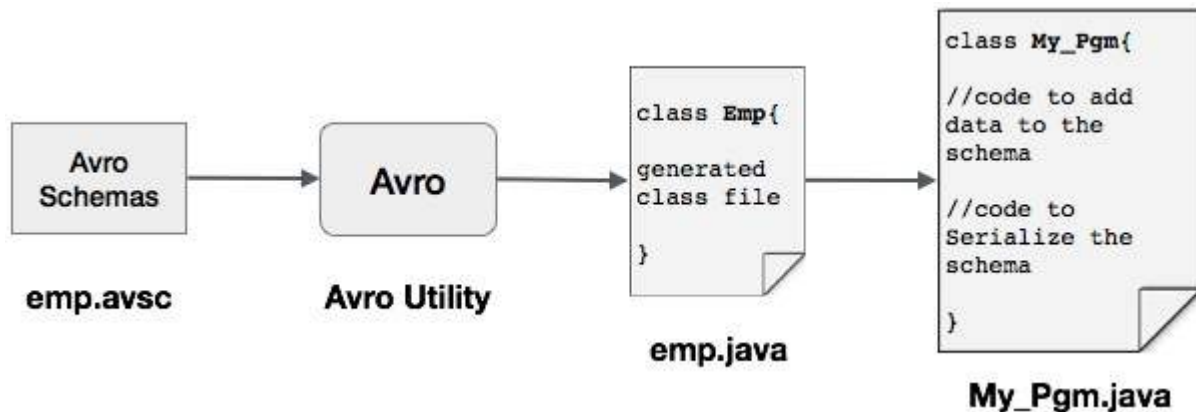


# AVRO - SERIALIZATION BY GENERATING CLASS

One can read an Avro schema into the program either by generating a class corresponding to a schema or by using the parsers library. This chapter describes how to read the schema **by generating a class** and **serialize** the data using Avro.

The following is a depiction of serializing the data with Avro by generating a class. Here, **emp.avsc** is the schema file which we pass as input to Avro utility.



The output of Avro is a java file.

## Serialization by Generating a Class

To serialize the data using Avro, follow the steps as given below –

- Define an Avro schema.
- Compile the schema using Avro utility. You get the Java code corresponding to that schema.
- Populate the schema with the data.
- Serialize it using Avro library.

## Defining a Schema

Suppose you want a schema with the following details –

Field	Name	id	age	salary	address
type	String	int	int	int	string

Create an Avro schema as shown below and save it as **emp.avsc**.

```
{
  "namespace": "tutorialspoint.com",
  "type": "record",
  "name": "emp",
  "fields": [
    {"name": "name", "type": "string"},
    {"name": "id", "type": "int"},
    {"name": "salary", "type": "int"},
    {"name": "age", "type": "int"},
    {"name": "address", "type": "string"}
  ]
}
```

## Compiling the Schema

After creating the Avro schema, we need to compile it using Avro tools. Avro tools can be located in **avro-tools-1.7.7.jar** file. We need to provide avro-tools-1.7.7.jar file path at compilation.

## Syntax to Compile an Avro Schema

```
java -jar <path/to/avro-tools-1.7.7.jar> compile schema <path/to/schema-file>
<destination-folder>
```

Open the terminal in the home folder. Create a new directory to work with Avro as shown below –

