JSON(JavaScript Object Notation) by PGKan

This is a document for introducing JSON format, there will be some information about JSON and a guide for using JSON as a medium of information interchange in Java using Eclipse IDE.

The guide includes the introduction and installation of libraries needed in Eclipse for using JSON and a tutorial for using Gson to work with JSON files, basic input/output, and some more advanced object conversions. Some sample codes will be provided.

Outline

[Back to top]

About JSON

JSON is a lightweight text format that facilitates structured data interchange between all programming languages. It is easy for humans to read and write, also for machines to parse and generate. Although it is a subset of the JavaScript Programming Language, JSON is a text format that is completely language independent. It uses conventions of the C-family of languages, including C, C++, C#, Java, JavaScript, Perl, Python, and many others. These properties make JSON an ideal data-interchange language.

JSON is syntax of braces, brackets, colons, and commas that is useful in many contexts, profiles, and applications. Its text is a sequence of Unicode code points. It also depends on Unicode in the hex numbers used in the `\u` escapement notation. Because JSON is lightweight and dsom simple, it is not expected that the JSON grammar will ever change. This gives JSON, as a foundational notation, tremendous stability.

JSON is built on two structures:

- A collection of name/value pairs. In Java, this is realized as an `Object`, a name/value pair corresponds to a field of an object.
- An ordered list of values. In Java, this is realized as an `Array`.

As most of the modern programming languages support the structures above, the JSON is interchangeable in programming languages that based on these structures.

[Back to top]

Data types

JSON consists of the following data types:

- `Number` : a signed *decimal* number that may contain a fractional part and may use exponential E notation, but cannot include non-numbers such as `NaN` . Just like JavaScript, the format makes no distinction between integer and floating-point.
- `String` : a sequence of zero or more Unicode characters. Strings are delimited with double quotation marks and support a backslash escaping syntax.
- `Boolean` : either of the values `true` or `false`
- `Array` : an ordered list of zero or more values, each of which may be of any type. Arrays use square bracket notation with comma-separated elements.
- `Object` : an unordered collection of name-value pairs where the names are strings. Objects are intended to represent associative arrays, where each key is *unique* within an object. Objects are delimited with `{` and `}` , and use `,` to separate each pair, while within each pair of the `:` character separates the name from its value.
- `null` : An empty value, using the word `null`

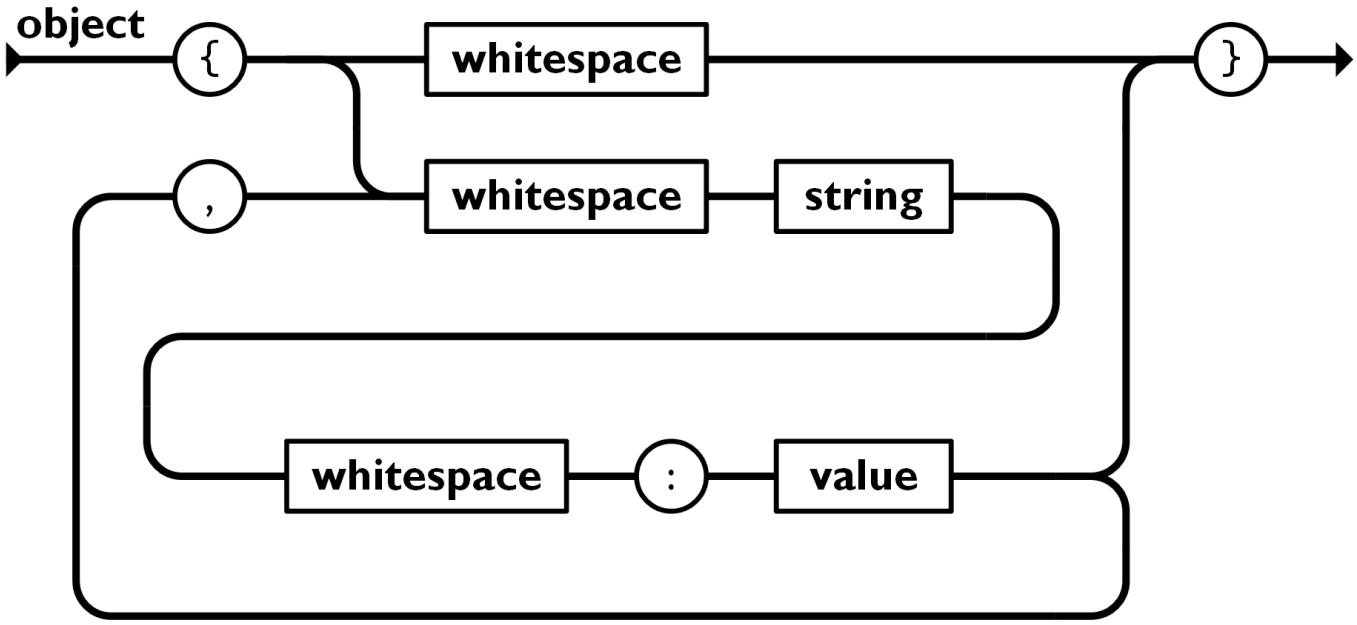
> JSON is case sensitive with `true` , `false` or `null` .

[Back to top]

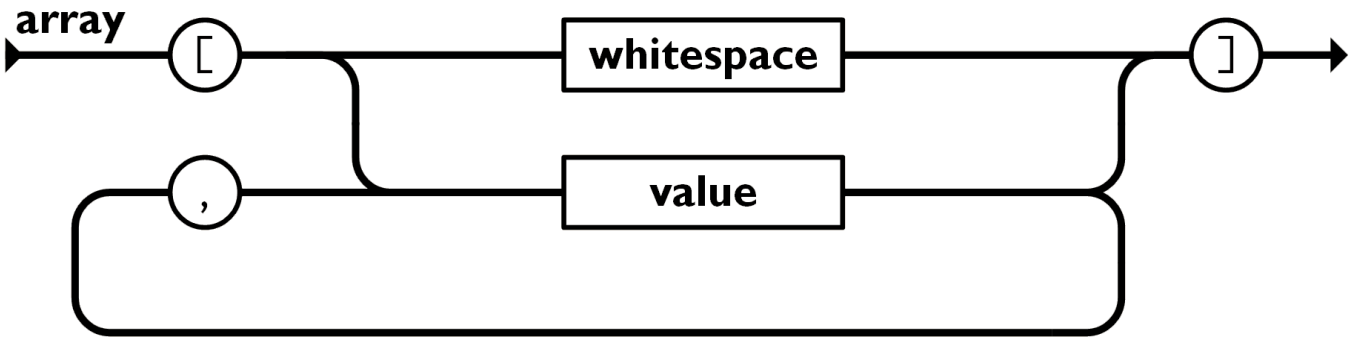
Syntax

▼ JSON grammar

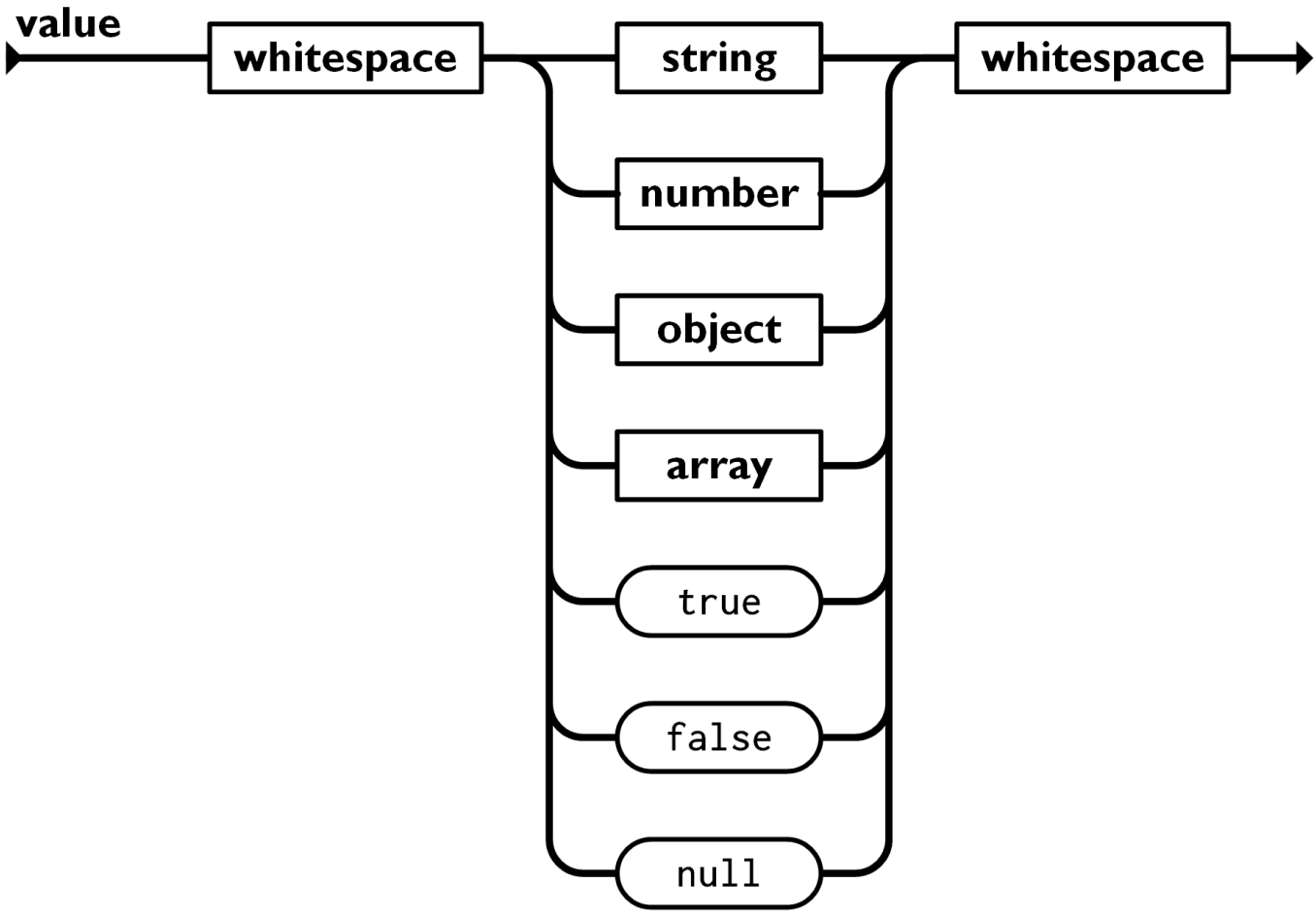
An **object** is an unordered set of name/value pairs. An object begins with `{` and ends with `}`. Each name is followed by `:` and the name/value pairs are separated by `,`.



