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JSR 353: Java API for JSON Processing

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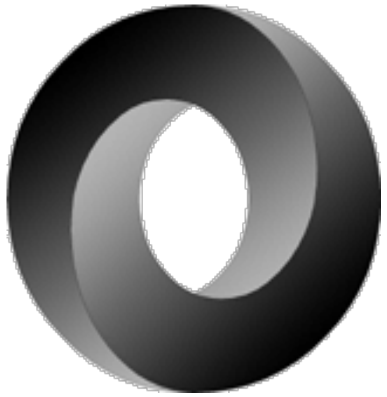
Program Agenda

- Overview
- JAX-RS usecase
- JSR 353
- API
- Demo

Overview

JSON



- JSON is a light-weight data exchange format
  - Minimal, textual and a subset of JavaScript
  - Easy for humans/machines to read and write
  - For e.g.:

```
{"name":"Bob", "age":20, "phone":["276 1234", "123 4567"]}
```

  - Used heavily in RESTful web services, configuration, databases, browser/server communication

Overview

JSON

- JSON is used by popular web sites in their RESTful web services
  - Facebook, Twitter, Amazon, …
  - Twitter Streaming API discontinues XML

Overview

JSON Usages: Amazon CloudSearch

http://search-domainname-domainid.us-east-1.cloudsearch.amazonaws.com/2011-02-01/search?q=star+wars

```
{
    "rank":"-text_relevance",
    "match-expr":"(label 'star wars')",
    "hits":{
        "found":7,
        "start":0,
        "hit":[
            {"id":"tt0086190"},
            {"id":"tt0120915"},
            {"id":"tt0121766"}, …]
    },
    …
}
```

Source: http://docs.amazonwebservices.com/cloudsearch/latest/developerguide/searching.html

Overview

JSON usages: Twitter Search

```
http://search.twitter.com/search.json?q=JSON

{
    "created_at":"Thu, 06 Sep 2012 21:45:04 +0000",
    "from_user":"loggly”,
    "metadata":{"result_type":"recent"},
    "text":"Good news if you log JSON.  (And another reason to
   switch to JSON if you haven't already.) http:\/\/t.co\/
   9Dz2JP41",
    …
}
```

Source: https://dev.twitter.com/docs/using-search

JAX-RS

XML Usage

- JAX-RS applications handle XML using JAXP API

```
@Produces("application/xml")
public Source getBook(String id) {
    return new StreamSource(…);
}
```

JAX-RS

XML Usage

- JAX-RS applications handle XML using JAXB API

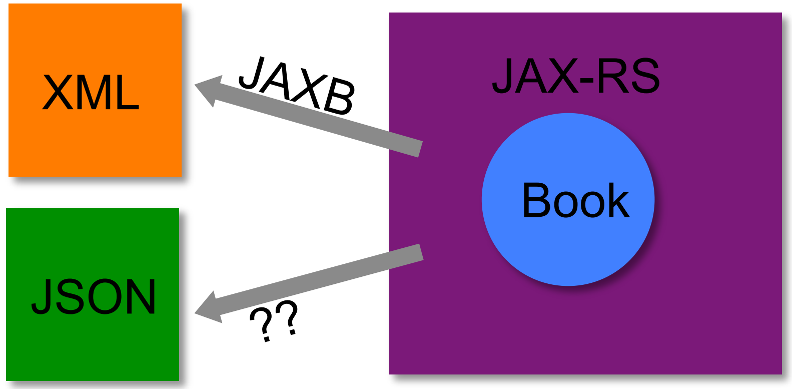
```
@Produces("application/xml")
public Book getBook(String id) {
    return new Book(…);
}
```

JAX-RS

DataBinding

- JAX-RS content negotiation

```
@Produces({"application/xml", "application/json"})
public Book getBook(String id) {
    return new Book(…);
}
```



