Exemple SPARK API

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Setup environnement

Pour commencer veuillez créer un dossier hdh_workspace par exemple qu'on va appeler $HDH_HOME.

```
# create the workspace anywhere you want
mkdir ~/hdh_workspace
export HDH_HOME=~/hdh_workspace
```

Installation de l’historian

Hurence Data Historian est composé de scripts et fichiers binaires qui permettent de travailler avec les time series et les chunks. Téléchargez la dernière version de l’historian à l’adresse suivante historian-1.3.5.tgz. Décompressez l’archive et entrez dedans, ensuite commencez l’installation en tapant la commande suivante :

```
sudo ./bin/install.sh
```

Pour tester notre api vous aurez besoin d’installez un IDE, dans notre cas nous allons utilizer IntelliJ IDEA: Créez un nouveau projet:

File > New > Project

Il faut spécifier Maven : un outil de gestion et automatisation de production des projets logiciels JAVA. Il faut choisir aussi la version 1.8 de java dans "project SDK" (il faut télécharger et installer le Java SE Development Kit).

Ensuite nommez votre projet et valider (dans notre cas on va l’appeller SPARK API tutorial).

Créez un dossier sous le nom "scala" sous le chemin SPARK API tutorial > src > main

et le convertir en un dossier "source root" pour qu’il soit compilable : clic droit sur le dossier, mark directory as puis source root.

Modification du fichier pom.xml

Maven nous offre la possibilité d'ajouter des bibliothèques tierces à notre application. il suffit alors d'ajouter une balise <dependency> sous la section <dependencies>. On commence par l'ajout de scala car notre SPARK API est codé en scala.

```
<dependency>
    <groupId>org.scala-lang</groupId>
    <artifactId>scala-library</artifactId>
    <version>2.11.12</version>
</dependency>
```

On aura besoin aussi de plusieurs autres bibliothèques comme :

spark-core:

```
<dependency>
    <groupId>org.apache.spark</groupId>
    <artifactId>spark-core_2.11</artifactId>
    <version>2.3.2</version>
    <exclusions>
        <exclusion>
            <groupId>log4j</groupId>
            <artifactId>log4j</artifactId>
        </exclusion>
    </exclusions>
</dependency>
```

Apache spark-sql:

```
<dependency>
    <groupId>org.apache.spark</groupId>
    <artifactId>spark-sql_2.11</artifactId>
    <version>2.3.2</version>
</dependency>
```

Apache spark mllib:

```
<dependency>
    <groupId>org.apache.spark</groupId>
    <artifactId>spark-mllib_2.11</artifactId>
    <version>2.3.2</version>
    <scope>runtime</scope>
</dependency>
```

Apache solr:

```
<dependency>
    <groupId>org.apache.solr</groupId>
    <artifactId>solr-core</artifactId>
    <version>8.2.0</version>
    <type>jar</type>
    <scope>compile</scope>
</dependency>
```

Spark solr:

```
<dependency>
    <groupId>com.lucidworks.spark</groupId>
    <artifactId>spark-solr</artifactId>
    <version>3.6.6</version>
</dependency>
```

log4j:

```
<dependency>
    <groupId>log4j</groupId>
    <artifactId>log4j</artifactId>
    <version>1.2.16</version>
</dependency>
```

le jar du loader (obtenu lors de l'installation de l'historian) :

```
<dependency>
    <groupId>org.example</groupId>
    <artifactId>loader</artifactId>
    <version>1.3.5</version>
    <scope>system</scope>
    <systemPath>$HDH_HOME/historian-1.3.5/lib/loader-1.3.5.jar</systemPath>
</dependency>
```

puis créez une section <build> et au-dessous d'elle créez une section <plugins> pour ajouter les balises de plugins:

maven-enforcer-plugin:

```
<plugin>
<groupId>org.apache.maven.plugins</groupId>
<artifactId>maven-enforcer-plugin</artifactId>
<version>1.4.1</version>
<executions>
    <execution>
        <goals>
            <goal>enforce</goal>
        </goals>
        <configuration>
            <rules>
                <bannedDependencies>
                    <excludes>
                        <!--implementation binding-->
                        <exclude>org.slf4j:slf4j-jdk14</exclude>
                        <exclude>org.slf4j:slf4j-nop</exclude>
                        <exclude>org.slf4j:slf4j-simple</exclude>
                        <exclude>org.slf4j:slf4j-jcl</exclude>
                        <exclude>org.slf4j:logback-classic</exclude>
                        <exclude>org.slf4j:log4j-over-slf4j</exclude>
                    </excludes>
                </bannedDependencies>
            </rules>
        </configuration>
    </execution>
</executions>
</plugin>
```