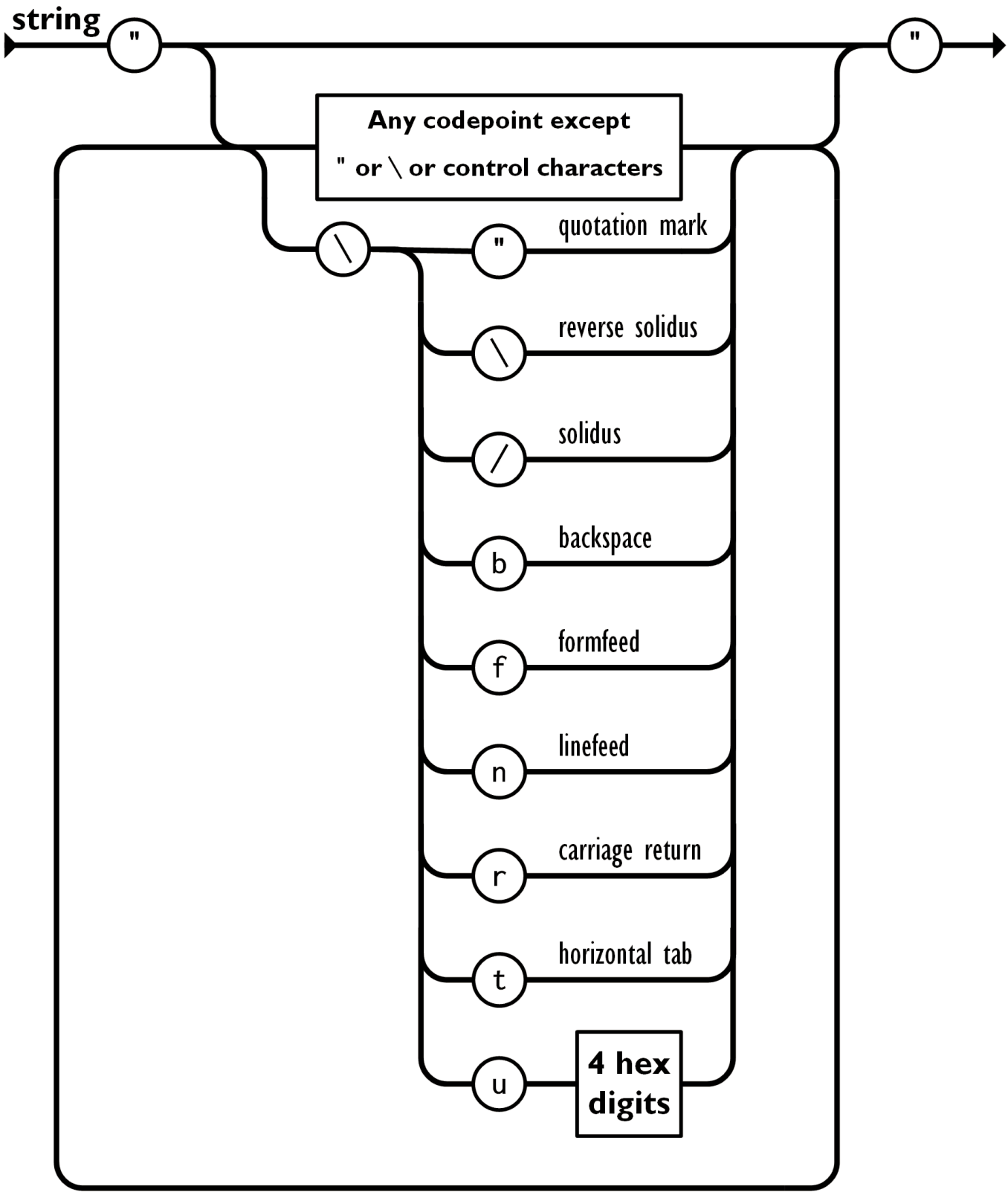
An **array** is an ordered collection of values. An array begins with `[` and ends with `]`. Values are separated by `,`.



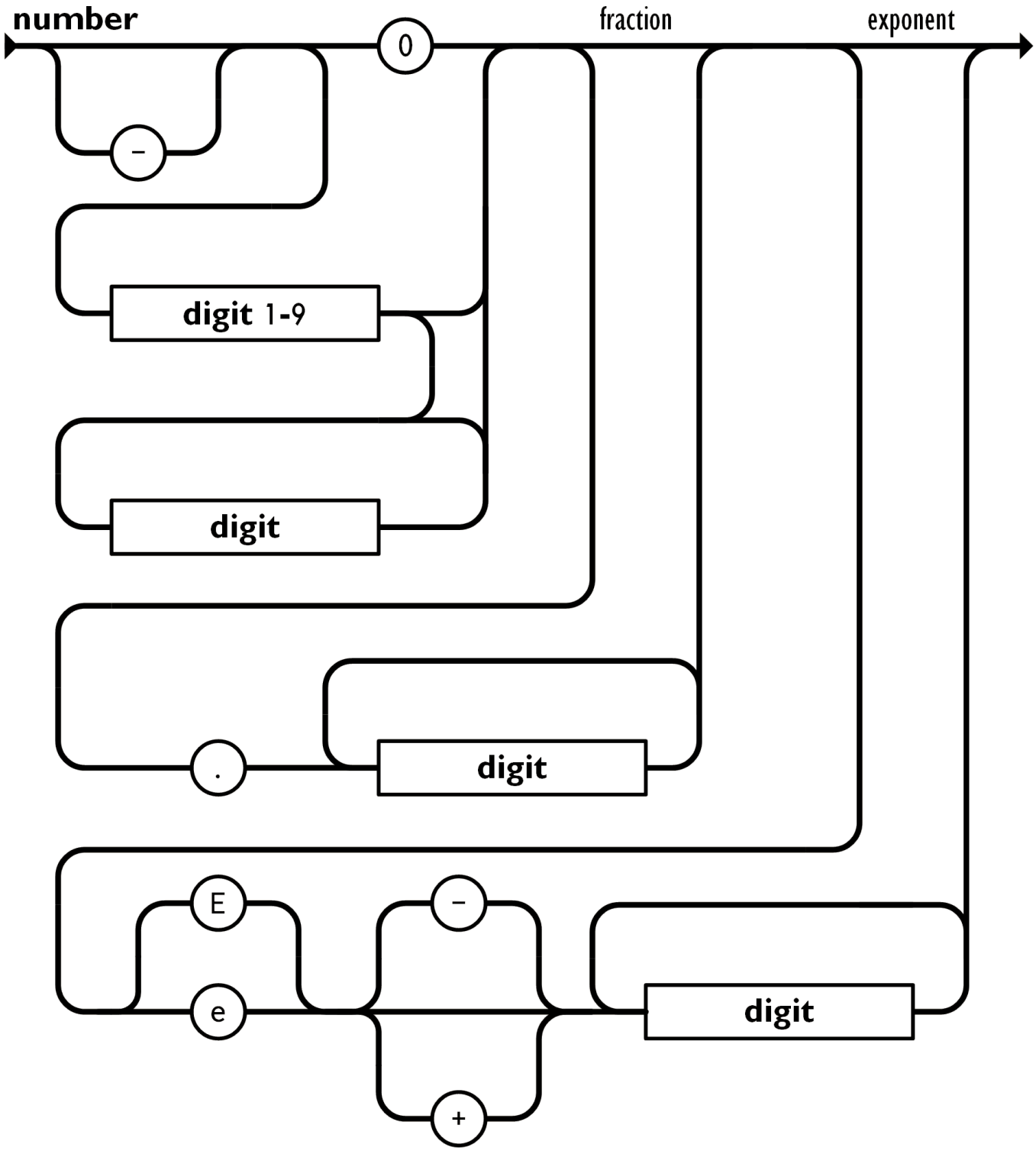
A **value** can be a string in double quotes, or a `number`, or `true` or `false` or `null`, or an `object` or an `array`. These structures can be nested.



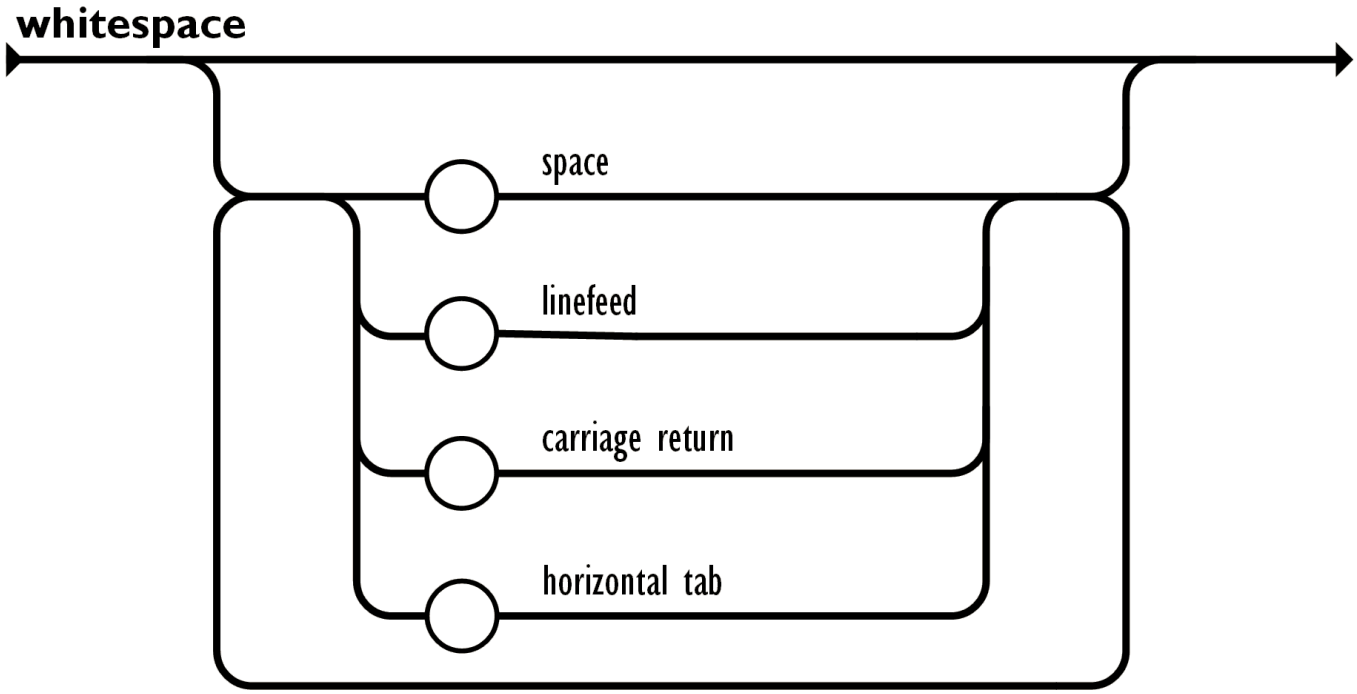
A **string** is a sequence of zero or more Unicode characters, wrapped in double quotes, using backslash escapes. A character is represented as a single character string. A string is very much like a C or Java string.



A **number** is very much like a C or Java number, except that the octal and hexadecimal formats are **NOT** used.



Whitespace can be inserted between any pair of tokens. Excepting a few encoding details, that completely describes the language.



▼ JSON grammar in McKeeman Form

```
json
        element
value
        object
        array
        string
        number
        "true"
        "false"
        "null"
object
        '{' ws '}'
        '{' members '}'
members
        member
        member ',' members
member
        ws string ws ':' element
array
        '[' ws ']'
        '[' elements ']'
elements
        element
        element ',' elements
element
        ws value ws
string
        '"' characters '"'
```

```
characters
        ""
        character characters
character
        '0020' . '10FFFF' '"' '\'
        '\' escape
escape
        '"'
        '\'
        '/'
        'b'
        'f'
        'n'
        'r'
        't'
        'u' hex hex hex hex
hex
        digit
        'A' . 'F'
        'a' . 'f'
number
        integer fraction exponent
integer
        digit
        onenine digits
        '-' digit
        '-' onenine digits
digits
        digit
        digit digits
digit
        '0'
        onenine
onenine
        '1' . '9'
fraction
        ""
        '.' digits
exponent
        ""
        'E' sign digits
        'e' sign digits
sign
        ""
        '+'
        '-'
ws
        ""
        '0020' ws
        '000A' ws
        '000D' ws
        '0009' ws
```

[Back to top]

Library: Gson

There is a fast amount of libraries on the internet for JSON in Java. The Gson library released from Google is an open-sourced utility library for serialising an Object in Java to JSON text, and deserialising JSON text to an Object in Java. The Gson library is chosen in this study because it is an open-sourced library, it is a stable and secure library, and there is a large amount of study and tutorial on the internet.