JAX-RS

Java Implementations for JSON

json-taglib

org.json

Jackson

json-simple

mjson

fastjson

jsonij

jjson

Argo

org.json.me

json-io

Json-lib

Stringtree

XStream

Jettison

SOJO

JsonMarshaller

Flexjson

google-gson

Json-smart

JAX-RS

JSON Solutions & Limitations

- A custom MessageBodyWriter that converts to JSON
  - JSONObject (For e.g. json.org's API) → JSON
  - POJO/JAXB → XML → JSON (For e.g. using jettison)
  - POJO/JAXB → JSON (For e.g. using jackson, eclipseLink etc.)
- No standard API
- Some solutions have technical limitations
- Applications/Frameworks need to bundle the libraries

Standard API

Advantages

- Application can use standard types
- Leaner, portable applications

Standard API

Contents

- Parsing/Processing JSON
  - Similar to JAXP
- Data binding : JSON text <-> Java Objects
  - Similar to JAXB
- Two JSRs:
  - Processing/Parsing, Binding

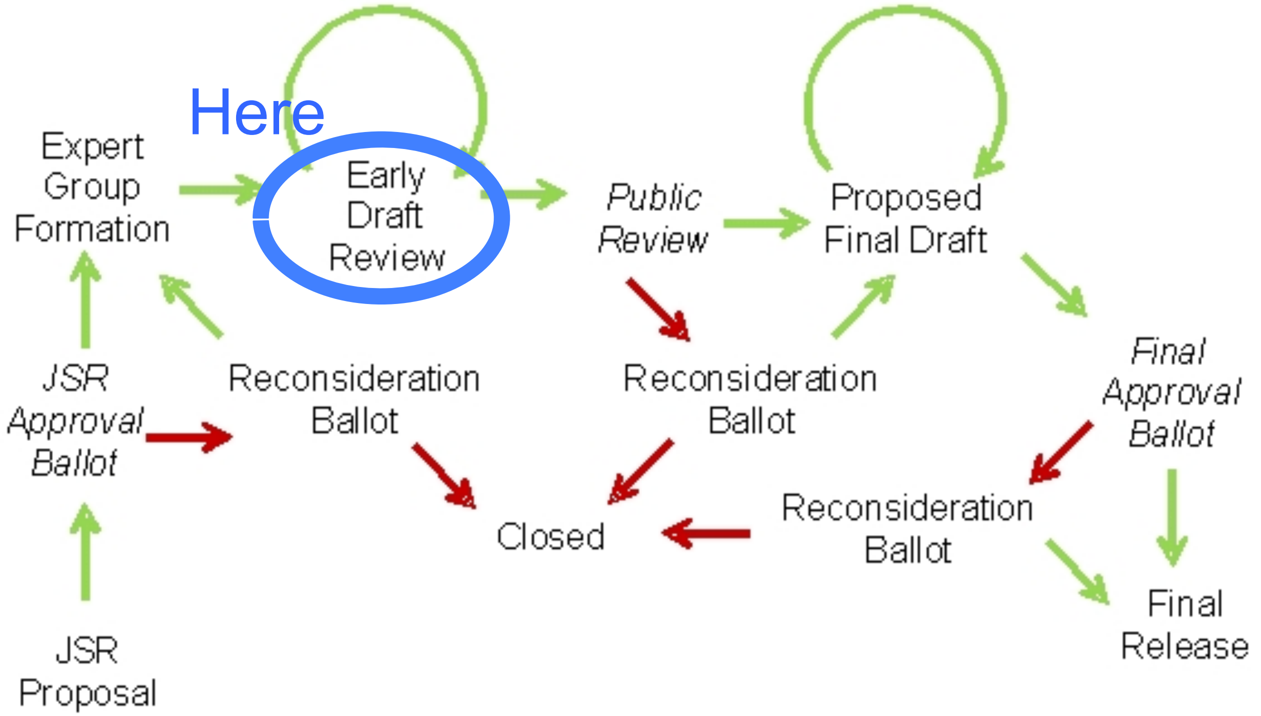
Java API for Processing JSON

JSR-353

- Streaming API to produce/consume JSON
  - Similar to StAX API in XML world
- Object model API to represent JSON
  - Similar to DOM API in XML world
- EG
  - Oracle, RedHat, Twitter
  - 3 individual members
  - And, user community !