maven-surefire-plugin:

```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-surefire-plugin</artifactId>
    <version>2.22.2</version>
</plugin>
```

scala-maven-plugin:

```
<plugin>
    <!-- see http://davidb.github.com/scala-maven-plugin -->
    <groupId>net.alchim31.maven</groupId>
    <artifactId>scala-maven-plugin</artifactId>
    <executions>
        <execution>
            <id>scala-compile-first</id>
            <phase>process-resources</phase>
            <goals>
                <goal>add-source</goal>
                <goal>compile</goal>
            </goals>
        </execution>
        <execution>
            <id>scala-test-compile</id>
            <phase>process-test-resources</phase>
            <goals>
                <goal>testCompile</goal>
            </goals>
        </execution>
    </executions>
</plugin>
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-compiler-plugin</artifactId>
    <executions>
        <execution>
            <phase>compile</phase>
            <goals>
                <goal>compile</goal>
            </goals>
        </execution>
    </executions>
</plugin>
```

maven-compiler-plugin:

```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-compiler-plugin</artifactId>
    <executions>
        <execution>
            <phase>compile</phase>
            <goals>
                <goal>compile</goal>
            </goals>
        </execution>
    </executions>
</plugin>
```

Après avoir ajouté les bibliothèques que InetlliJ IDEA les a téléchargés.

Créez un package sous le dossier scala et créez un object scala sous ce package. dans l'exemple suivant le package est nommé spark et l'objet scala est nommé JustSimpleTest.

Exemple test de SPARK API

L'exemple suivant montre comment vous pouvez lire un fichier csv contenant des timeseries, le transformer (chunkifier) et puis l'injecter dans solr.

