SixDesk Scripts – an Update

A. Mereghetti
Special thanks to:
• R. De Maria, M. Giovannozzi, I. Zacharov for stimulating discussions and guidance;
• E. McIntosh and F. Schmidt, for having given us the present system!
• P.D. Hermes and F. Van der Veken, for continuous feedback on new scripts and help with coding;
Outline

• Rationale Behind Changes
• Present Workflow and Updates (HTCondor)
• A Demo
• Outlook
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Rationale – *Foreseen* Changes

1. **AFS phasing out** (mv home folders by 2017… - [J. Iven](#), 2\(^{\text{nd}}\) ABP CWG meeting, 2016-09-29):
   - Potential migration to **EOS**, but with critical points:
     - Limit to 1M files (total per user);
     - System very slow when dealing with many small files → way better behavior with few big files;
     - SQL db (eg 6DB) basically un usable (TBC);
     - Problems of synchronization between redundancy images of files (TBC);
   - Personally not fully convinced by proposed solution → further iteration with IT;

2. **HTCondor** as replacement of LSF, and as interface to BOINC;

3. **New SixTrack features**, requiring new input parameters (i.e. new blocks in fort.3 treated by SixDesk): FMA, wires for bb compensation, eLenses, .zip functionality, collimation, …

4. **New variables** to be added to scans – eg: x-ing angle, octupole / chroma (now outside SixDesk), momentum, …;
Rationale – *Foreseen Changes* (II)

5. **Trash bin** mechanism, in case user buffer dir is full…

6. Other additions:
   - Scan on a squared domain in tune space, not only on a line;
   - Extend use of SixDesk to FCC - e.g. integer part of tunes to be correctly represented;
Rationale – *Odd* Behaviors

AFS `work.boinc` volume (SPOOLDIRs) becoming un-responsive:

- **BOINC server:** dispatching WUs to volunteers and validation/assimilation of results gets BLOCKED!
- **User side:** submission of WUs to BOINC (`run_six`) and retrieval of results (`run_results`) slowed down a lot;

**Countermeasures:**
- Auto-restart of server where `work.boinc` volume is located;
- Reduce load by scripts;
Random problems in AFS / lxplus, mainly with run_six:

1. Segmentation faults:
   - The script stops, without much info useful for debugging;
   - Painful to restart submission;
   - Suspect: failures taking place at calling awk / gawk / sed;
   - Countermeasures:
     - Use bash built-in functionalities as much as possible, skipping external components (awk / gawk / sed);
     - Avoid tmp files;
     - Re-factorize code, optimizing operations as much as possible (zip/gzip, setacl, …)

2. Generation of empty strings of study names:
   - Dissemination of files in track/ folder;
   - Entire dirs of MadX seeds being removed! → incomplete studies;
   - Countermeasures:
     - Generalized multiple trial algorithm;
Rationale – *Odd* Behaviors (III)

Random problems in AFS / lxplus, mainly with run_six:

3. **Sed failures:** “read error on stdin: Bad address”
   - Direct consequence: generation of empty strings;
   - Countermeasures:
     - Generalized multiple trial algorithm;

4. **DB corruption:**
   - run_incomplete_* becomes un-usable;
   - Counter measures:
     - Fixing DB (taskids, incomplete_/completed_cases, my*, lsfjobs/boincjobs files) from existing info (thanks to PDHermes!);

5. **Other failures:** `bsub`, `kinit`, `cp-ing` to BOINC buffer…
   - Counter measures:
     - Generalized multiple trial algorithm;
Rationale – Miscellanea

1. Separate tools from workspace:
   • whenever an update is available, a user does not need to go through all their workspaces;

2. Central management of scripts:
   • Scripts are stored in a shared area on AFS: /afs/cern.ch/project/sixtrack/SixDesk_utilities
   • It is easier to make sure that all users use the latest version!

3. Some general clean-up and down-sizing of code, for better and faster maintenance (hopefully!);
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Present Workflow

General workflow foresees:
1. First job submission to BOINC:
   - Very large CPU power, though ETA is floating (days/weeks/months);
   - Completion of most of the jobs;
2. Second job submission to LSF:
   - Finite CPU power, and ETA more under control;
   - Completion of missing jobs;

Submission to BOINC is essential to keep load on LSF at a reasonable level!