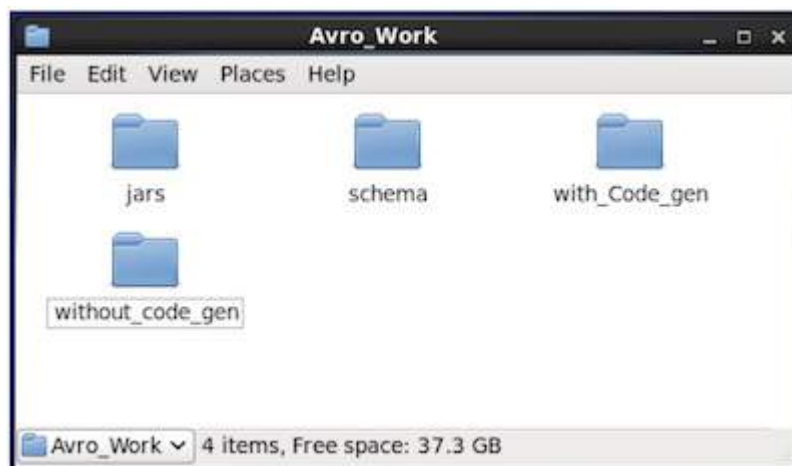
```
$ mkdir Avro_Work
```

In the newly created directory, create three sub-directories –

- First named **schema**, to place the schema.
- Second named **with\_code\_gen**, to place the generated code.
- Third named **jars**, to place the jar files.

```
$ mkdir schema
$ mkdir with_code_gen
$ mkdir jars
```

The following screenshot shows how your **Avro\_work** folder should look like after creating all the directories.



- Now **/home/Hadoop/Avro\_work/jars/avro-tools-1.7.7.jar** is the path for the directory where you have downloaded avro-tools-1.7.7.jar file.
- **/home/Hadoop/Avro\_work/schema/** is the path for the directory where your schema file emp.avsc is stored.
- **/home/Hadoop/Avro\_work/with\_code\_gen** is the directory where you want the generated class files to be stored.

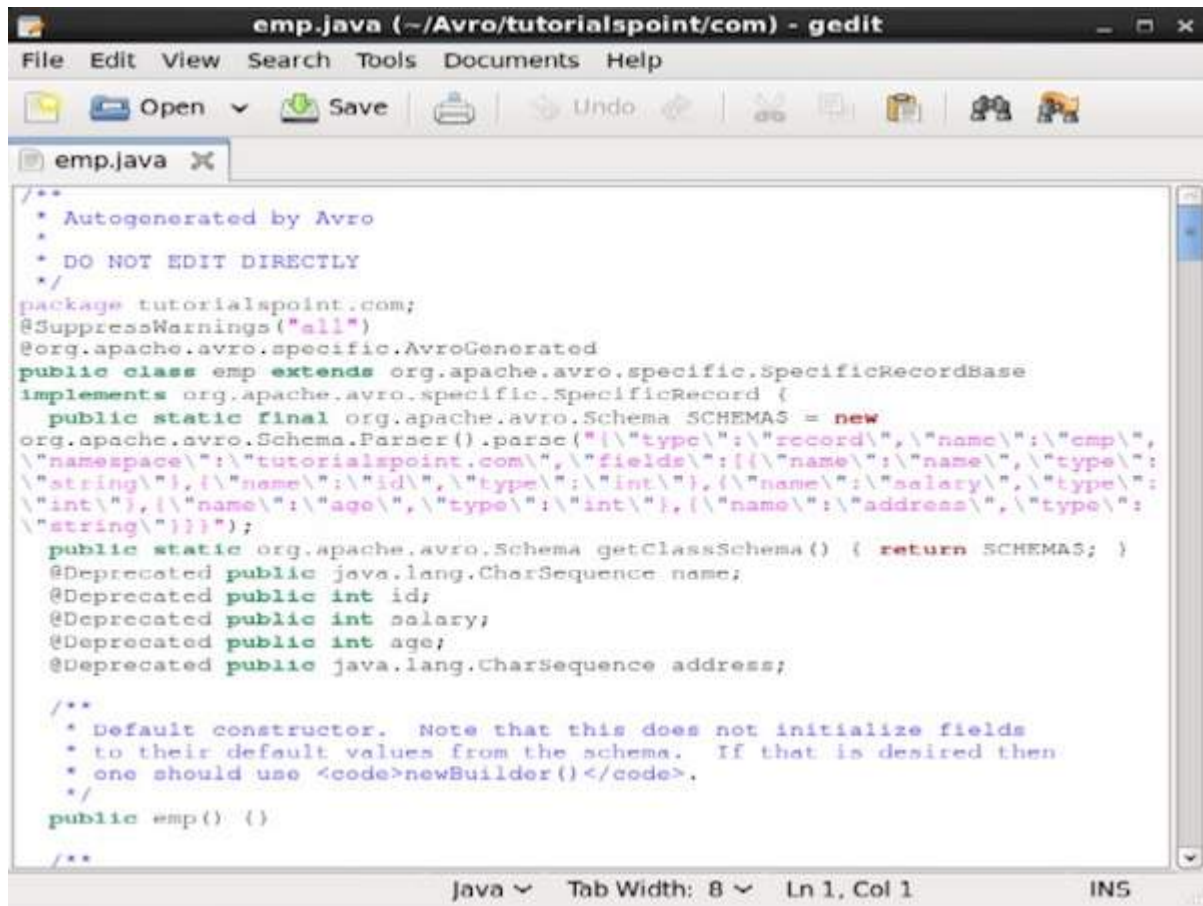
Compile the schema as shown below –

```
$ java -jar /home/Hadoop/Avro_work/jars/avro-tools-1.7.7.jar compile schema
/home/Hadoop/Avro_work/schema/emp.avsc /home/Hadoop/Avro/work/with_code_gen
```

