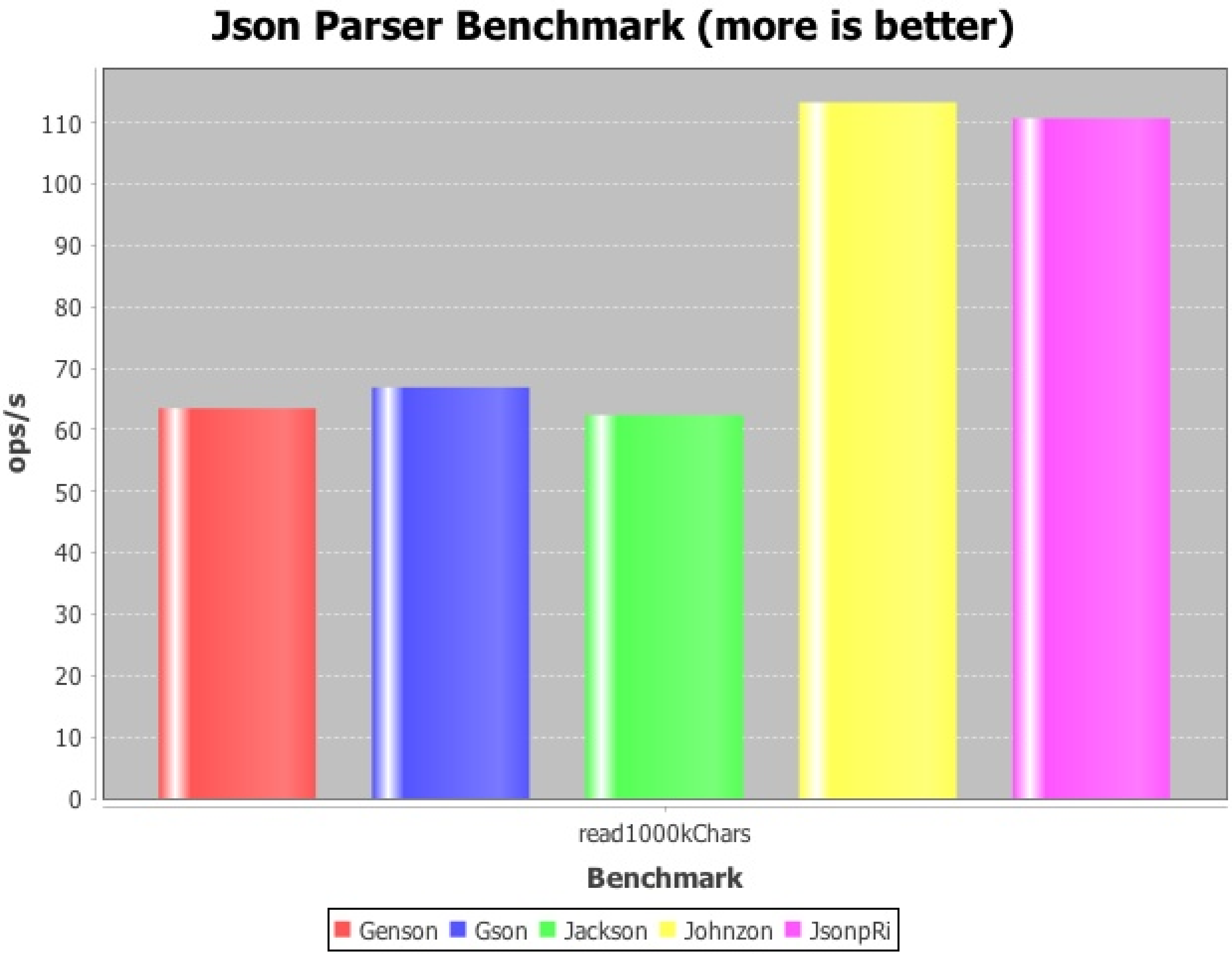
Benchmark (cont.)

- Medium size JSON (byte stream)