Download

You can download Gson from GitHub directly and build it on the local environment, or download the Gson jar from Maven Central. If you have downloaded Gson from GitHub, follow the instruction on GitHub to build the Gson. If you want to download Gson from Maven Central, click the `Downloads` button at the right-hand side of the page and select `jar` (mandatory). You can also download the `javadoc.jar` and the `sources.jar` (not vital for the actions below).

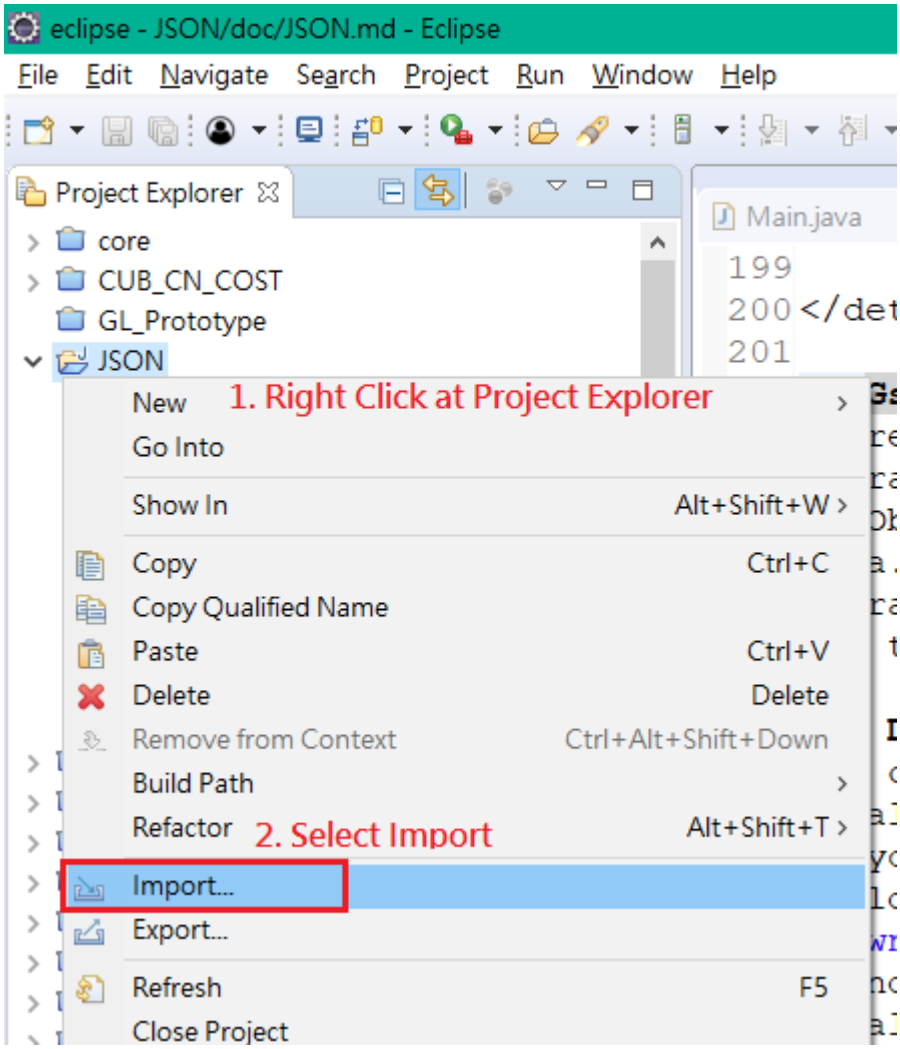
Installation

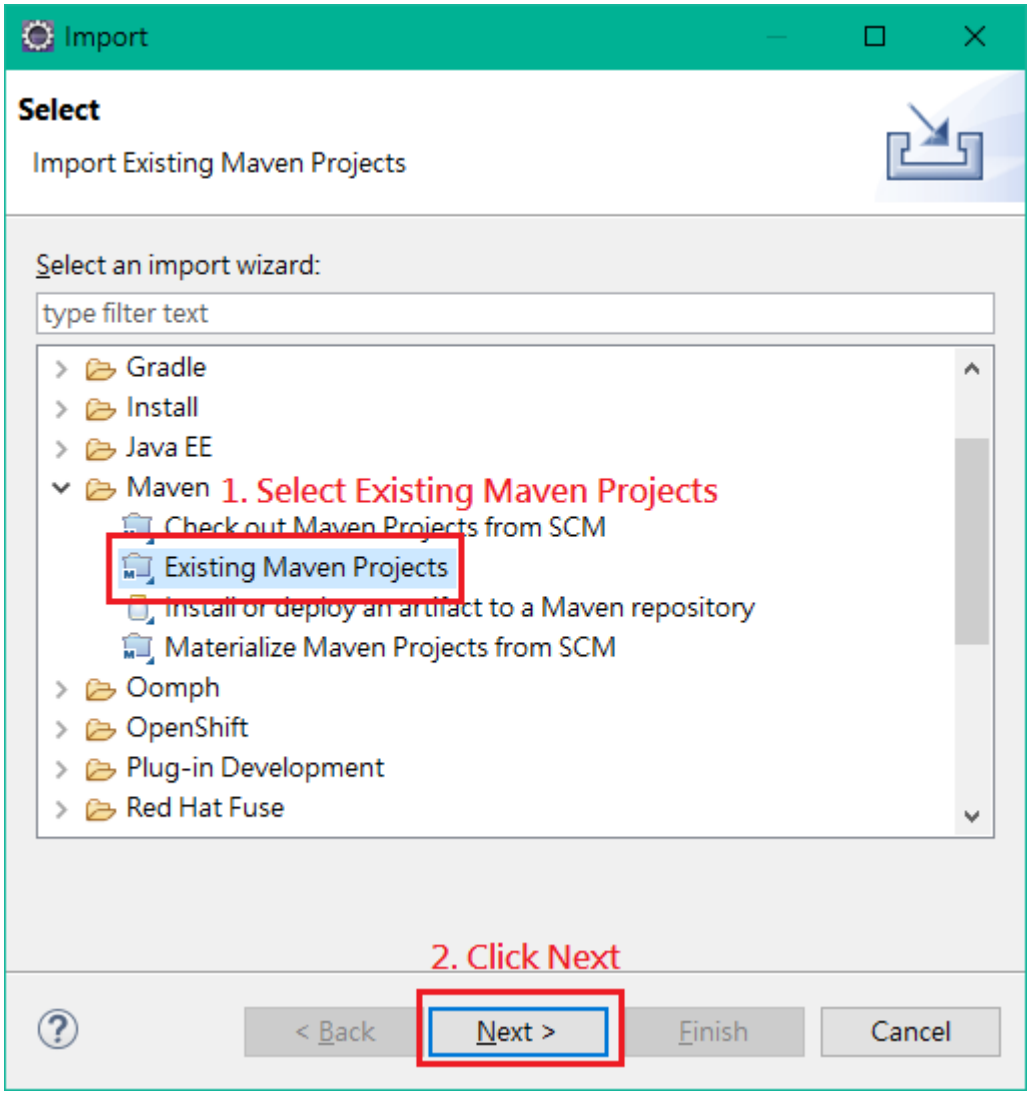
Install as Maven project

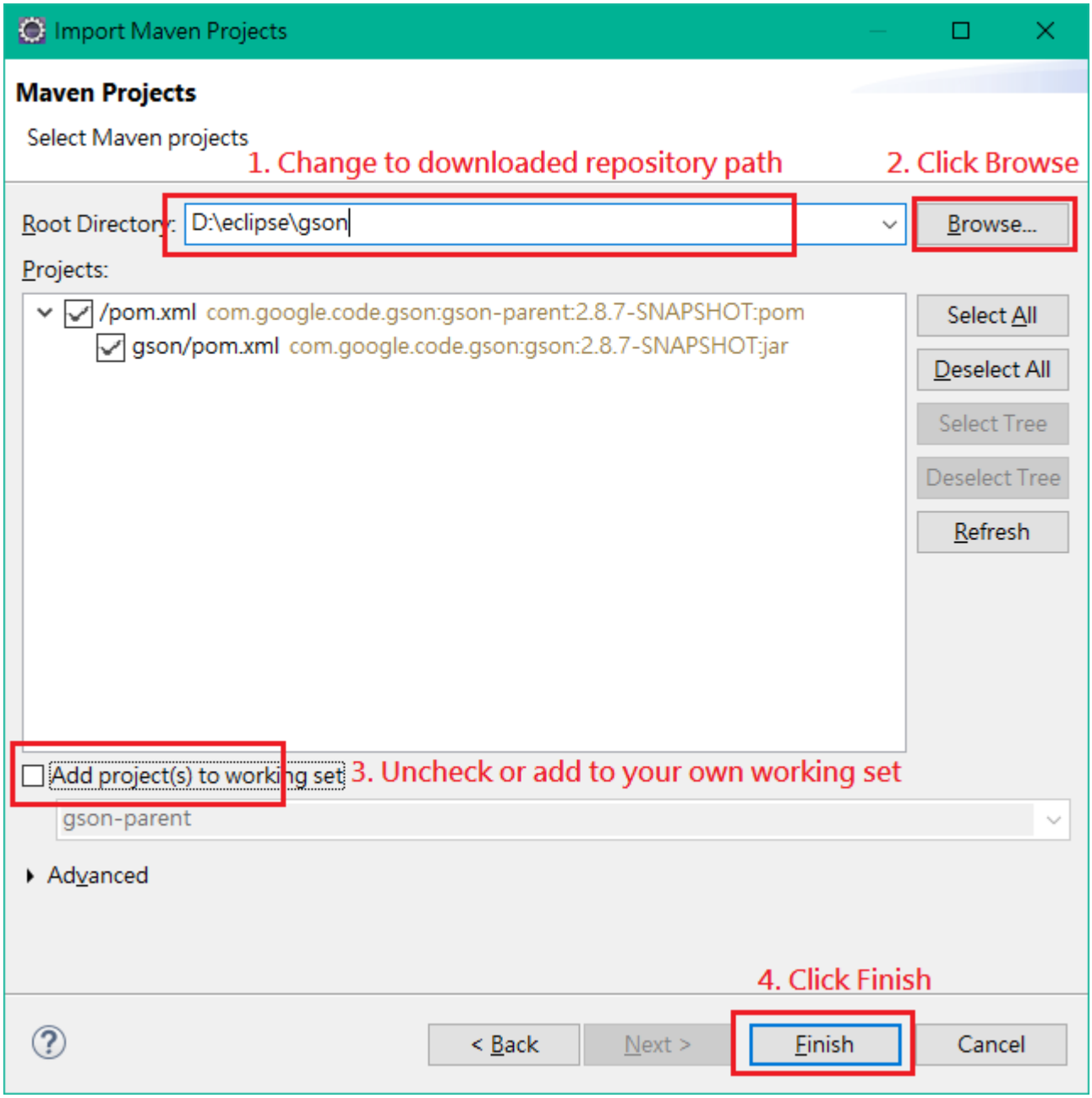
If you have downloaded the Gson library from GitHub, you need to import the downloaded sources as Maven project and add project dependency at your project to the Gson project.