After this compilation, a package is created in the destination directory with the name mentioned as namespace in the schema file. Within this package, the Java source file with schema name is generated. The generated file contains java code corresponding to the schema. This java file can be directly accessed by an application.

In our example, a package/folder, named **tutorialspoint** is created which contains another folder named **com** *sincethenamespaceistutorialspoint.com* and within it, resides the generated file **emp.java**.

The following snapshot shows **emp.java** –



```
emp.java (~/Avro/tutorialspoint/com) - gedit
File Edit View Search Tools Documents Help
emp.java x
/**
 * Autogenerated by Avro
 *
 * DO NOT EDIT DIRECTLY
 */
package tutorialspoint.com;
@SuppressWarnings("all")
@org.apache.avro.specific.AvroGenerated
public class emp extends org.apache.avro.specific.SpecificRecordBase
implements org.apache.avro.specific.SpecificRecord {
    public static final org.apache.avro.Schema SCHEMAS = new
org.apache.avro.Schema.Parser().parse("{\"type\":\"record\",\"name\":\"emp\",
\"namespace\":\"tutorialspoint.com\",\"fields\":[{\"name\":\"name\",\"type\":
\"string\"},{\"name\":\"id\",\"type\":\"int\"},{\"name\":\"salary\",\"type\":
\"int\"},{\"name\":\"age\",\"type\":\"int\"},{\"name\":\"address\",\"type\":
\"string\"}]");
    public static org.apache.avro.Schema getClassSchema() { return SCHEMAS; }
    @Deprecated public java.lang.CharSequence name;
    @Deprecated public int id;
    @Deprecated public int salary;
    @Deprecated public int age;
    @Deprecated public java.lang.CharSequence address;

    /**
     * Default constructor. Note that this does not initialize fields
     * to their default values from the schema. If that is desired then
     * one should use <code>newBuilder()</code>.
     */
    public emp() {}
}
```

This java file is useful to create data according to schema.

The generated class contains –

- Default constructor, and parameterized constructor which accept all the variables of the schema.
- The setter and getter methods for all variables in the schema.
- Get method which returns the schema.
- Builder methods.

## Creating and Serializing the Data

First of all, copy the generated java file used in this project into the current directory or import it from where it is located.

Now we can write a new Java file and instantiate the class in the generated file (**emp**) to add employee data to the schema.

Let us see the procedure to create data according to the schema using apache Avro.

### Step 1

Instantiate the generated **emp** class.

```
emp e1=new emp( );
```

### Step 2

Using setter methods, insert the data of first employee. For example, we have created the details of the employee named Omar.

```
e1.setName("omar");
e1.setAge(21);
e1.setSalary(30000);
e1.setAddress("Hyderabad");
e1.setId(001);
```

Similarly, fill in all employee details using setter methods.

### Step 3

Create an object of **DatumWriter** interface using the **SpecificDatumWriter** class. This converts Java objects into in-memory serialized format. The following example instantiates **SpecificDatumWriter** class object for **emp** class.

```
DatumWriter<emp> empDatumWriter = new SpecificDatumWriter<emp>(emp.class);
```

### Step 4

Instantiate **DataFileWriter** for **emp** class. This class writes a sequence serialized records of data conforming to a schema, along with the schema itself, in a file. This class requires the **DatumWriter** object, as a parameter to the constructor.

```
DataFileWriter<emp> empFileWriter = new DataFileWriter<emp>(empDatumWriter);
```

### Step 5

Open a new file to store the data matching to the given schema using **create** method. This method requires the schema, and the path of the file where the data is to be stored, as parameters.