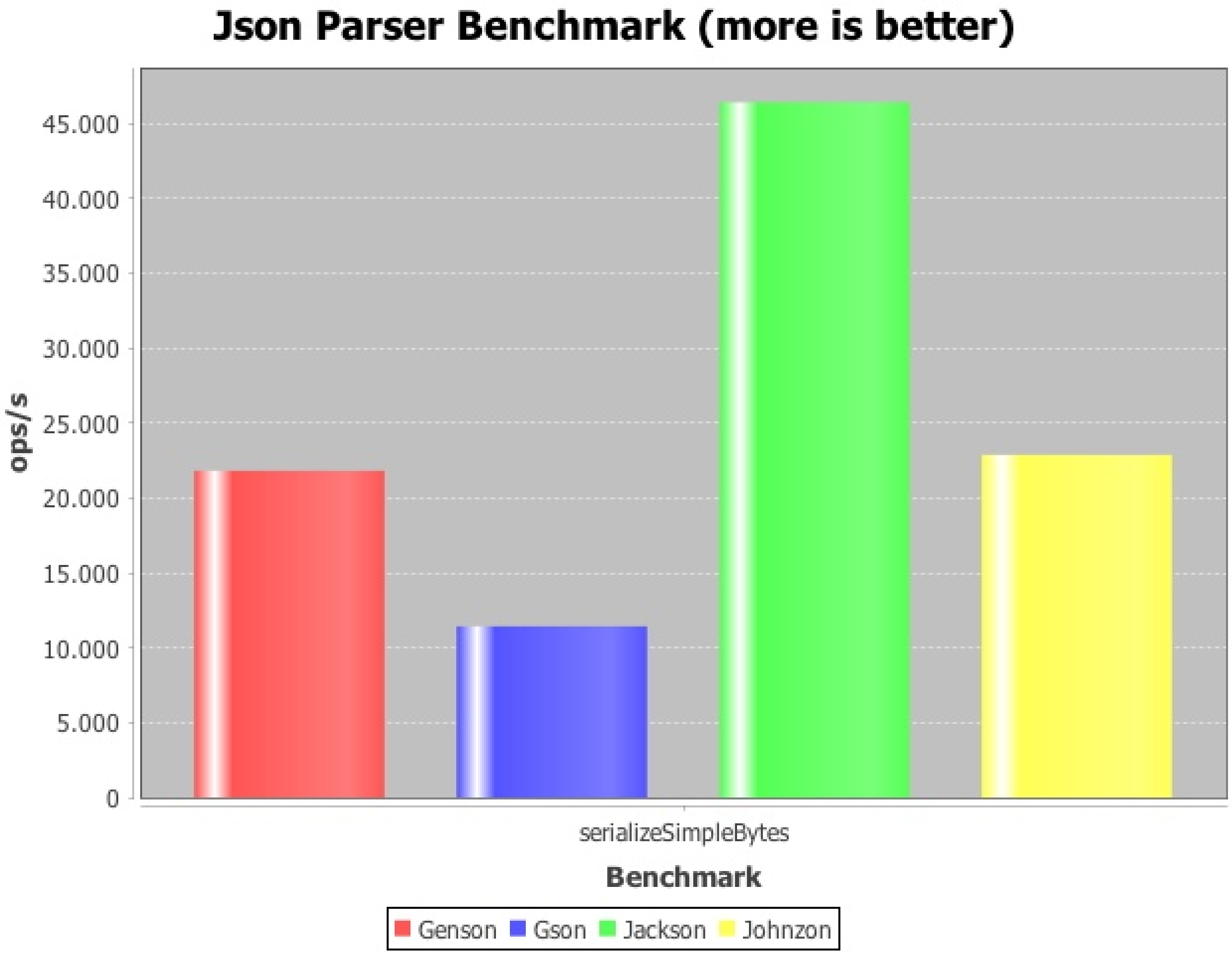
Benchmark (cont.)

- Medium size JSON (character stream)



Benchmark (cont.)

- Serialize simple Java Object



Testcoverage

- Approx. 74% testcoverage yet
- We want to get above 90%
- https://coveralls.io/github/salyh/incubator-johnzon

Upcoming

The new JSON JSR Specs

JSR-374 (JSON-P 1.1)

- RFC 7159 (update of RFC 4627)
- Java SE 8
- Json Pointer (RFC 6901)
- Json Patch (RFC 6902)
- Json Merge Patch (RFC 7396)
- Mutable "Tree Model"
- Currently EDR (Early draft review)

JSR-367 (JSON-B 1.0)

- Java standard for JSON<→Java Binding
- Java SE 8
- Integrates with JSR-353/374
- Currently EDR (Early draft review)

JSR-367 (JSON-B 1.0) (cont.)

```
Jsonb jsonb = JsonbBuilder.create();
Book book = jsonb.fromJson(new File("jsonfile.json"), Book.class);
```

Getting started

and involved

Get it

from maven central

```
<dependency>
  <groupId>org.apache.johnzon</groupId>
  <artifactId>johnzon-core</artifactId>
  <version>0.9.1-incubating</version>
</dependency>

<dependency>
  <groupId>org.apache.geronimo.specs</groupId>
  <artifactId>geronimo-json_1.0_spec</artifactId>
  <version>1.0-alpha-1</version>
  <scope>provided</scope> <!-- or compile if your environment doesn't provide it -->
</dependency>
```

or download from http://www.eu.apache.org/dist/incubator/johnzon/

Where to go from here

- http://incubator.apache.org/projects/johnzon.html
- Subscribe to the dev mailing list
- https://github.com/salyh/jsr353-benchmark

- https://github.com/apache/incubator-johnzon/tree/jsr374_367
- https://www.jcp.org/en/jsr/detail?id=353
- https://www.jcp.org/en/jsr/detail?id=374
- https://www.jcp.org/en/jsr/detail?id=367

Consider to join the project if you are

- a (Java) developer looking to get involved within ASF
- interested in implementing standards
- doing JSON the whole day
- looking for a great community to engage with

Github

- https://github.com/apache/incubator-johnzon
- We accept Pull Requests

Thank you!

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