▼ Procedure

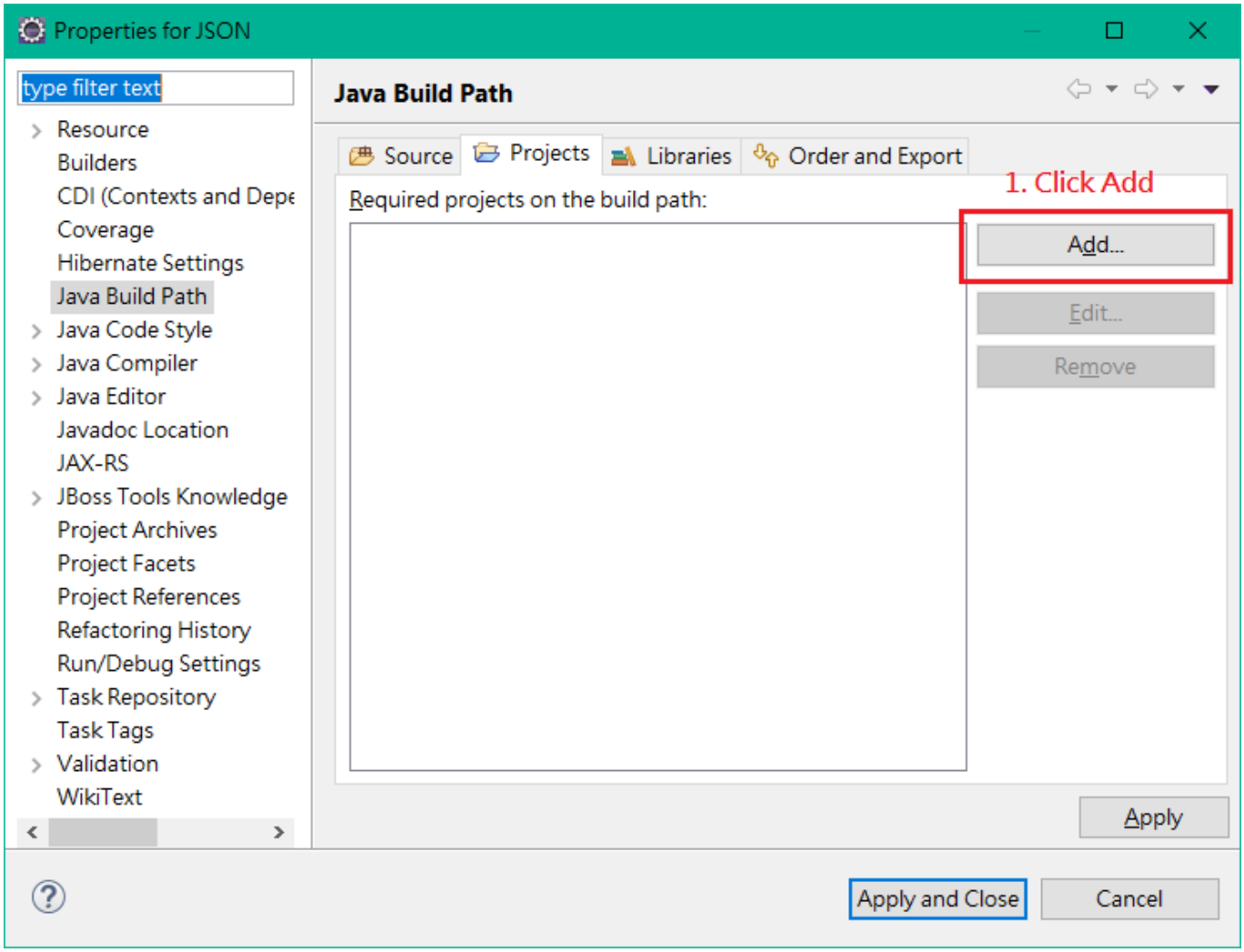
1. Import Gson as a Maven project.

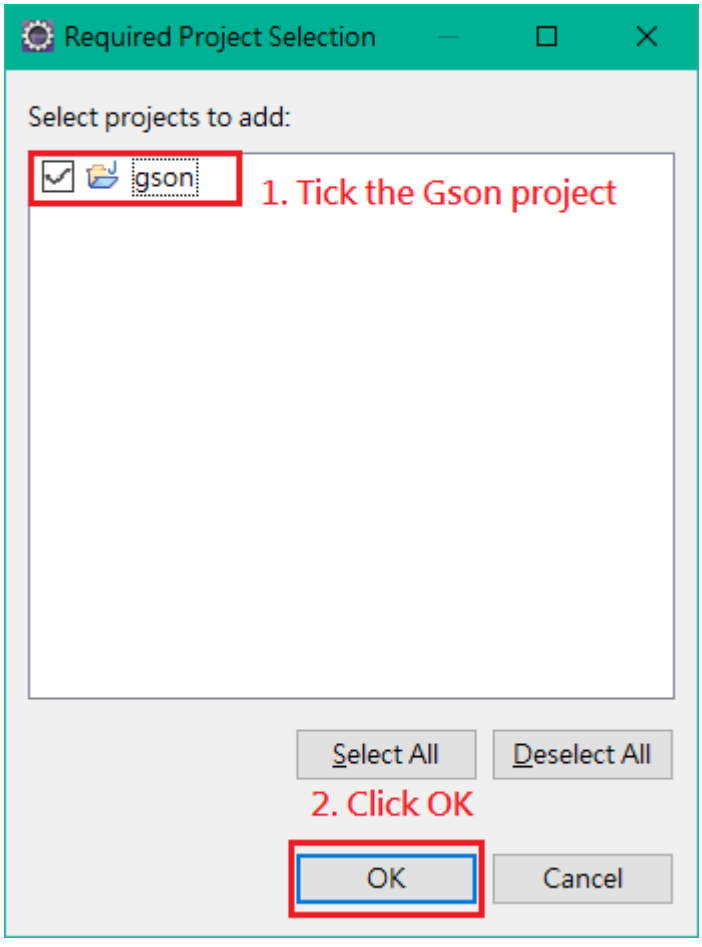

eclipse - JSON/doc/JSON.md - Eclipse
File Edit Navigate Search Project Run Window Help
Project Explorer
core
CUB_CN_COST
GL_Prototype
JSON
Main.java
199
200 </det
201
New
1. Right Click at Project Explorer
Go Into
Show In Alt+Shift+W
Copy Ctrl+C
Copy Qualified Name
Paste Ctrl+V
Delete Delete
Remove from Context Ctrl+Alt+Shift+Down
Build Path
Refactor
2. Select Import
Alt+Shift+T
Import...
Export...
Refresh F5
Close Project

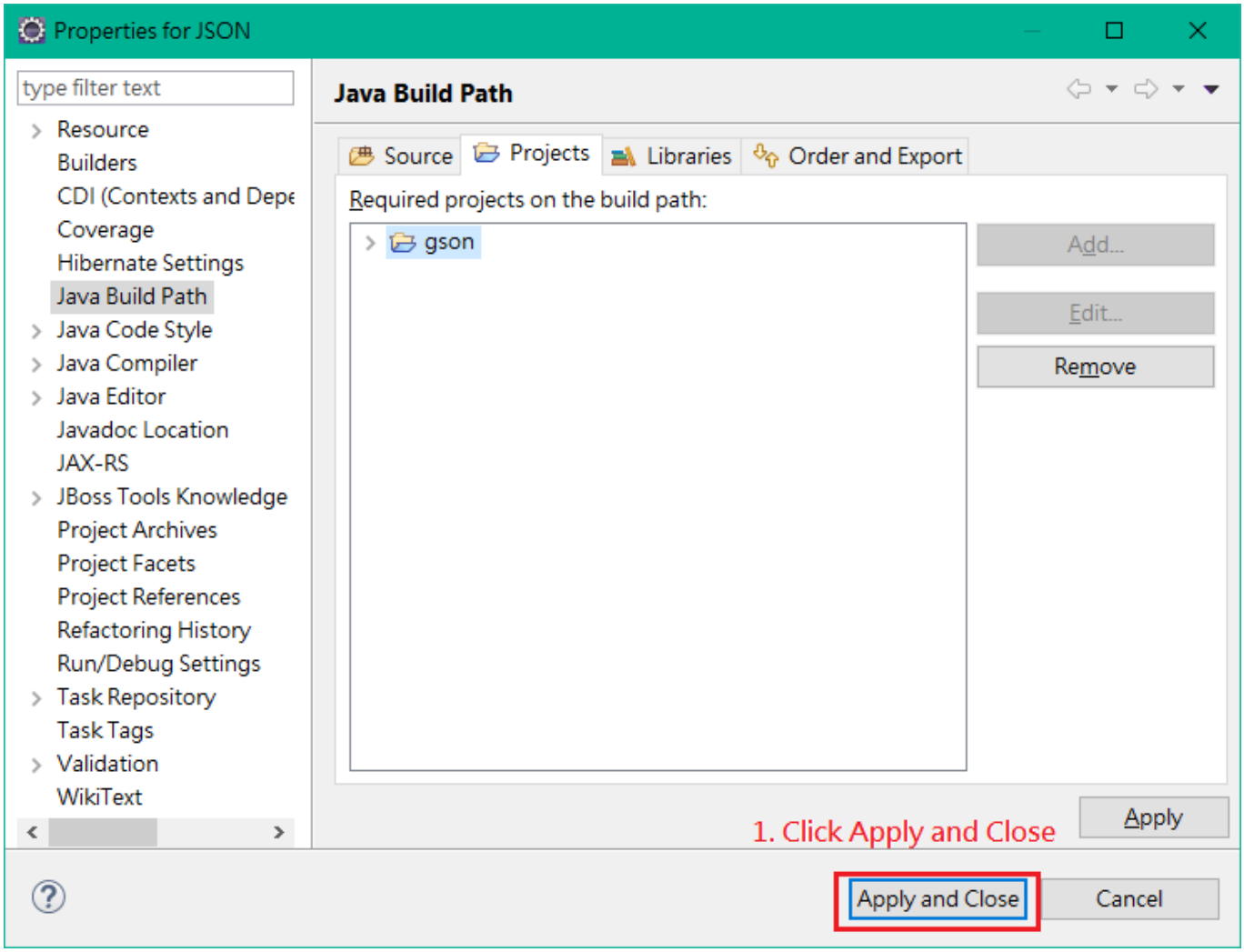

Import
Select
Import Existing Maven Projects
Select an import wizard:
type filter text
Gradle
Install
Java EE
Maven
1. Select Existing Maven Projects
Check out Maven Projects from SCM
Existing Maven Projects
Install or deploy an artifact to a Maven repository
Materialize Maven Projects from SCM
Oomph
OpenShift
Plug-in Development
Red Hat Fuse
2. Click Next
< Back
Next >
Finish
Cancel



2. Add project dependency to your project build path.


Properties for JSON
type filter text
Resource
Builders
CDI (Contexts and Depe
Coverage
Hibernate Settings
Java Build Path
Java Code Style
Java Compiler
Java Editor
Javadoc Location
JAX-RS
JBoss Tools Knowledge
Project Archives
Project Facets
Project References
Refactoring History
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Java Build Path
Source
Projects
Libraries
Order and Export
Required projects on the build path:
1. Click Add
Add...
Edit...
Remove
Apply
Apply and Close
Cancel


Required Project Selection
Select projects to add:
gson
1. Tick the Gson project
Select All
Deselect All
2. Click OK
OK
Cancel


Properties for JSON
type filter text
Resource
Builders
CDI (Contexts and Depe
Coverage
Hibernate Settings
Java Build Path
Java Code Style
Java Compiler
Java Editor
Javadoc Location
JAX-RS
JBoss Tools Knowledge
Project Archives
Project Facets
Project References
Refactoring History
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Java Build Path
Source
Projects
Libraries
Order and Export
Required projects on the build path:
gson
Add...
Edit...
Remove
1. Click Apply and Close
Apply
Apply and Close
Cancel