In the following example, schema is passed using **getSchema** method, and the data file is stored in the path – **/home/Hadoop/Avro/serialized\_file/emp.avro**.

```
empFileWriter.create(e1.getSchema(), new
File("/home/Hadoop/Avro/serialized_file/emp.avro"));
```

### Step 6

Add all the created records to the file using **append** method as shown below –

```
empFileWriter.append(e1);
empFileWriter.append(e2);
empFileWriter.append(e3);
```

## Example - Serialization by Generating a Class

The following complete program shows how to serialize data into a file using Apache Avro –

```
import java.io.File;
import java.io.IOException;

import org.apache.avro.file.DataFileWriter;
import org.apache.avro.io.DatumWriter;
import org.apache.avro.specific.SpecificDatumWriter;

public class Serialize {
    public static void main(String args[]) throws IOException{

        //Instantiating generated emp class
        emp e1=new emp();

        //Creating values according the schema
        e1.setName("omar");
        e1.setAge(21);
```

```

e1.setSalary(30000);
e1.setAddress("Hyderabad");
e1.setId(001);

emp e2=new emp();

e2.setName("ram");
e2.setAge(30);
e2.setSalary(40000);
e2.setAddress("Hyderabad");
e2.setId(002);

emp e3=new emp();

e3.setName("robbin");
e3.setAge(25);
e3.setSalary(35000);
e3.setAddress("Hyderabad");
e3.setId(003);

//Instantiate DatumWriter class
DatumWriter<emp> empDatumWriter = new SpecificDatumWriter<emp>(emp.class);
DataFileWriter<emp> empFileWriter = new DataFileWriter<emp>(empDatumWriter);

empFileWriter.create(e1.getSchema(), new
File("/home/Hadoop/Avro_Work/with_code_gen/emp.avro"));

empFileWriter.append(e1);
empFileWriter.append(e2);
empFileWriter.append(e3);

empFileWriter.close();

System.out.println("data successfully serialized");
}
}

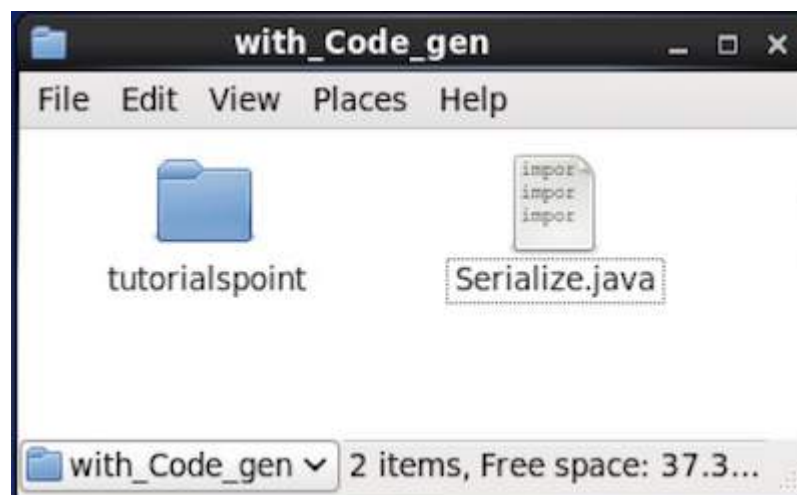
```

Browse through the directory where the generated code is placed. In this case, at **home/Hadoop/Avro\_work/with\_code\_gen**.

#### In Terminal –

```
$ cd home/Hadoop/Avro_work/with_code_gen/
```

#### In GUI –



Now copy and save the above program in the file named **Serialize.java** and compile and execute it as shown below –

```
$ javac Serialize.java
```

```
$ java Serialize
```

## Output

```
data successfully serialized
```

If you verify the path given in the program, you can find the generated serialized file as shown below.



Loading [Mathjax]/jax/output/HTML-CSS/jax.js