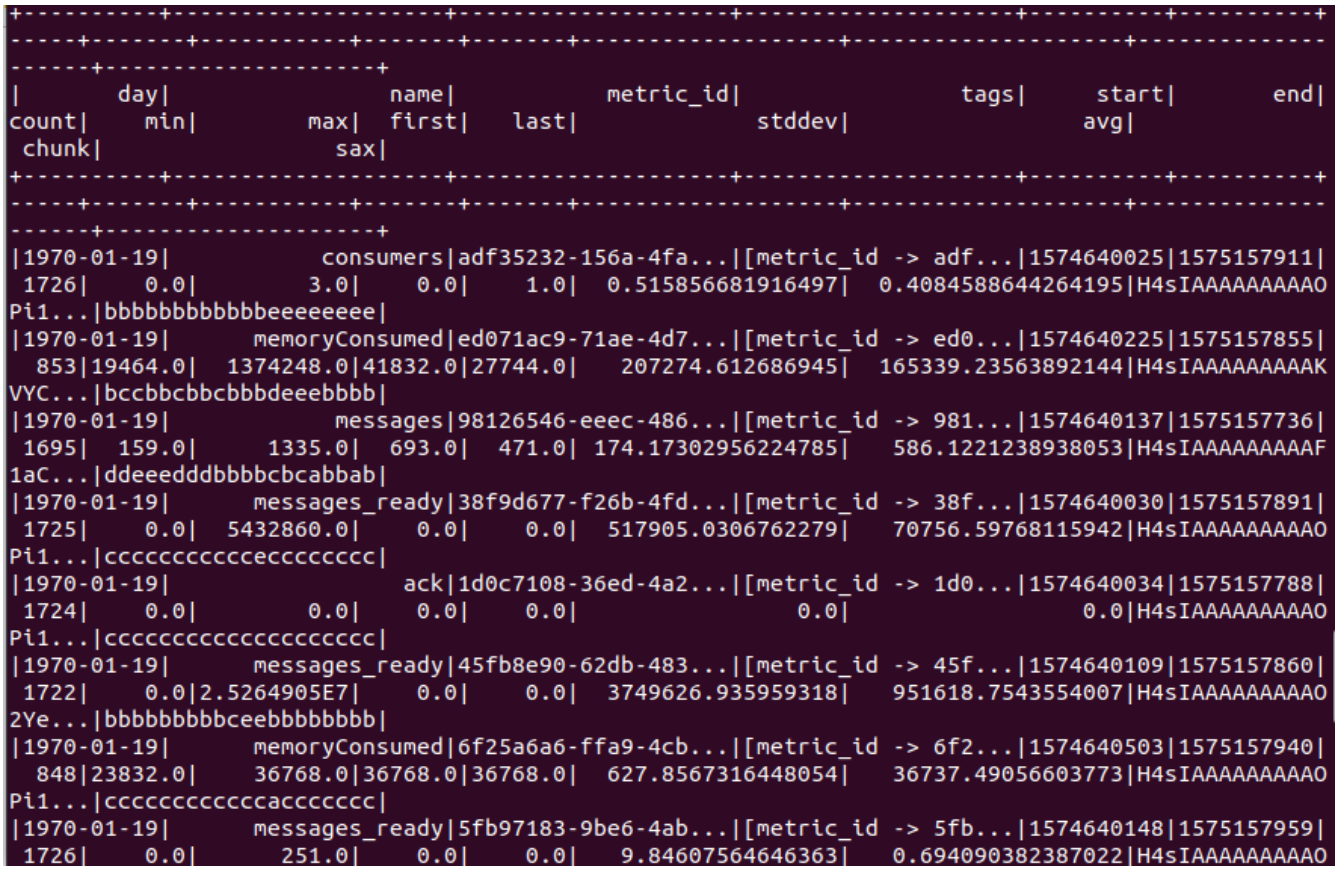
```
package spark

import com.hurence.historian.model.ChunkRecordV0
import com.hurence.historian.spark.ml.Chunkyfier
import com.hurence.historian.spark.sql
import com.hurence.historian.spark.sql.reader.MeasuresReaderType
import com.hurence.historian.spark.sql.reader.ReaderFactory
import com.hurence.historian.spark.sql.writer.{WriterFactory, WriterType}
import org.apache.spark.sql.SparkSession

object JustSimpleTest {

  def main(args: Array[String]): Unit = {
    val origpath = "$HDH_HOME/historian/loader/src/test/resources/it-data-
4metrics.csv.gz"

    val spark = SparkSession.builder
      .config("spark.master", "local[1]")
      .getOrCreate()

    import spark.implicits._


    val brutData = spark.read.format("csv").option("inferSchema",
"true").option("header", "true").load(origpath)
```

```
+--------------------+----------+------+-------------+----+----+----+----+
|           metric_id| timestamp| value|  metric_name|warn|crit| min| max|
+--------------------+----------+------+-------------+----+----+----+----+
|091c334c-a90a-4d8...|1575157723|13.375|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575157423|  13.5|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575157123|13.375|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575156823|  13.5|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575156523| 13.75|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575156223| 2.125|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575155923|  2.25|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575155623| 1.875|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575155323|   8.5|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575155023|17.375|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575154723|15.375|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575154424|  18.5|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575154124| 18.75|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575153824|  24.0|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575153524|18.125|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575153224|17.875|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575152924|14.375|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575152624|  20.0|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575152324|  12.0|cpu_prct_used|85.0|95.0|null|null|
|091c334c-a90a-4d8...|1575152025| 14.25|cpu_prct_used|85.0|95.0|null|null|
+--------------------+----------+------+-------------+----+----+----+----+
```

```
val reader = ReaderFactory.getMeasuresReader(MeasuresReaderType.GENERIC_CSV)
val measuresDS = reader.read(sql.Options(
  origpath,
  Map(
    "inferSchema" -> "true",
    "delimiter" -> ",",
    "header" -> "true",
    "nameField" -> "metric_name",
    "timestampField" -> "timestamp",
    "timestampDateFormat" -> "ms",
    "valueField" -> "value",
    "tagsFields" -> "metric_id,warn,crit"
  )))
//measuresDS.show(20,200)
```

```
+-------------+------+----------+-----------------------------------------------------------------------------------------------+----+-----+----+----------+
|         name| value| timestamp|                                                                                           tags|year|month|hour|       day|
+-------------+------+----------+-----------------------------------------------------------------------------------------------+----+-----+----+----------+