JSR 353:Java API for Processing JSON

Status



Source: http://blogs.oracle.com/darcy/entry/pictorial_jcp

JSR-353: Java API for Processing JSON

Transparency

- Using json-processing-spec java.net open source project
- Mailing lists:
  - users@json-processing-spec.java.net
  - jsr353-experts@json-processing-spec.java.net
  - Lists are archived (publicly readable)
- Issue Tracker:
  - http://java.net/jira/browse/JSON_PROCESSING_SPEC

Source: http://www.flickr.com/photos/benjamin_galle/3142187694/

JSR-353

Schedule

- Align with Java EE 7 schedule
  - Early Draft – Sep 2012
  - Public Review – Dec 2012
  - Proposed Final Draft – Mar 2013
  - Final Release – Apr 2013

Source:http://www.flickr.com/photos/29254399@N08/3187186308

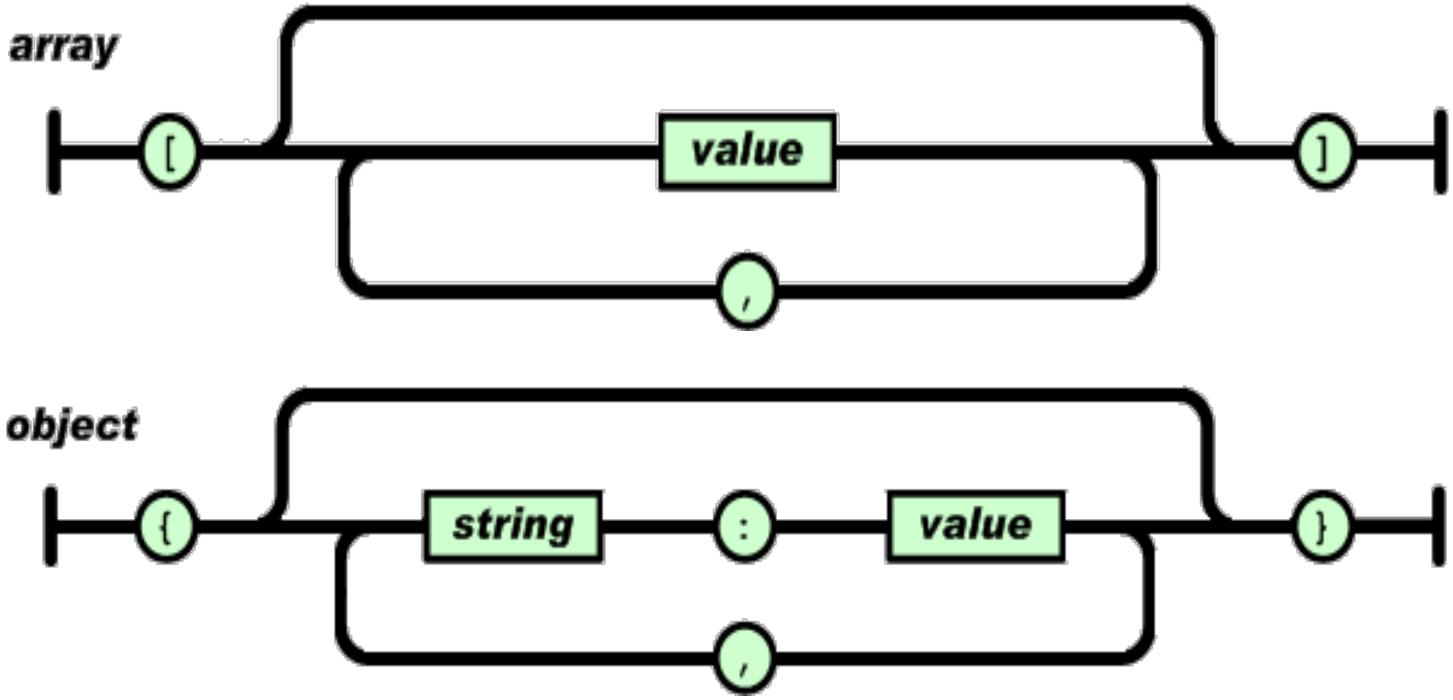
JSR-353 RI

Open Source Project

- Using jsonp java.net open source project
  - by GlassFish community
- Up-to-date w.r.t spec (pretty much !)
- Latest bits are in maven central

