Testing your code for security issues with automated fuzzing

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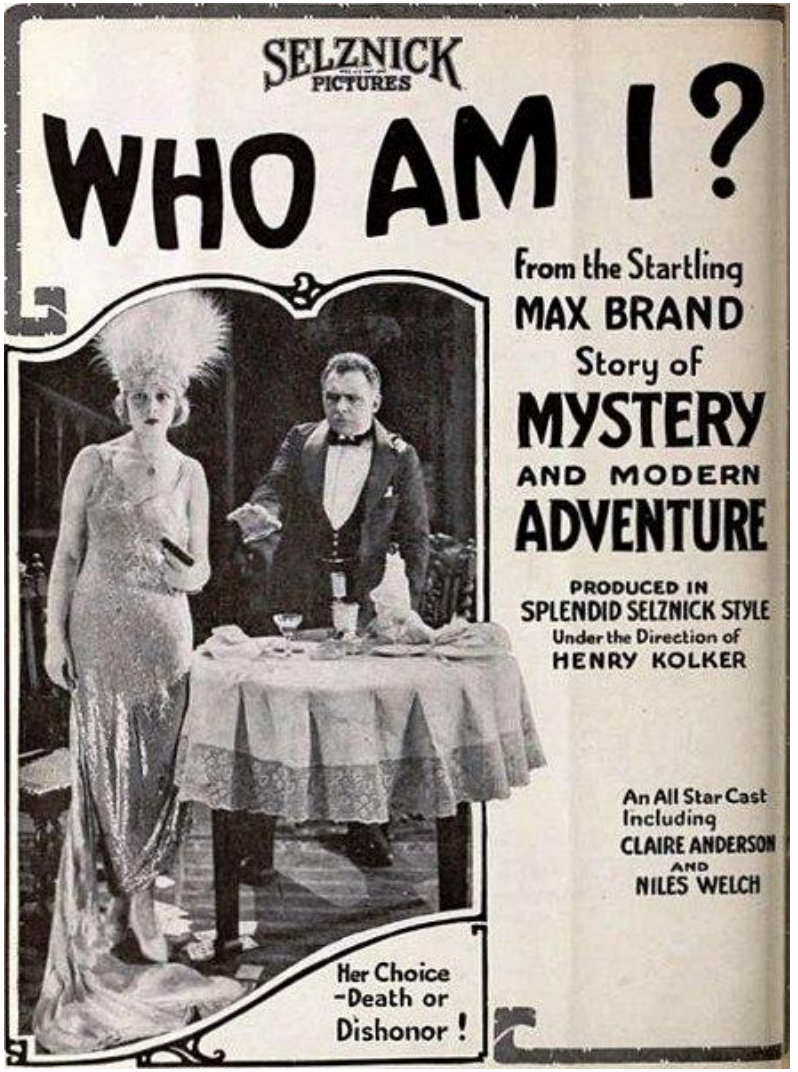
Akademy2019

Who is this?

In KDE for a while:

- KPDF/Okular
- Translations
- Releases
- kdegames
- kdeedu
- KDE España
- KDE e.V.
- A little bit of everything :)

NOT A SECURITY EXPERT



Which kind of security issues are we talking about?

The issues found by this kind of tools are generally related to wrong memory uses like uninitizalized variables or using already freed memory.

These errors typically mean that the application will behave incorrectly either by doing unexpected things or simply crashing.

People with more experience than me are able to turn this memory related crashes into code execution exploits.

Which tools do we have to detect such issues?

- The Operating System

  If your application uses memory incorrectly it will probably crash, making sure that doesn't happen it's a good first step ;)

- Valgrind

  valgrind will help us find memory errors. It's main problem is the huge penalty paid regarding resourge use

- ASAN/MSAN/UBSAN

  The compilier sanitizers instrument the code at compile time. They have a functionality very similar to valgrind but the resource usage is much smaller (though using them is from harder to way harder)

What is fuzzying?

Fuzzying is a tecnique based in sending random/garbage values to a given application or function.

This way it tests the robustness of that code.

The most basic way is just calling a given binary with all possible inputs and make sure it doesn't explode.

```
echo "a" | pdfinfo -
echo "b" | pdfinfo -
echo "c" | pdfinfo -
echo "aa" | pdfinfo -
```

What is oss-fuzz?

oss-fuzz is a fuzzying engine developed by Google

[well the engine itself is called libFuzzer ;)].

It links with the code and is coverage based meaning it is able to lean and maximize coverage with the least number of “random” inputs.

```
void theFunction(int x) {
    if (x > 50) {
    } else {
    }
}
```

What is oss-fuzz? (II)

oss-fuzz is a set of docker images (with the last version of clang, libFuzzer, etc) and small test applications that exercise free software projects.