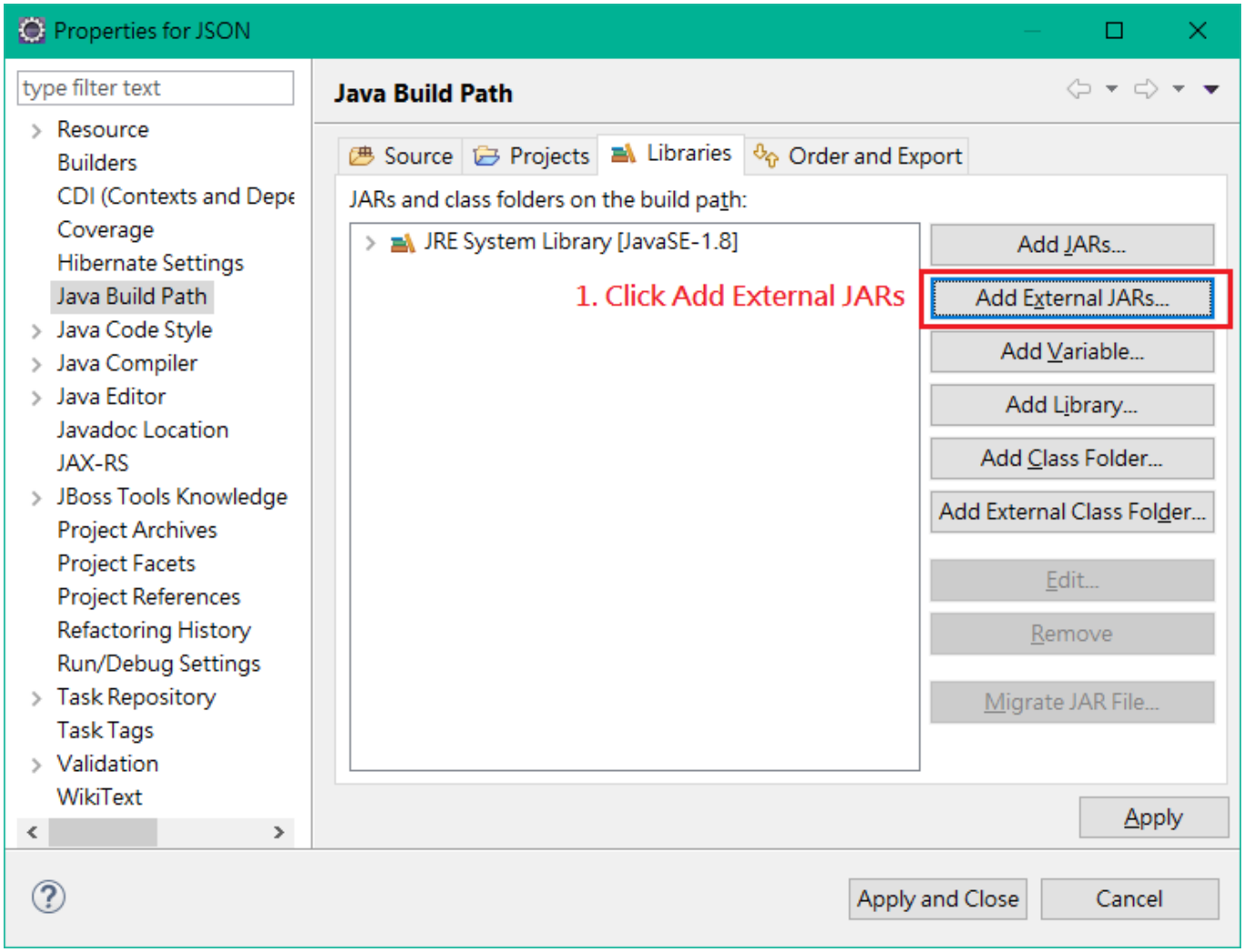
[Back to top]

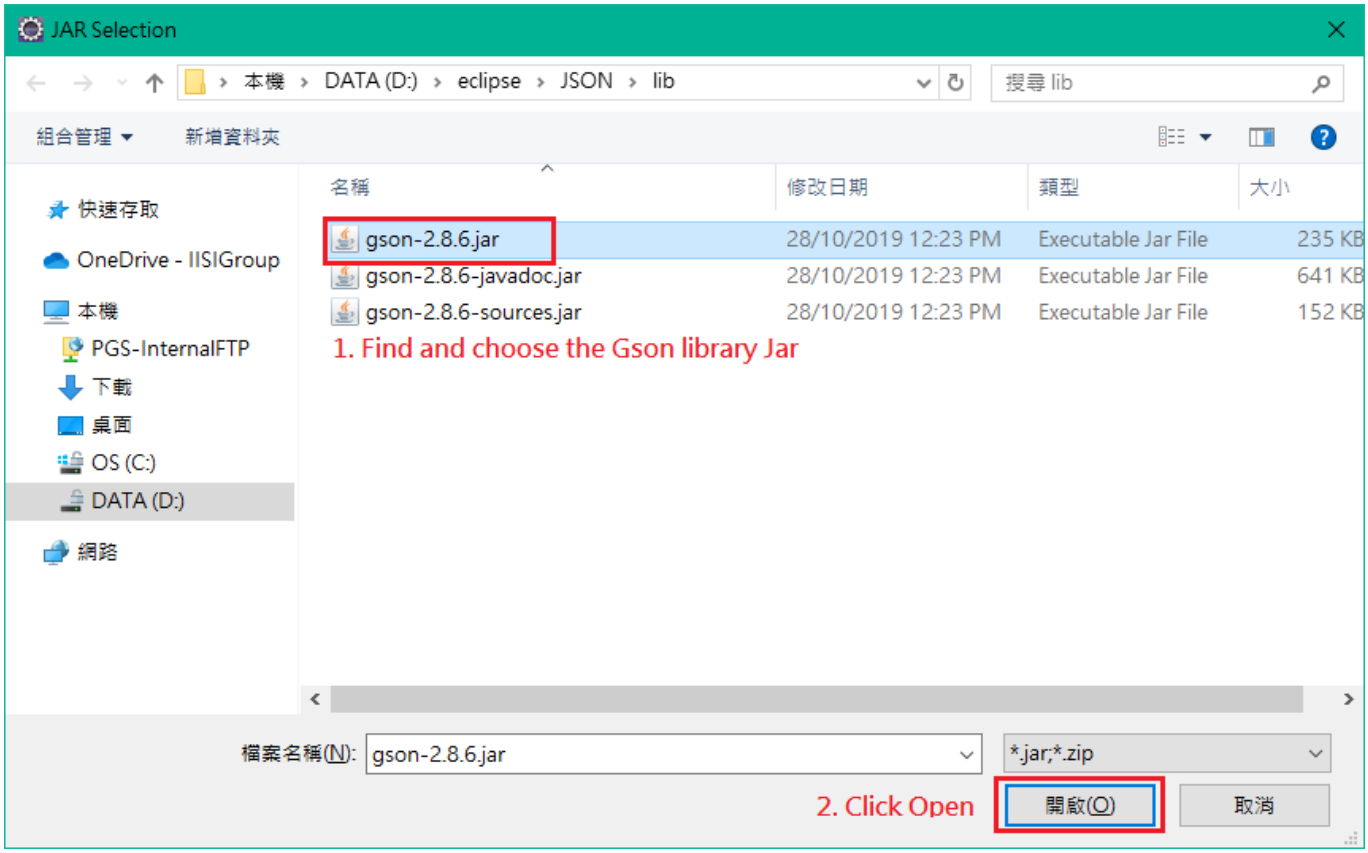
Install as Jar files

If you have downloaded the Gson library as Jar files, you need to add the library into your build path reference.