<table>
<thead>
<tr>
<th>step</th>
<th>script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up of study</td>
<td>set_env</td>
</tr>
<tr>
<td>Input generation</td>
<td>run_mad6t</td>
</tr>
<tr>
<td>Submit to BOINC</td>
<td>run_six</td>
</tr>
<tr>
<td>Retrieve results</td>
<td>run_results</td>
</tr>
<tr>
<td>Re-submit to LSF</td>
<td>run_incomplete_cases_lsf</td>
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<tr>
<td>Retrieve results</td>
<td>run_status</td>
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</table>
BOINC Is a Vital Resource

BOINC server status
(1st March 2017)

Auto-restart of work.boinc volume (thanks to IT): seems not to be due to large traffic of WUs from/to volunteers…

SixTrack app on BOINC
(1st March 2017)
BOINC Is a Vital Resource (II)

(Cumulative) submissions (1st March 2017)

Approaching limit of BOINC server in receiving new work from users!

~5.8M WUs being processed in 43 d (looming IPAC/LARP…)

…more to come!!!

SixTrack app on BOINC (1st March 2017)
New Scripts

- New scripts are available in shared space of AFS:
  /afs/cern.ch/project/sixtrack/SixDesk_utilities
  - dev/ : most recent stable updates;
  - pro/ : production version (previous version with most recent updates);
  - old/ : previous pro/ version;

- Development being tracked in Git:
  https://github.com/amereghe/SixDesk/tree/isolateScripts

- New scripts:
  - Presently, only management of simulations → for analysis of results: 6DB…;
  - contained in utilities/, in sub-folders divided according to implementation language;
  - ported to bash → calls to external scripting languages kept (sed / awk / …);
  - Code refactoring + use of getops:
    - Reduce redundant lines / functionalities to essential minimum;
    - Possible to collect all concerned lines of code in very few files while triggering specific actions;
    - Each script must be called with terminal-line arguments;
    - Mini help / how-to-use if no argument is given;
  - Not all functionalities have been fully ported to new scripts (e.g. run_results) → old ones are available in new path!
- templates/ folder
Overview of Recent Improvements

- Mainly in run_six.sh, but not only:
  - Some scripts have been (almost) fully re-written: set_env, run_mad6t, run_six;
  - All the others: collected in one place only;
- In general: trying to reduce load on OS/FS, minimizing operations to bare essential ones:
  - gzip/gunzip, cp, use of tmp files;
  - awk/sed calls replaced by built-in bash string manipulation;
  - points in scan computed only before the big loop in run_six.sh, …;
- Random errors:
  - Glitches in OS: introduced a generalised multiple trial algorithm, used in strategic positions;
  - Warning email to admin anytime algorithm is used, error email also sent to user when algorithm fails – mail contains also dump of envs;
  - Fatality: -R option, to resume submission from where it was interrupted;
- Treating any tune / amplitude / angle values – limitation on format of integer / fractional parts no longer there;
- Tune scan not only on line but also on squared domain → SixTrack!
- Trash bin / megazip mechanisms – retrieval of trashed results still manual…
- Checks of buffer dirs of old studies;
- Reworked sixdeskmess syntax (thanks to PDHermes):
  - Reduction of number of code lines;
  - Removed auto-logging → anyway, it does not capture STDERR!
- Porting to HTCondor;
## New Workflow

<table>
<thead>
<tr>
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<th>New script</th>
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<td>mad6t.sh</td>
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<td>run_six.sh</td>
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Recent additions:

- **Control.sh**:
  - Teeing of STDOUT / STDERR to a log file;
  - Suitable for acrontab jobs;
  - List of studies / workspaces can be provided on terminal line or via txt file → manage entire workspaces!
- **backup.sh**:
  - Back up (archiving) complete studies (no longer single points), no matter the platform;
  - To EOS/CASTOR/local path;
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Few Notes

- Aim: to show new scripts and their basic use → more infos available in the twiki and in the help of each scripts;
- Additionally, give an insight to use of HTCondor:
  - All you have to do is to set: `export platform=HTCONDOR;`
  - All the rest is for your education;
  - Useful commands in HTCondor: `condor_q`, `condor_rm`;
- This morning, AFS issues when using HTCondor!
  → IT partner on vacation for a week, more news asap!
- Latest news on batch system (this afternoon!):
  - 18th Apr 2017: start of grace period (1 month), i.e. 50% HTCondor, 50% LSF;
  - From mid May: 90% HTCondor, 10% LSF, for ~6 months;
  - Afterwards, only HTCondor;
- Demo still makes use of my private version of scripts – recent bug fixes, will commit asap!
Key Commands