API

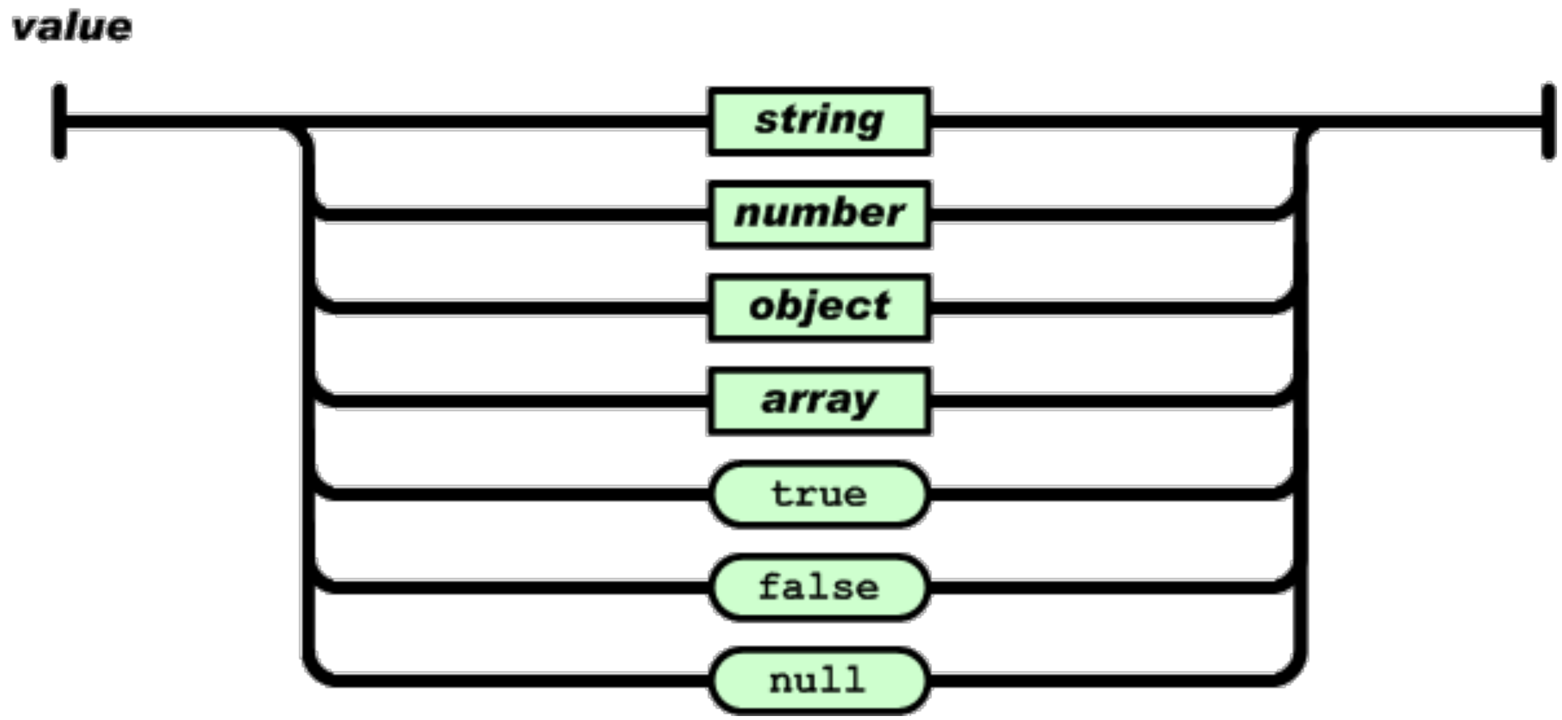
JSON Grammar



Source: http://json.org

API

JSON Grammar



Source: http://json.org

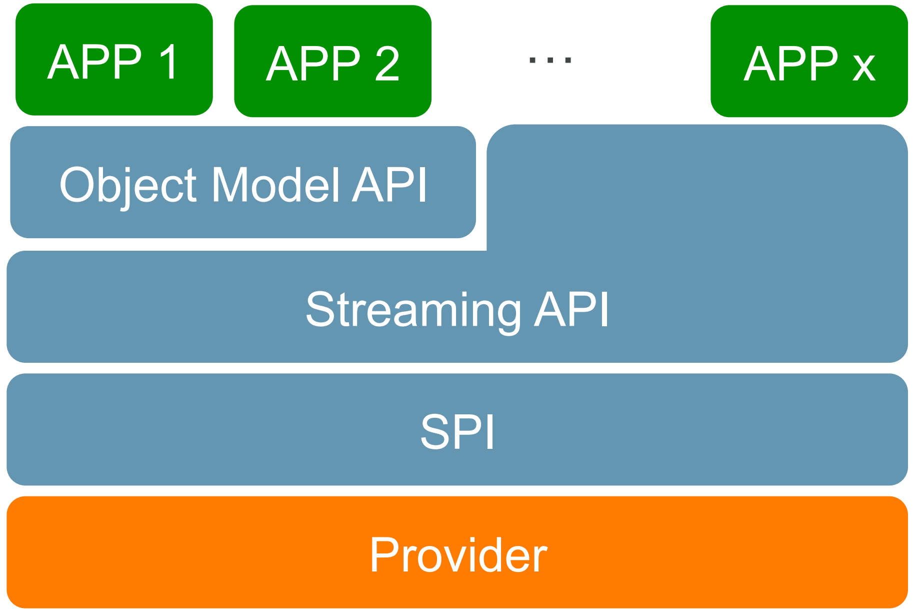
API

Streaming & Object Model

- Streaming API
  - Low-level, efficient way to parse/generate JSON
  - Provides pluggability for parsers/generators
- Object Model API
  - Simple, easy to use high-level API
  - Implemented on top of streaming API

API

Architecture



JSR-353 Streaming API

JsonParser

- JsonParser – Parses JSON in a streaming way from input sources
  - Similar to StAX's XMLStreamReader, a pull parser
- Created using :
  - Json.createParser(…), Json.createParserFactory().createParser(…)
- Optionally, configured with features
- Parser state events :
  - START_ARRAY, START_OBJECT, KEY_NAME, VALUE_STRING, VALUE_NUMBER, VALUE_TRUE, VALUE_FALSE, VALUE_NULL, END_OBJECT, END_ARRAY

JSR-353 Streaming API

JsonParser

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

JSR-353 Streaming API

JsonParser

START_OBJECT

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

JSR-353 Streaming API

JsonParser

KEY_NAME

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

JSR-353 Streaming API

JsonParser

```
VALUE_STRING
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

JSR-353 Streaming API

JsonParser

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

↑VALUE_NUMBER

JSR-353 Streaming API

JsonParser

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