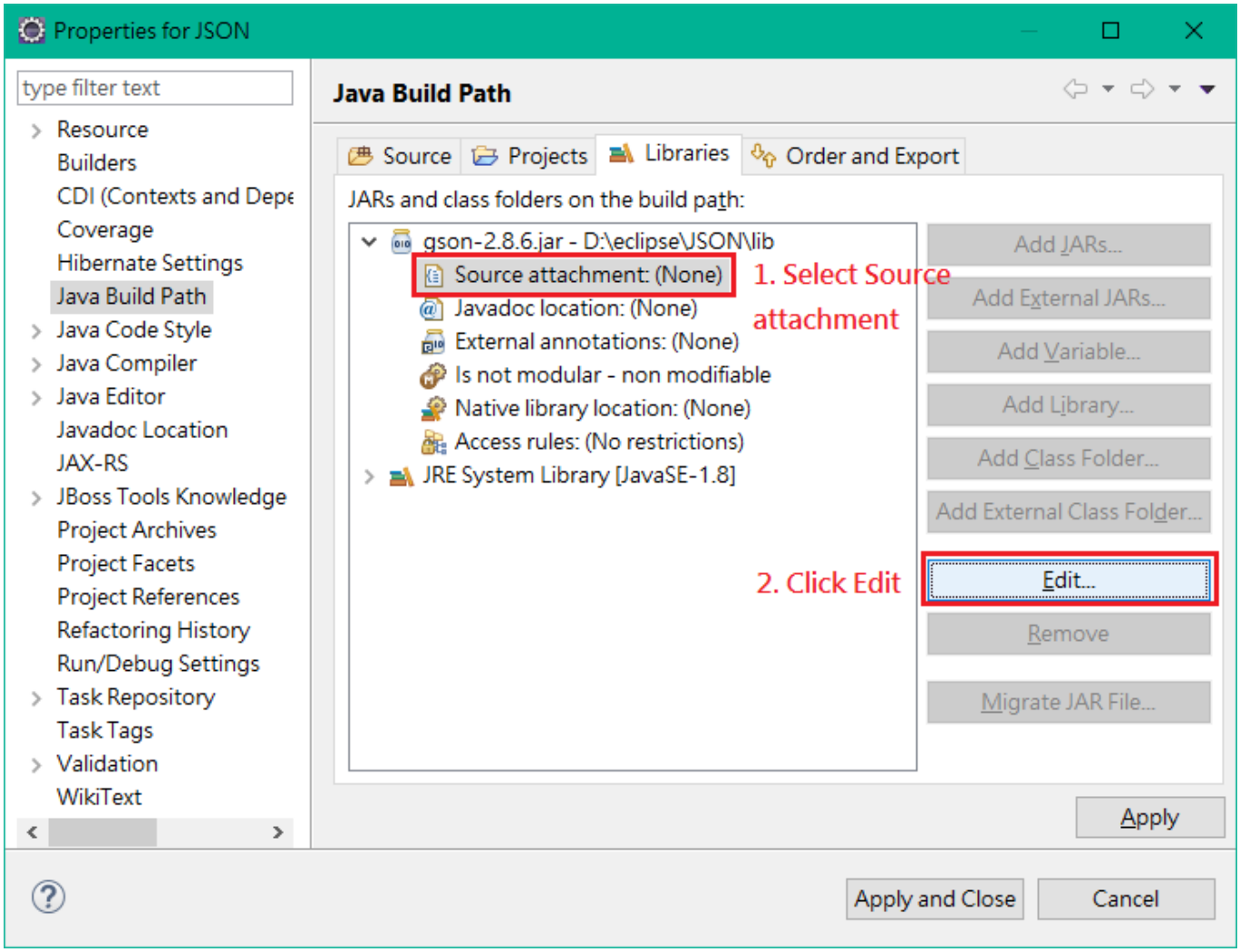
▼ Procedure

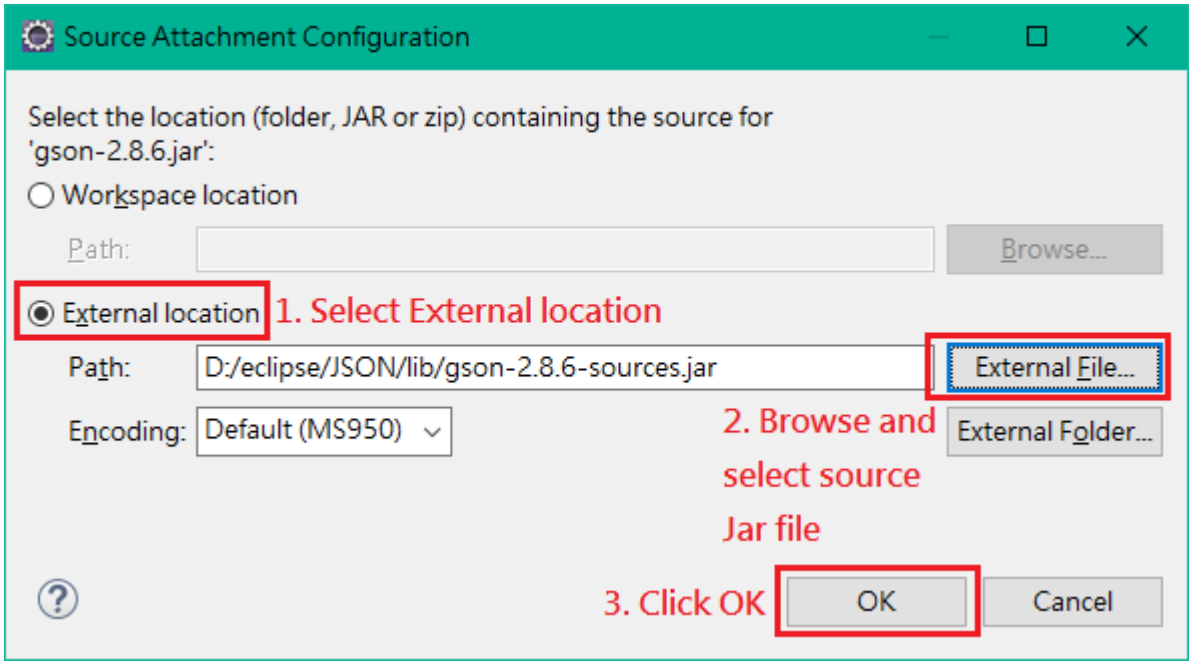
1. Add Gson library Jar file into your project.

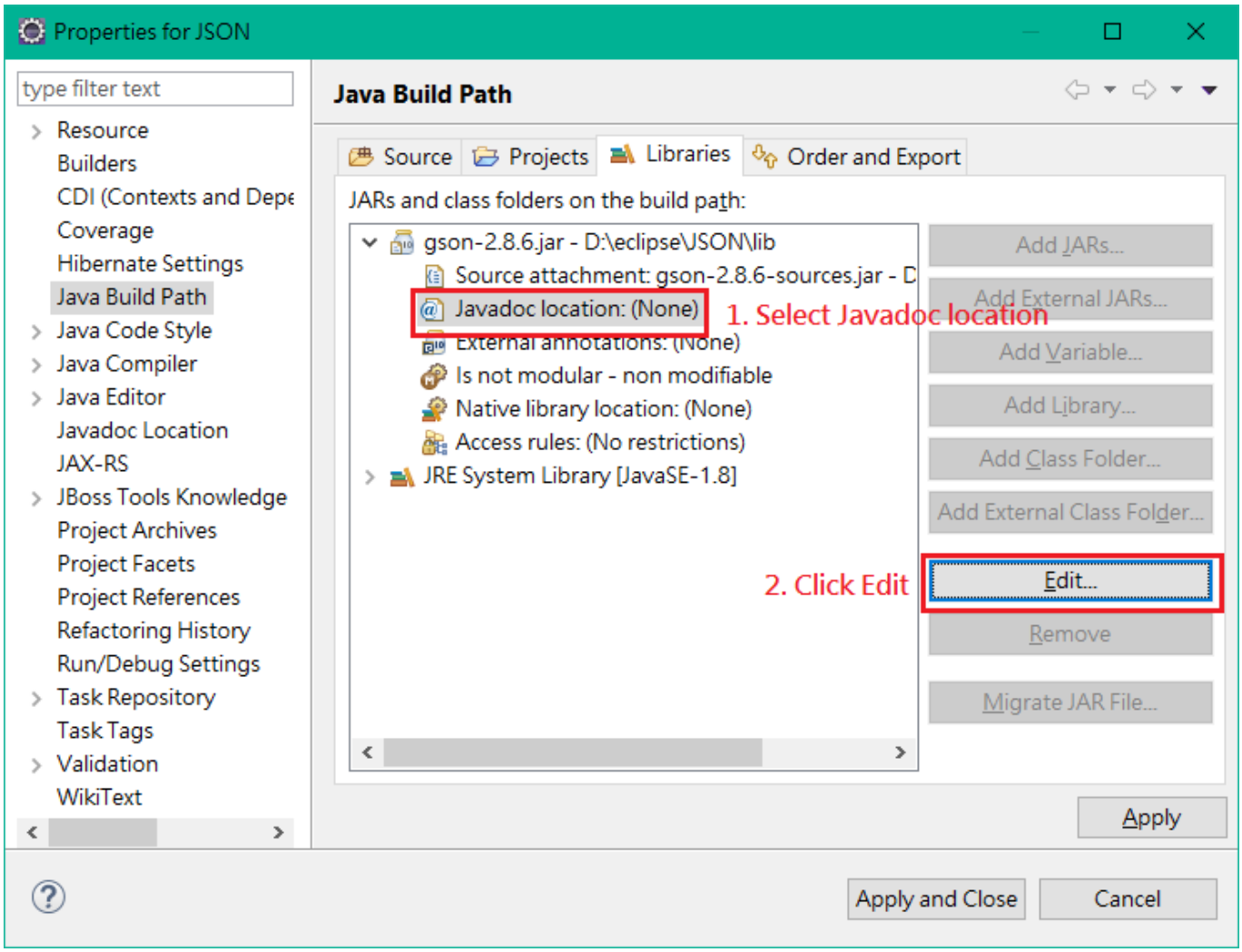


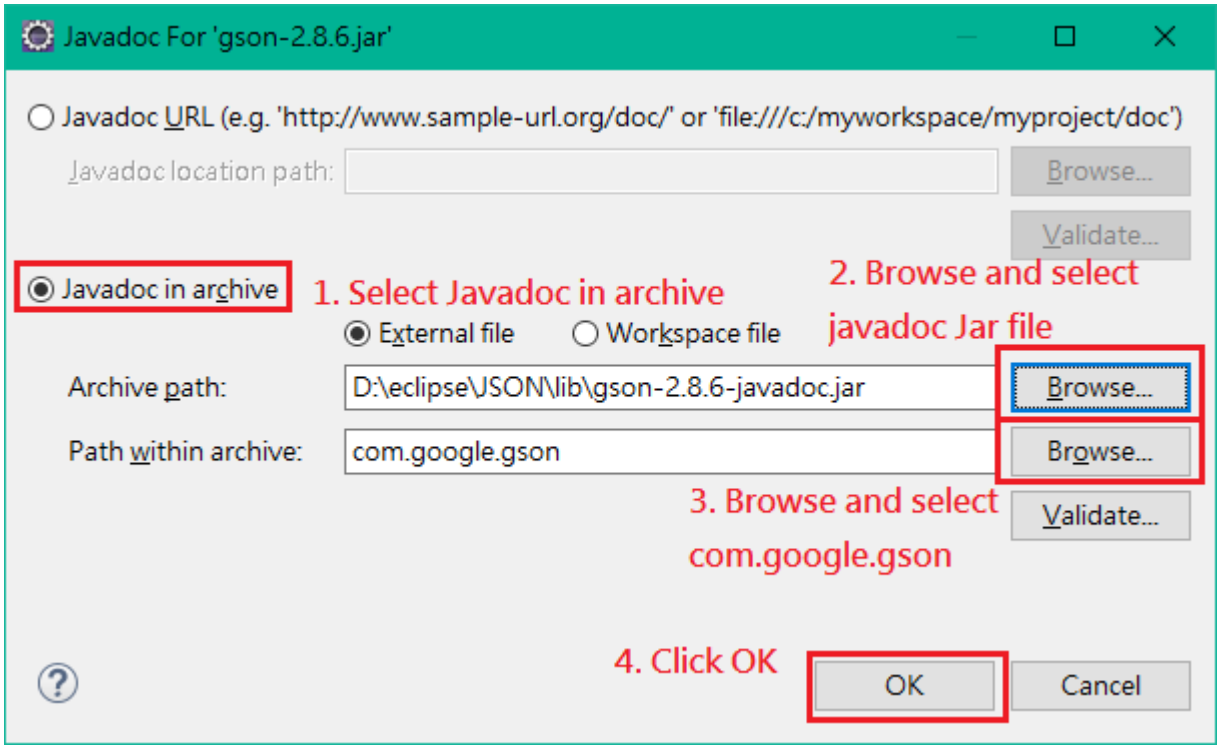


2. Optional: add javadoc and source Gson library.

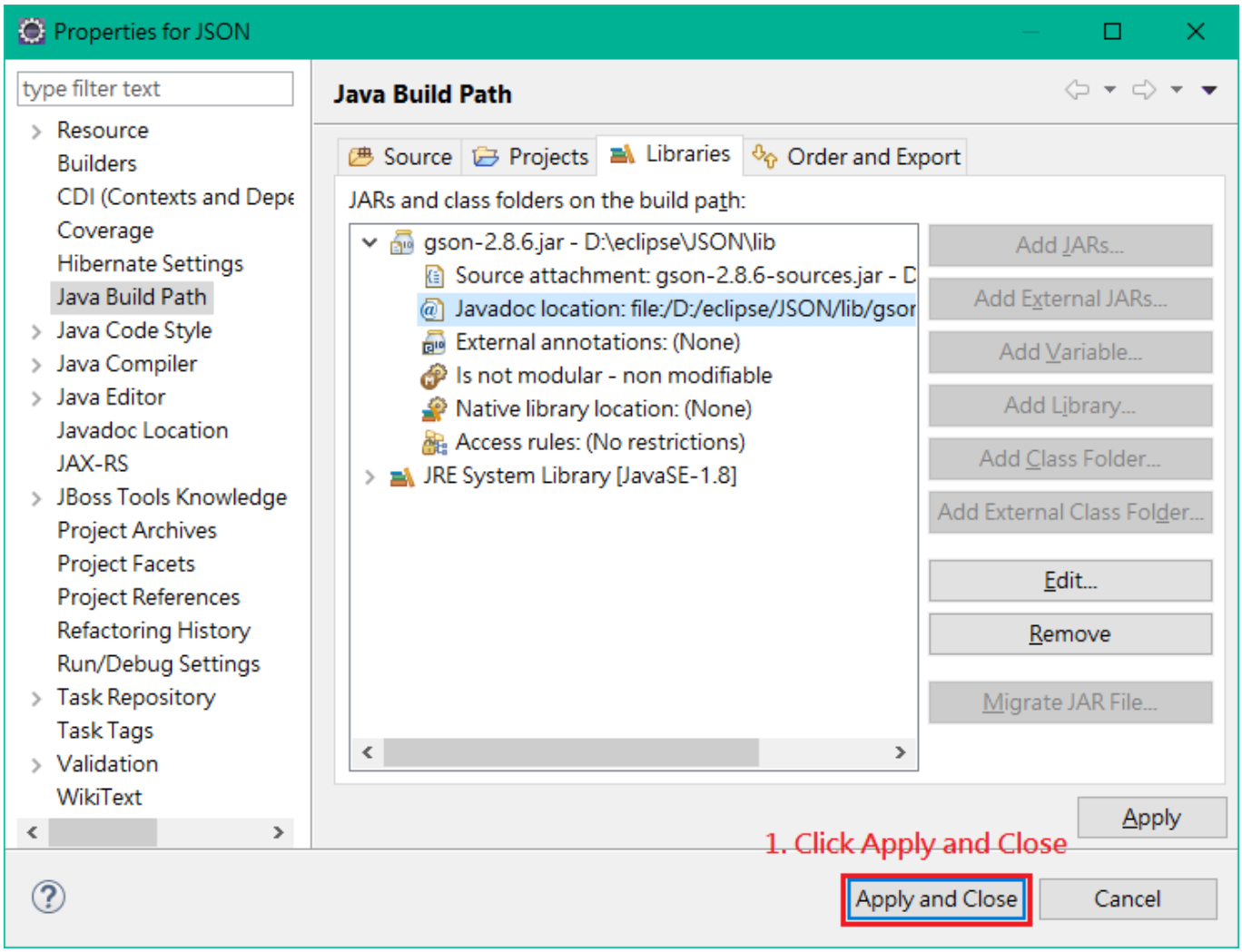



Source Attachment Configuration
Select the location (folder, JAR or zip) containing the source for 'gson-2.8.6.jar':
Workspace location
Path:
Browse...
External location
1. Select External location
Path:
D:/eclipse/JSON/lib/gson-2.8.6-sources.jar
External File...
Encoding:
Default (MS950)
2. Browse and select source Jar file
External Folder...
3. Click OK
OK
Cancel