- Set path var (bash):
  ```bash
  export TOOLSdev=/afs/cern.ch/project/sixtrack/SixDesk_utilities/dev
  ```
- Set study:
  ```bash
  ${TOOLSdev}/utilities/bash/set_env.sh -s
  ```
- Submit MADX jobs:
  ```bash
  ${TOOLSdev}/utilities/bash/mad6t.sh -s
  ```
- First Submission (to BOINC):
  ```bash
  ${TOOLSdev}/utilities/bash/run_six.sh -a -p BOINC
  ```
- Retrieve results from BOINC:
  ```bash
  ${TOOLSdev}/utilities/bash/run_results
  ```
- Submit missing jobs:
  ```bash
  ${TOOLSdev}/utilities/bash/run_six.sh -i -s -p HTCONDOR
  ```
- Update DBs:
  ```bash
  ${TOOLSdev}/utilities/bash/run_status
  ```
Key Commands (II)

• Resume submission after killing:
  ${TOOLSdev}/utilities/bash/run_six.sh -a -R <last_WU_name>

• Selective submission:
  ${TOOLSdev}/utilities/bash/run_six.sh -s -S

• Example of acrontab job for retrieving results:
  0 0,6,12,18 * * * lxplus.cern.ch
  /afs/cern.ch/user/a/amereghe/private/repos/SixDesk/utilities/bash/control.sh -R
  -f ~/studies.lis >> /dev/null 2>&1

• Backing up to EOS (no need to set up env vars!):
  ${TOOLSdev}/utilities/bash/backUp.sh -d <study_name>

• Restore back up from EOS (no need to set up env vars!):
  ${TOOLSdev}/utilities/bash/backUp.sh -d <study_name> -R
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Outlook – High Priority

• Update SixTrack exes (thanks to Kyrre and James for new compilation procedure – very effective!) on BOINC and lxplus (LSF/HTCondor), to have new features in: fma, wires, eLenses, ZIPF, fcc lattice (bignblz), various improvements in DYNK, bignpart;
  • User decides flavor of exe on BOINC;
  • Adapt run_status / run_results to ZIPF functionality;

• Submission to HTBOINC:
  • Removal of spooldirs!

• Very long simulations;

• Add new parameter scans:
  • Momentum, collimation, etc…
  • Incorporate as much as possible about the scan in .mask file, and leave the rest to SixTrack input parameters;

• Finalize test suite → anyone willing to have a particular case to be constantly checked at every release, please send me sixdeskenv / sysenv / .mask / .db;

12 Apr 2017
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Outlook – Mid / Low Priority

- **Fixing DB** (all DB files! - PDHermes);
- **Faster status** of study (FVanDerVeken);
- **Archiving** of study (FVanDerVeken);
- **Import run_results / run_status functionality in run_six.sh**:
  - try to make these tools less demanding on system;
  - Lower number of code lines;
- **Parallelization** of tasks;
- **User workspace**:
  - Folder structure;
  - Merge long / short / DA type of simulations:
    - At declaration of input parameters;
    - At handling of files / submission of jobs;
    - Only one input file among sixdeskenv / sysenv;
- **Cleaning**:
  - All checks performed at set_env.sh;
  - Remove:
    - BNL / bignblz / test flags;
    - Rm superseded platforms: CPSS, GRID;
Final Remarks

• If you use BOINC for producing results, please remember to acknowledge the BOINC volunteers in your papers, as done here:
  “The volunteers of LHC@home are warmly thanked as, without their contribution of CPU-time, the intense tracking campaign reported in this paper would not have been possible.”

• I should update the list of papers with results from BOINC volunteers, quoted on BOINC web page (dates back to 2013!!) – please send me any new contribution since last year!

• Whoever wants to help with discussions / feedback / maintenance / coding / development is more than welcome!

• 8th BOINC pentathlon (message boards announcement – thanks to E. McIntosh)

• Additional info:
  • New scripts:
    • twiki page → in continuous update, so please be patient! → help is more than welcome!
    • Development in Repo on GitHub;
  • HTCondor: CERN guide / Submit guide;
Back up slides
The idea is to have:
- All files / folders in only one path;
- Minimize number of links;