START_ARRAY

JSR-353 Streaming API

JsonParser

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
```

END_ARRAY

Streaming API

JsonParser

```
{
    "firstName": "John", "lastName": "Smith", "age": 25,
    "phoneNumber": [
        { "type": "home", "number": "212 555-1234" },
        { "type": "fax", "number": "646 555-4567" }
    ]
}
Iterator<Event> it = parser.iterator();
Event event = it.next();                 // START_OBJECT
event = it.next();                       // KEY_NAME
event = it.next();                       // VALUE_STRING
String name = parser.getString();        // "John”
```

JSR-353 Streaming API

JsonGenerator

- JsonGenerator – Generates JSON in a streaming way to output sources
  - Similar to StAX's XMLStreamWriter
- Created using :
  - Json.createGenerator(…), Json.createGeneratorFactory().createGenerator(…)
- Optionally, configured with features
  - For e.g. pretty printing
- Allows method chaining
- Cannot mix array and object methods

JSR-353: Java API for Processing JSON

JsonGenerator Example

```
JsonGenerator ge = Json.createGenerator(…);
ge.beginArray()
    .beginObject()
      .add("type", "home”)
      .add("number", "212 555-1234")
    .endObject()
      .beginObject()
        .add("type", "fax”)
        .add("number", "646 555-4567")
      .endObject()
  .endArray()
.close();
```

```
[
  {
    "type": "home”,
    "number": "212 555-1234"
  },
  {
    "type": "fax”,
    "number": "646 555-4567"
  }
]
```