Properties for JSON
type filter text
Resource
Builders
CDI (Contexts and Depe
Coverage
Hibernate Settings
Java Build Path
Java Code Style
Java Compiler
Java Editor
Javadoc Location
JAX-RS
JBoss Tools Knowledge
Project Archives
Project Facets
Project References
Refactoring History
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Java Build Path
Source
Projects
Libraries
Order and Export
JARs and class folders on the build path:
gson-2.8.6.jar - D:\eclipse\JSON\lib
Source attachment: gson-2.8.6-sources.jar - D
Javadoc location: (None)
1. Select Javadoc location
External annotations: (None)
Is not modular - non modifiable
Native library location: (None)
Access rules: (No restrictions)
JRE System Library [JavaSE-1.8]
Add JARs...
Add External JARs...
Add Variable...
Add Library...
Add Class Folder...
Add External Class Folder...
2. Click Edit
Edit...
Remove
Migrate JAR File...
Apply
Apply and Close
Cancel



3. Apply editions.



[Back to top]

Tutorial

Test the installation

If you have downloaded the full repository from GitHub, you should have a source folder called `test`. Under `src/test`, there should be two source files `EnvironmentTest.java` and `JsonTestObject.java`. Go to `EnvironmentTest` and run as **Java Application**.

If the application output the following string, your installation is correct and complete.

```
Environment Test
Input test succeeded!
Output test succeeded!
JSON test succeeded!
```

If you receive an error message: `Missing file: "res/json-test.json"`, you have not downloaded the full repository, or the path configuration is faulty.

[Back to top]

Create a Gson Object

There are 2 methods to create a Gson Object instance in the Gson library.

- `new Gson()`
- `new GsonBuilder().create()`

The first method is a quick and easy way to instantiate a Gson object with default settings. However, there are a lot of settings you can configure with if the second `GsonBuilder` method is used to instantiate a Gson object.

For example,

```
Gson gson = new GsonBuilder()
        .serializeNulls() // tells Gson do not skip null value
        .setPrettyPrinting() // makes the output JSON text formatted
        .excludeFieldsWithModifiers(
                Modifier.TRANSIENT, Modifier.STATIC
        ) // exclude some modifiers
        .create(); // create a Gson instance
```

When using `GsonBuilder` to create a Gson object, you can chain the settings together to create a Gson object with those settings. More about Gson settings in a later chapter.

For more details, browse the Gson Javadoc online.

[Back to top]

Serialize JSON with toJson()

Gson can generate JSON string from Java Objects with the method `toJson()` of a `Gson` instance. You can simply give any `Object` to `toJson()`, the Json string will be generated.

The 3 basic data types in the JSON format, they are `String`, `Number` and `Boolean`, there are the mapping of data type between Gson and JSON.

Java Type	JSON Type
Character	String
String	String
Byte, Short, Integer, Long	Number
Float, Double	Number
Boolean	Boolean

> In Gson library, all Java primitive types will be treated as its wrapper type

Consider the following Java code:

```
String b = gson.toJson(new Boolean(true));
String i = gson.toJson(new Integer(Integer.MAX_VALUE));
String d = gson.toJson(new Double(Double.MAX_VALUE));
String c = gson.toJson(new Character('C'));
String s = gson.toJson("String");
String n = gson.toJson(null);
```

Their value after serialized into JSON by Gson:

```
true                    // the data type is Boolean
2147483647              // the data type is Number
1.7976931348623157E308  // the data type is Number
"C"                     // the data type is Stirng
"String"                // the data type is Stirng
null
```

The 2 structured data types in the JSON format, `Object` and `List`. Gson treats all Java `Object` as `Object` in JSON, excepted for the implementations of `Collection`. The type of `Array` and implementations of `Collection` are treated as JSON `List` in Gson.

Consider the following Java code:

```
List<String> list = new ArrayList<>();

Set<String> set = new HashSet<>();
set.add("set item 0");
set.add("set item 1");
set.add("set item 2");

String strings[] = {"string 0", "string 1", "string 2"};

Map<Integer, String> map = new HashMap<>();
map.put(0, "map item 0");
map.put(1, "map item 1");
map.put(2, "map item 2");
```

Their value after serialized into JSON by Gson:

```
// an empty list
[]

// the order of a set is determined by the hash value of the item
["set item 0","set item 2","set item 1"]

// array or any ordered list structure keep their order
["string 0","string 1","string 2"]

// maps are treated as an object/map in JSON and the order of its
// items are determined by the hash value of the key
{"0":"map item 0","1":"map item 1","2":"map item 2"}
```

Consider the following Java code:

Definition of `Car` and `Engine`:

```
public class Car {
        public Car() {
                this.brand = "TOYOTA";
                this.model = "PRIUS α";
                this.capacity = 7;
                this.engine = new Engine();
        }
        private String brand    = "TOYOTA";
        private String model    = "PRIUS α";
        private int    capacity = 7;
```

```
        private Engine engine   = new Engine();
}


public class Engine {

        public Engine() {
                this("TOYOTA", "2ZR-FXE", 1798, 13, new double[2], new double[2]);
                this.maxPowerRPM[0] = 99;
                this.maxPowerRPM[1] = 5200;
                this.maxPowerRPM[0] = 14.5;
                this.maxPowerRPM[1] = 4000;
        }

        public Engine(String brand, String model, double displacement,
                double compressionRate, double[] maxPowerRPM, double[] maxTorqueRPM) {
                this.brand = brand;
                this.model = model;
                this.displacement = displacement;
                this.compressionRate = compressionRate;
                this.maxPowerRPM = maxPowerRPM.clone();
                this.maxTorqueRPM = maxTorqueRPM.clone();
        }

        private String brand;
        private String model;
        private double displacement;
        private double compressionRate;
        private double maxPowerRPM[];
        private double maxTorqueRPM[];
}


String car = gson.toJson(new Car());
```

The serialized JSON text will look like this:

```
{
  "brand": "TOYOTA",
  "model": "PRIUS α",
  "capacity": 7,
  "engine": {
    "brand": "TOYOTA",
    "model": "2ZR-FXE",
    "displacement": 1798.0,
    "compressionRate": 13.0,
    "maxPowerRPM": [
      99.0,
      5200.0
    ],
    "maxTorqueRPM": [
      14.5,
      4000.0
```

```
    ]
  }
}
```

`Engine` itself is a separate class in Java. Therefore after the object `Car` serialized into JSON text, the value of object property `engine` contains a JSON object with the properties of an `Engine`.

> The text output by Gson will not be formatted unless the Gson instance you use is configured by `setPrettyPrinting`.

[Back to top]

Deserialize JSON with fromJson()

Gson can deserialize a JSON string to a Java Object with the method `fromJson()` of a `Gson` instance. This method requires 2 arguments, the JSON string and the Javatype of the targeted class.

Consider the following codes:

```
// the definition of class Car is the same as above
Car myCar = gson.fromJson(new FileReader("res/car.json"), Car.class);
System.out.println(myCar.toString());
System.out.println(new Car());
```

Content of car.json:

```
{
        "brand" : "HONDA",
        "model" : "ODYSSEY APEX",
        "capacity" : 8,
        "engine" : {
                "brand" : "HONDA",
                "model" : "i-VTEC DOHC",
                "displacement" : 2356.0,
                "compressionRate" : 10.1,
                "maxPowerRPM" : [
                        129.0,
                        6200.0
                ],
                "maxTorqueRPM" : [
                        23.0,
                        4000.0
                ]
        }
}
```

The output data:

```
Car [brand=TOYOTA, model=PRIUS α, capacity=7, engine=Engine [brand=TOYOTA,
        model=2ZR-FXE, displacement=1798.0, compressionRate=13.0,
        maxPowerRPM=[99.0, 5200.0], maxTorqueRPM=[14.5, 4000.0]]]
Car [brand=HONDA, model=ODYSSEY APEX, capacity=8, engine=Engine [brand=HONDA,
        model=i-VTEC DOHC, displacement=2356.0, compressionRate=10.1,
        maxPowerRPM=[129.0, 6200.0], maxTorqueRPM=[23.0, 4000.0]]]
```

In the output object `myCar`, the properties loaded from `car.json` will replace the default properties of the class `Car`.

[Back to top]

Fields Exclusion

Some fields of an object may use in Java program exclusively, and you don't want to serialse those fields. There are some methods to exclude specific field from JSON string generation.

1. By default any field with the value `null` will be excluded. If you want Gson serialize `null` values, add `serializeNulls()` to your `GsonBuilder`.

2. The `static` or `transient` modifier. Just likes using `Serializable`, `transient` fields will not be writen into `OutputStream` by `writeObject`.

   > If `excludeFieldsWithModifiers()` is used to configure the Gson instance, the default exclusion of modifier `static` and `transient` will be overriden.

3. The `@Expose` annotation. The Gson library provides an annotation `com.google.gson.annotations.@Expose` to set the field is or is not (de)serializable. The annotation `@Expose` takes 2 arguments to specify the (de)serializability of a field. By default `@Expose` makes a field both serializable and deserializable by Gson. Give parameter `serialize` or `deserialize` to the annotation to specifically set a field cannot be serialized or deserialized.

```
@Expose(serialize = false) // the field will not serialize by Gson
@Expose(deserialize = false) // the field will not deserialize by Gson
@Expose(serialize = false, deserialize = false) // the field will not serialize
                                                // and deserialize by Gson
```

4. The `ExclusionStrategy` interface. The Gson library provides an interface `com.google.gson.ExclusionStrategy` to set on a `GsonBuilder`. A `Gson` instance with

`ExclusionStrategy` will check a field shoud or should not (de)serialize by the `shouldSkipField()` and `shouldSkipClass()` methods implement from the `ExclusionStrategy` interface.

An example of using ExclusionStrategy:

```
public class ExcludeEngineStrategy implements ExclusionStrategy {
        @Override
        public boolean shouldSkipField(FieldAttributes f) {
                return f.getName().equals("engine")
                        || f.hasModifier(Modifier.STATIC);
        }
        @Override
        public boolean shouldSkipClass(Class<?> clazz) {
                return false;
        }
}
```

```
Gson gson = new GsonBuilder()
        .excludeFieldsWithModifiers(Modifier.TRANSIENT)
        .setExclusionStrategies(new ExcludeEngineStrategy())
        .setPrettyPrinting()
        .create();
        System.out.println(gson.toJson(new Car()));
```

The `ExcludeEngineStrategy` above will cause the `Gson` instance skip field named as "engine" and all `static` fields.

The output will looks like this:

```
{
  "brand": "TOYOTA",
  "model": "PRIUS α",
  "capacity": 7
}
```

There is no output data for the field engine.