|cpu_prct_used|13.375|1575157723|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|  13.5|1575157423|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|13.375|1575157123|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|  13.5|1575156823|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used| 13.75|1575156523|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|2.125|1575156223|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used| 2.25|1575155923|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|1.875|1575155623|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|  8.5|1575155323|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|17.375|1575155023|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|15.375|1575154723|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used| 18.5|1575154424|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|18.75|1575154124|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used| 24.0|1575153824|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|18.125|1575153524|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|17.875|1575153224|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|14.375|1575152924|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used| 20.0|1575152624|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used| 12.0|1575152324|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
|cpu_prct_used|14.25|1575152025|[metric_id -> 091c334c-a90a-4d8f-ba75-2c936220cd64, warn -> 85.0, crit -> 95.0]|1970|    1|   6|1970-01-19|
+-------------+------+----------+-----------------------------------------------------------------------------------------------+----+-----+----+----------+
```

```
    val chunkyfier = new Chunkyfier().setGroupByCols(Array("name", "tags.metric_id"))
    val chunksDS = chunkyfier.transform(measuresDS).as[ChunkRecordV0]
```



```
    chunksDS.show()

    val writer = WriterFactory.getChunksWriter(WriterType.SOLR)
    writer.write(sql.Options("historian", Map(
      "zkhost" -> "localhost:9983",
      "collection" -> "historian",
      "tag_names" -> "metric_id,warn,crit"
    )), chunksDS)


    spark.stop()
  }
}
```

```
{
  "responseHeader":{
    "zkConnected":true,
    "status":0,
    "QTime":302,
    "params":{
      "q":"*:*",
      "_":"1594806762314"}},
  "response":{"numFound":220,"start":0,"maxScore":1.0,"docs":[
      {
        "chunk_day":"1970-01-19",
        "chunk_start":1574640025,
        "chunk_end":1575157911,
        "chunk_count":1726,
        "chunk_avg":0.4084588644264195,
        "chunk_stddev":0.515856681916497,
        "chunk_min":0.0,
        "chunk_max":3.0,
        "chunk_first":0.0,
        "chunk_last":1.0,
        "chunk_sax":"bbbbbbbbbbbbbeeeeeeee",
        "chunk_value":"H4sIAAAAAAAAAOPi1GSAAi5WhTVMBgxco3gUD3XMqrAaTAlQLUWTZyLpuqjvcvJMpp07Bt422tg8cH4Yeq4axYMTD93UQtjlw9lvtFY9+MNuONQgA2vTYDIdu2rquhC3aaSWJawCgyfkaIkpCbHB(
        "name":"consumers",
        "metric_id":"adf35232-156a-4fad-bde2-12467b76ca57",
        "id":"ad0ab3f35655f50f71b74049ae8a135314ba4129d0d1075b5e8587c9501fc7a2",
        "_version_":1672270699597660160},
      {
        "chunk_day":"1970-01-19",
        "chunk_start":1574640030,
        "chunk_end":1575157891,
        "chunk_count":1725,
        "chunk_avg":70756.59768115942,
        "chunk_stddev":517905.0306762279,
        "chunk_min":0.0,
        "chunk_max":5432860.0,
        "chunk_first":0.0,
        "chunk_last":0.0,
        "chunk_sax":"ccccccccccceccccccc",
        "chunk_value":"H4sIAAAAAAAAAOPi1GSAAi5WhTVMBgxc1MSsCqvBlADVTR5Ym+nrL/rZRj2bME0auLRA31AYeH8O9bRPuQ24TRgKrh/OeGiEztBw5dByKXk+Iey/oR8CQ98Hg9eX1LV14GOKfBcMvNsHl4uGeiuPl
        "name":"messages_ready",
        "metric_id":"38f9d677-f26b-4fda-b489-29b9e426a9c9",
        "warn":"100000.0",
        "crit":"500000.0",
        "id":"f9bedb67d4bb82258e5eac26e7042ad6b8f54a7b234d6d811c6523893b5865b8",
        "_version_":1672270700039110656},
```