JSR-353 Object Model API

Core classes

- JsonObject/JsonArray – JSON object and array structures
  - JsonString and JsonNumber for string and number values
- JsonBuilder – Builds JsonObject and JsonArray
- JsonReader – Reads JsonObject and JsonArray from input source
- JsonWriter – Writes JsonObject and JsonArray to output source

JSR-353 Object Model API

JsonObject

- Holds name/value pairs and immutable
- Name/value pairs can be accessed as Map<String, JsonValue>

```
JsonObject obj = …;
Map<String, JsonValue> map = obj.getValues();    // as a map

JsonNumber num = obj.getValue(“foo”, JsonNumber.class);

Set<String> names = obj.getNames();   // all names
```

JSR-353 Object Model API

JsonObject

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JsonNumber num = obj.getValue(“foo”, JsonNumber.class);

Set<String> names = obj.getNames();   // all names
```

JSR-353 Object Model API

JsonArray

- Holds a list of values and immutable
- Values can be accessed as List<JsonValue>

```
JsonArray arr = …;

List<JsonValue> list = arr.getValues();  // as a list

JsonNumber num = arr.getValue(0, JsonNumber.class);
```

JSR-353 Object Model API

JsonArray

- Holds a list of values and immutable
- Values can be accessed as List<JsonValue>

```
JsonArray arr = …;

List<JsonValue> list = arr.getValues();  // as a list

JsonNumber num = arr.getValue(0, JsonNumber.class);
```

JSR-353 Object Model API

JsonArray

- Holds a list of values and immutable
- Values can be accessed as List<JsonValue>

```
JsonArray arr = …;

List<JsonValue> list = arr.getValues();  // as a list

JsonNumber num = arr.getValue(0, JsonNumber.class);
```

JSR-353 Object Model API

JsonBuilder

- Builder to build JsonObject and JsonArray from scratch
- Allows method chaining
- Type-safe (cannot mix array and object building methods)

```
// builds empty JSON object
JsonObject obj = new JsonBuilder().beginObject().endObject().build()
```

JSR-353: Java API for Processing JSON

JsonBuilder Example

```
JsonArray arr = new JsonBuilder()
  .beginArray()
    .beginObject()
      .add("type", "home”)
      .add("number", "212 555-1234")
    .endObject()
      .beginObject()
        .add("type", "fax”)
        .add("number", "646 555-4567")
      .endObject()
  .endArray()
.build();
```

```
[
  {
    "type": "home”,
    "number": "212 555-1234"
  },
  {
    "type": "fax”,
    "number": "646 555-4567"
  }
]
```

JSR-353 Object Model API

JsonReader

- Reads JsonObject and JsonArray from input source
  - i/o Reader, InputStream (+ encoding)
- Optionally, configured with features
- Uses pluggable JsonParser

```
// Reads a JSON object
try(JsonReader reader = new JsonReader(io)) {
    JsonObject obj = reader.readObject();
}
```

JSR-353 Object Model API

JsonWriter

- Writes JsonObject and JsonArray to output source
  - i/o Writer, OutputStream (+ encoding)
- Optionally, configured with features. For e.g. pretty printing
- Uses pluggable JsonGenerator

```
// Writes a JSON object
try(JsonWriter writer = new JsonWriter(io)) {
    writer.writeObject(obj);
}
```

JSR-353 API

Configuration

- Configuration is a set of parser/generator features
  - Pretty Printing, Single-Quoted strings
- Supports extensibility (custom features)
- Can be used in streaming & object-model API

```
// Writes a JSON object prettily
JsonConfiguration config = new
    JsonConfiguration().withPrettyPrinting();
try(JsonWriter writer = new JsonWriter(io, config)) {
    writer.writeObject(obj);
}
```

API

TODO

- Defining equals/hashcode() semantics
- Exception handling
- Miscellaneous

DEMO

Resources

- http://json-processing-spec.java.net
- http://jsonp.java.net
- users@json-processing-spec.java.net

Q&A

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