Tools for understanding file I/O patterns produced by LSST

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Goal

- Ongoing work aiming at **understanding the file I/O patterns** induced by LSST stack

- Ultimate goal: to identify what data storage platform best suits the needs of LSST

  or alternatively, modify LSST software to take into account the intrinsic limitations of the available storage platforms

Current status

- Developed FUSE-based synthetic file system to **intercept**, **trace** and **forward** I/O operations to the target underlying file system

  `open, read, write, close, flush, stat, fsstat, …`

- Inspired by existing tools: systemTap, strace, dtrace, …

  none of them fully satisfying for this particular use case

- Features

  Works on both Linux and MacOS X

  No superuser privilege required

  Stand-alone executable

  Focus exclusively on I/O operations

  Generates easy-to-parse text files: CSV and JSON initially

Usage example

- To trace operations on files under `$HOME/Temp`, mount the file system at `$HOME/trace`

```
$ tracefs  --target=$HOME/Temp  --mount=$HOME/trace
```

- All the operations referring to files under `$HOME/trace` will be traced

```
$ cat $HOME/trace/hello.txt
```

will produce

```
{"Uid":501,"Gid":20,"Pid":8058,"User":"fabio","Group":"staff",
"Process":"cat","OpType":"access","Start":"2015-02-11T14:38:52.807023059+01:00","End":"2015-02-11T
14:38:52.807069488+01:00","Path":"/Users/fabio/Temp/hello.txt","Mask":4}

{"Uid":501,"Gid":20,"Pid":8058,"User":"fabio","Group":"staff",
"Process":"cat","OpType":"openfile","Start":"2015-02-11T14:38:52.807250079+01:00","End":"2015-02-1
1T14:38:52.807299616+01:00","Path":"/Users/fabio/Temp/hello.txt","IsDir":false,"Flags":0,"Perm":0}

{"Uid":501,"Gid":20,"Pid":8058,"User":"fabio","Group":"staff",
"Process":"cat","OpType":"read","Start":"2015-02-11T14:38:52.807557872+01:00","End":"2015-02-11T14
:38:52.808424381+01:00","Path":"/Users/fabio/Temp/hello.txt","Offset":0,"Size":19,"BytesRead":19}

{"Uid":501,"Gid":20,"Pid":8058,"User":"fabio","Group":"staff",
"Process":"cat","OpType":"flush","Start":"2015-02-11T14:38:52.8086749+01:00","End":"2015-02-11T14:
38:52.808700451+01:00","Path":"/Users/fabio/Temp/hello.txt"}

{"Uid":501,"Gid":20,"Pid":8058,"User":"fabio","Group":"staff",
"Process":"cat","OpType":"releasefile","Start":"2015-02-11T14:38:52.80884041+01:00","End":"2015-02
-11T14:38:52.808854485+01:00","Path":"/Users/fabio/Temp/hello.txt","IsDir":false}
```

Current work

- Developing tools to exploit trace files

Python notebook

Source code

- Source code and documentation will be soon on Github