At this point there are around 240 projects

https://github.com/google/oss-fuzz/tree/master/projects

What is oss-fuzz? (III)

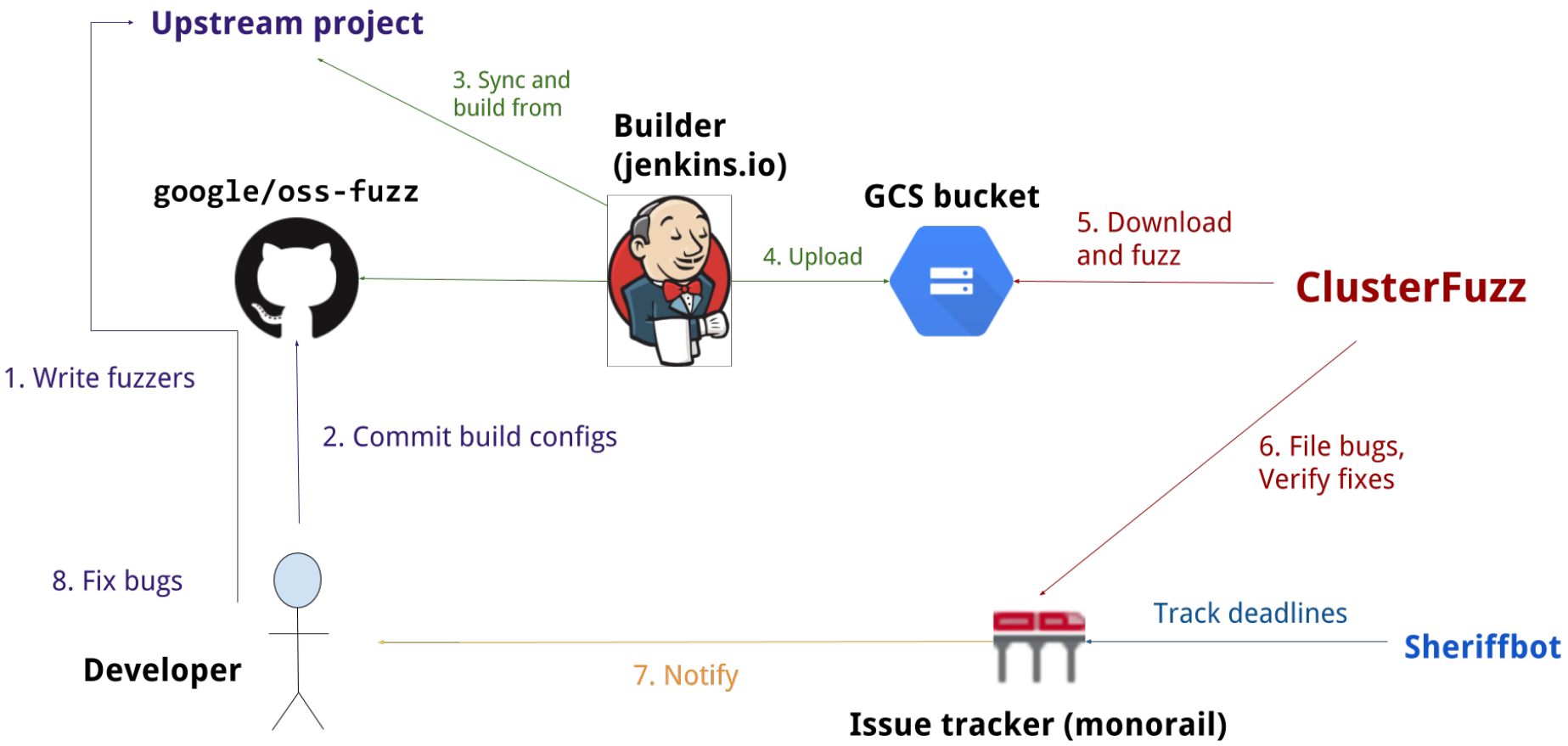
oss-fuzz is a SAAS around libFuzzEngine + ASAN/MSAN/UBSAN + bug tracker

Strict policy on the bugs that are found:

- Mantainers are notified when issues are found
- Mantainers have 30 days to fix a given issue
- If not fixed the issue is made public after 30 days

All the software to build the SAAS is free software in case you want to run one yourself

What is oss-fuzz? (IV)



oss-fuzz and KDE

kimageformats (January)

kcodecs (February)

karchive (April)

poppler (May 2018)

libical (April)

What do they have in common?

Demo

KArchive en oss-fuzz

- KArchive y ficheros laaaaaaaaaaaaaaaaargos

KImageFormats en oss-fuzz

- Bugs ya resueltos de KImageFormats
  - https://bugs.chromium.org/p/oss-fuzz/issues/detail?id=12752
    - #0 0x54f265 in (anonymous namespace)::LoadPSD(QDataStream&, (anonymous namespace)::PSDHeader const&, QImage&) /src/kimageformats/src/imageformats/psd.cpp:206:51
    - #1 0x54e90e in PSDHandler::read(QImage*) /src/kimageformats/src/imageformats/psd.cpp:255:10
    - #2 0x53a18f in LLVMFuzzerTestOneInput /src/kimgio_fuzzer.cc:60:12
  - git log
- Parche para qpnghandler.cpp en Qt

Future

What else should be fuzz?

baloo

kfilemetadata

more pim stuff?

Aaaaaaaand who's going to work in it ;)

Questions

Who?

When?

How?

Why?