Basic Principle

De Opera
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OPERA proposed a Java interface. To use this Java interface, the developer will have to:

- create the **OPERA** ReentrySimulation object with ...
  - an OperaConfigurationProperties object created from an existing file
  - a List<SolarActivityRow>] object including actual and predicted solar activities
- call for a given method of the ReentrySimulation object with a list of TLE as arguments

To obtain the results, some "getter" methods will be available depending on the type of computation.

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Sommaire

Do not forget to initialize PATRIUS dataset ...

As every computation using [PATRIUS], it is mandatory to well intialize a data set including main information to propagate trajectories (atmospheric models, third bodies ephemeris, UTC/TAI shifts, ...). Thanks to the additional jar available [here] and directly included in the opera-NN.n-jar-with-dependencies.jar file, it is really easy to do it by calling the OperaReadUtils.iniPatriusDataset() method.

```
// Patrius Dataset initialization (needed for example to get the UTC time)
OperaReadUtils.iniPatriusDataset(null);
```

Rather than to put **null** as input parameter of the OperaReadUtils.iniPatriusDataset() method, it is possible to give the name of a directory where additional data could be read.

How to initialize Opera Properties

A properties file is mandatory to initialize all the parameters needed to tune an **OPERA** computation. For more explanation about this kind of file, see here.

Thanks to the static method getConfigurationProperties() from OperaReadUtils class, we have just to precise the file path:

```
// Opera properties configuration
final OperaConfigurationProperties conf =
OperaReadUtils.getConfigurationProperties("data/opera-
configuration.properties");
```

How to initialize solar activity

Similarly, we can use another static method from the OperaSolarActivity class. This method (getSolarActivityFromFile()) needs as input parameters:

- the path for the file where actual activity is stored
- the path for the file where predicted activity is stored
- the CNES Julian date corresponding to the switch between actual and predicted activity

```
// Solar activity initialization
final String realPath = "data/solar/ACSOL_REAL.act";
final String predPath = "data/solar/ACSOL_PREDICTED.act";
final double switchCJD = 22700.0;
final List<OperaSolarActivityRow> solarActivity =
OperaSolarActivity.getSolarActivityFromFile(realPath, predPath, switchCJD);
```

Reentry simulation object

To create such an object only consists in calling the dedicated constructor with both previous OperaConfigurationProperties and List<OperaSolarActivityRow> objects:

```
// Reentry simulation creation
final OperaReentrySimulation simulation = new OperaReentrySimulation(conf,
solarActivity);
```

Getting list of TLE

Getting the list of TLE is done in two steps:

1. Getting all the available TLE for a given Norad Id calling the static OperaTleManager.readTLEs() method
2. Extract from this previous list the needed sublist corresponding to a given duration and an "End Of History" date calling the static OperaTleManager.selectTLEs() method

```
// TLEs initialization
final int noradId = 10479;
final SortedSet<TLE> tlesSet = OperaTleManager.readTLEs("data/tles", noradId,
true, "txt");
// TLEs selection
final double historyDuration = 80.;
final double endOfHistoryCJD = 22605.0;
final List<OperaTLE> tles = OperaTleManager.selectTLEs(tlesSet,
endOfHistoryCJD, historyDuration);
```

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