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## Abstract

A SixTrack [1] running environment was developed in CERN [2] to perform massive tracking campaigns. This environment is highly automated, from the production of the SixTrack input files to the post-processing of the output. It was designed for the CERN's LSF computer cluster, known as LX-BATCH. This running environment has been ported to the CAD's parallel multiprocessor computer Godzilla. As many features as possible have been kept. A rudimentary queue system has been designed to replace LSF.

## 1 Set-up

The user is assumed to have a large amount (roughly 1Gb) of disk space available for himself. This note will refer to this disk space as the user's SIXTRACK directory, which should be located in his home directory. This is the equivalent directory to the w1 of [2]. Most of the scripts are written for the Korn Shel (ksh). The user needs to check the availability of this shell by, for instance, typing `ksh` on the prompt. If this shell is not available the user should contact the system administrator.

The Linux version of the SixTrack running environment is located at:

```
/misc/rap/cvsrelease/tools/SixTrack/SIXTRACK.tar
```

This file has to be copied to the user's home directory and the command `tar -x SIXTRACK.tar` has to be run to extract the files. This will create the necessary entire directory subtree starting with the SIXTRACK directory and the sub-directory COREHOME. The user only needs to do one small editing, in the text file

```
SIXTRACK/COREHOME/track/sixjobs/GOD
```

he has to introduce his user-name in the line starting with `username=`.

## 2 Overview

This environment runs exactly as [2] with three main differences:

- No direct interface with MADX has been provided. The input files `fort.3.mother1`, `fort.3.mother2`, `fort.2` and `fort.16` have to be produced by the user and copied to the directory

```
SIXTRACK/COREHOME/track/v1/s0/<LHCDescrip>
```

where LHCDescrip is any string that characterizes the lattice. The files `fort.2` and `fort.16` have to be renamed as `fort.2_1` and `fort.16_1` and gzipped. An example is provided in the directory `SIXTRACK/COREHOME/track/v1/s0/2SlicesBB`, which is a model of the Blue ring with magnetic errors and four beam-beam interactions.

- The jobs are firstly placed in the file `SIXTRACK/COREHOME/track/sixjobs/JOBSINQUEUE` and then distributed by running `GOD`. This will be further discussed.
- There is no available tape-based back-up system and therefore this feature has been removed.

The run environment is a collection of four scripts which are all run from the directory

```
SIXTRACK/COREHOME/track/sixjobs/
```

They are normally run in the following order:

1. `run_six` This puts SixTrack jobs in the `JOBSINQUEUE` file.
2. `GOD` This distributes the jobs among the Godzilla processors. Only one job per processor is run at a time for optimizing machine resources.
3. `run_join10` This gathers already tracked jobs together and produces combined output files.

4. **run\_post** This analyses either individually tracked jobs or jobs that have been combined using **run\_join10**.

The scripts should normally be edited beforehand to specify the user's requirements. The user's favorite editing package may be used for this. The following changes are required to all scripts before running:

**basedir** This is the path to user's SIXTRACK directory.

**LHCVers** It is set to 1. The user can change this if he wants to follow a version scheme for archive purposes.

**LHCSubVers** It is set to 0. Idem as previous item.

**LHCDescrip** The name of the directory with the input files located at `SIXTRACK/COREHOME/track/v1/s0/`. In the example given this is 2SlicesBB.

**ista & iend** These are set to 1 in the example. These would allow the use of a large set of input files placed in the same directory with names: `fort.2_1`, `fort.2_2`, `fort.2_3`, and so on.

### 3 Tidying up after SixTrack

The tracking takes place in sub-directories below `SIXTRACK/tmp`. This directory has to be removed after all the jobs have finished for freeing disk space. The file

`SIXTRACK/COREHOME/track/sixjobs/JOBSINQUEUE`

has to be also removed after all the jobs have finished. Not removing this file would cause the re-submission of the same jobs in the following run.

### 4 Concluding remarks

The precise description of the contents of the different scripts is available in [2]. The differential algebra type of run has not been tested in this new version of the running environment. The user is encouraged to contact the author for questions, bug reports or possible improvements.

### Acknowledgements

Thanks to Yun Luo who dedicated time in successfully testing this environment. Thanks to Frank Schmidt for providing a bug-free version of SixTrack. The author is thankful to Mark Hayes for his comprehensible programming style. Thanks also go to Wolfram Fischer for motivating this work.

### References

- [1] F. Schmidt, "SixTrack: Version 3, Single Particle Tracking Code Treating Transverse Motion with Synchrotron Oscillations in a Symplectic Manner, User's Reference Manual" , CERN/SL/94 56 (AP)  
(see also <http://wwwslap.cern.ch/frs/Documentation/doc.htmlx>).
- [2] M. Hayes, F. Schmidt, "Run Environment for SixTrack" CERN LHC Project Note 300, July 2002.