There is another `Gson` instance with difference configuration:

```
Gson gson = new GsonBuilder()
        .excludeFieldsWithModifiers(Modifier.TRANSIENT)
        .setPrettyPrinting()
        .create();
```

If this `Gson` instance is used instead, the output will looks like this:

```
{
  "MODEL_CAR": {
    "brand": "Mercedes-Benz",
    "model": "GLS 350d",
    "capacity": 7,
    "engine": {
      "brand": "Mercedes-Benz",
      "model": "4MATIC G-TRONIC",
      "displacement": 2987.0,
      "compressionRate": 15.5,
      "maxPowerRPM": [
        192.4,
        3400.0
      ],
      "maxTorqueRPM": [
        63.2,
        2400.0
      ]
    }
  },
  "brand": "TOYOTA",
  "model": "PRIUS α",
  "capacity": 7,
  "engine": {
    "brand": "TOYOTA",
    "model": "2ZR-FXE",
    "displacement": 1798.0,
    "compressionRate": 13.0,
    "maxPowerRPM": [
      99.0,
      5200.0
    ],
    "maxTorqueRPM": [
      14.5,
      4000.0
    ]
  }
}
```


Because `excludeFieldsWithModifiers()` did not define `Modifier.STATIC`, the static field `MODEL_CAR` is output to the JSON string; engine is output to the JSON string.

[Back to top]

Version Support

The Gson library contains version support functionality. It can base on the version number on properties to decide whether or not the properties will be excluded. The method to enable using version support is annotating the properties with the annotation `com.google.gson.annotations.@Since` and using `setVersion()` in your `GsonBuilder`.

Consider the follow codes:

```
public class Car {

        public Car() {
                this.brand = "TOYOTA";
                this.model = "PRIUS α";
                this.capacity = 7;
                this.engine = new Engine();
        }

        public static Car MODEL_CAR = Car.createModelCar();

        private String brand;
        @Since(1.0)
        private String model;
        @Since(2.0)
        private int capacity;
        @Since(3.0)
        private Engine engine;



private static void noVersion() {
                Gson gson = new GsonBuilder()
                        .setPrettyPrinting()
                        .create();
                System.out.println(gson.toJson(new Car()));
}

private static void version1() {
        Gson gson = new GsonBuilder()
                .setVersion(1.0)
                .setPrettyPrinting()
                .create();
        System.out.println(gson.toJson(new Car()));
}

private static void version3() {
        Gson gson = new GsonBuilder()
                .setVersion(3.0)
                .setPrettyPrinting()
                .create();
        System.out.println(gson.toJson(new Car()));
}
```

If `version1()` is being called, its output the follwing:

```
{
  "brand": "TOYOTA",
  "model": "PRIUS α"
}
```

The fields annotated as version greater than 1.0 are excluded.

If `version3()` is being called, its output the follwing:

```
{
  "brand": "TOYOTA",
  "model": "PRIUS α",
  "capacity": 7,
  "engine": {
    "brand": "TOYOTA",
    "model": "2ZR-FXE",
    "displacement": 1798.0,
    "compressionRate": 13.0,
    "maxPowerRPM": [
      99.0,
      5200.0
    ],
    "maxTorqueRPM": [
      14.5,
      4000.0
    ]
  }
}
```

The fields annotated as version 3.0 or below are included. The fields belong to `Engine` are not annotated with `@Since` annotation therefore they are all included.

If `noVersion()` is being called, its output the follwing:

```
{
  "brand": "TOYOTA",
  "model": "PRIUS α",
  "capacity": 7,
  "engine": {
    "brand": "TOYOTA",
    "model": "2ZR-FXE",
    "displacement": 1798.0,
    "compressionRate": 13.0,
    "maxPowerRPM": [
      99.0,
      5200.0
    ],
    "maxTorqueRPM": [
      14.5,
      4000.0
    ]
  }
}
```

The `Gson` serialize all of the fields. Even if the fields are annotated with `@Since` annotation, without using `setVersion()` in the `GsonBuilder` will not enable the version support exclusion

functionality.

[Back to top]

Custom Conversion

The Gson library provides some customizations to paring and generating JSON strings for converting between Java type and custom JSON stirng.

Policies and Strategies

The Gson library provides two types of configuration to customize the (de)serialize process, they are policies and strategies. Policies are a bunch of pre-defined attributes tell how should the `Gson` works to (de)serialize an `Object`. And Strategies are interfaces that you need to implement before using it the customize the (de)serialization.

Using Policies to Configure Gson

There are 2 types of policy in Gson library, they are `FieldNamingPolicy` and `LongSerializationPolicy`.

The `FieldNamingPolicy` is used to configure how the `Gson` convert the name of fields to the keys(names) in a JSON `Object`. The policies can choose from the `FieldNamingPolicy` are listed below:

Policy	Field Name	Key Name
IDENTITY	simpleFieldName	simpleFieldName
LOWER_CASE_WITH_DASHES	simpleFieldName	simple-field-name
LOWER_CASE_WITH_DOTS	simpleFieldName	simple.field.name
LOWER_CASE_WITH_UNDERSCORES	simpleFieldName	simple_field_name
UPPER_CAMEL_CASE	simpleFieldName	SimpleFieldName
UPPER_CAMEL_CASE_WITH_SPACES	simpleFieldName	Simple Field Name

The `LongSerializationPolicy` is used to configure how the `Gson` convert `Long` into JSON string. There is two policies in `LongSerializationPolicy`, `DEFAULT` and `STRING`. Under `DEFAULT` policy, the `Gson` will serialize Java `Long` into Json `Number` as chapter 3.3 "Serialization" stated. Under `STRING` policy, the `Gson` will serialize Java `Long` into Json `String`.

Consider the following codes:

```
Gson gson = new GsonBuilder()
        .setPrettyPrinting()
        .setFieldNamingPolicy(FieldNamingPolicy.LOWER_CASE_WITH_DASHES)
        .create();
System.out.println(gson.toJson(Engine.createModelEngine()));
```

The output will look like this:

```
{
  "brand": "Mercedes-Benz",
  "model": "4MATIC G-TRONIC",
  "displacement": 2987.0,
  "compression-rate": 15.5,
  "max-power-r-p-m": [
    192.4,
    3400.0
  ],
  "max-torque-r-p-m": [
    63.2,
    2400.0
  ]
}
```

[Back to top]

Using Strategies to Configure Gson

There are 2 types of strategies in Gson library, they are `ExclusionStrategy` and `FieldNamingStrategy`.

The `ExclusionStrategy` is already stated in chapter 3.5 "Field Exclusion", and the `FieldNamingStrategy` is used to convert the name of fields into the key in JSON string, the translation between Java fields name and JSON keys name needs to be implemented by the user.

This is an example of using `FieldNamingStrategy`:

The `JavaFieldNamingPolicy.LOWER_CASE_WITH_DASHES` translates the name "RPM" into "r-p-m", this may not be what you are looking for. You can implement a `FieldNamingStrategy` to translate the name instead.

Implementation of `ShortenedNameLowerCaseDashesStrategy`:

```
public class ShortenedNameLowerCaseDashesStrategy implements FieldNamingStrategy {

        @Override
        public String translateName(Field f) {
                char originalChars[] = f.getName().toCharArray();
```

```
                String newName = "";
                boolean previousCapital = false;
                for (char originalChar : originalChars) {
                        boolean currentCapital = originalChar > 0x40
                                && originalChar < 0x5B;
                        newName += !previousCapital && currentCapital ? "-" : "";
                        newName += (char) (currentCapital ? originalChar + 0x20
                                : originalChar);
                        previousCapital = currentCapital;
                }
                return newName;
        }
}


Gson gson = new GsonBuilder()
        .setPrettyPrinting()
        .setFieldNamingStrategy(new ShortenNameLowerCaseDashesStrategy())
        .create();
System.out.println(gson.toJson(Engine.createModelEngine()));
System.out.println();
```

The output will look like this:

```
{
  "brand": "Mercedes-Benz",
  "model": "4MATIC G-TRONIC",
  "displacement": 2987.0,
  "compression-rate": 15.5,
  "max-power-rpm": [
    192.4,
    3400.0
  ],
  "max-torque-rpm": [
    63.2,
    2400.0
  ]
}
```

[Back to top]

Type Adapter

The `registerTypeAdapter()` can customize the conversion between JSON string and a type. You need to implement a `TypeAdapter` in order to cutomize the (de)serialization of a type.

This is an example of using TypeAdapter to implement the conversion between the class `Engine` and JSON string.

Implement a `TypeAdapter` for class `Engine` :

```
public class EngineTypeAdapter extends TypeAdapter<Engine> {

	@Override
	public void write(JsonWriter out, Engine value) throws IOException {
		if (value == null) {
			out.nullValue();
		}
		else {
			out.beginArray();
			out.value(value.getBrand());
			out.value(value.getModel());
			out.value(value.getDisplacement());
			out.value(value.getCompressionRate());
			out.beginArray();
			out.value(value.getMaxPowerRPM()[0]);
			out.value(value.getMaxPowerRPM()[1]);
			out.endArray();
			out.beginArray();
			out.value(value.getMaxTorqueRPM()[0]);
			out.value(value.getMaxTorqueRPM()[1]);
			out.endArray();
			out.endArray();
		}
	}

	@Override
	public Engine read(JsonReader in) throws IOException {
		if (in.peek().equals(JsonToken.NULL)) {
			return null;
		}
		Engine engine = new Engine();
		in.beginArray();
		engine.setBrand(in.nextString());
		engine.setModel(in.nextString());
		engine.setDisplacement(in.nextDouble());
		engine.setCompressionRate(in.nextDouble());
		in.beginArray();
		double d[] = new double[2];
		d[0] = in.nextDouble();
		d[1] = in.nextDouble();
		engine.setMaxPowerRPM(d);
		in.endArray();
		in.beginArray();
		d = new double[2];
		d[0] = in.nextDouble();
		d[1] = in.nextDouble();
		engine.setMaxTorqueRPM(d);
		in.endArray();
		in.endArray();
		return engine;
	}
}
```

Register the `EngineTypeAdapter` using `registerTypeAdapter`:

```
Gson gson = new GsonBuilder()
                .registerTypeAdapter(Engine.class, new EngineTypeAdapter())
                .setPrettyPrinting()
                .create();
```

Use the `Gson` instance to (de)serialize and `Car` :

```
String car = gson.toJson(Car.MODEL_CAR);
System.out.println(car);
System.out.println(gson.fromJson(car, Car.class));
```

The output will look like this:

```
{
  "brand": "Mercedes-Benz",
  "model": "GLS 350d",
  "capacity": 7,
  "engine": [
    "Mercedes-Benz",
    "4MATIC G-TRONIC",
    2987.0,
    15.5,
    [
      192.4,
      3400.0
    ],
    [
      63.2,
      24000.0
    ]
  ]
}
```

```
Car [brand=Mercedes-Benz, model=GLS 350d, capacity=7, engine=Engine
        [brand=Mercedes-Benz, model=4MATIC G-TRONIC, displacement=2987.0,
        compressionRate=15.5, maxPowerRPM=[192.4, 3400.0],
        maxTorqueRPM=[63.2, 24000.0]]]
```

The `write()` method of the `EngineTypeAdapter` serialize the `engine` into a nested JSON `List` , instead of the default serialize method into a JSON `Object` contains 2 JSON `List` .

The `read()` method of the `EngineTypeAdapter` deserialize the `engine` `List` and store its data into a new `Engine` instance, instead of returning a `Engine` with default properties.

[Back to top]

Alternative Libraries

There are more libraries provided in JSON.org, browse JSON.org at the bottom to see the list of libraries.

[Back to top]

Reference

- JSON.org
- The JSON Standard ECMA-404
- GitHub: Gson
- Maven: Gson
- Javadoc: Gson
- Gson 基礎教學
- Java JSON, tutorials.jenkov.com

[Back to top]