

# elfutils debuginfod

a web fileserver for debugging artifacts

Frank Ch. Eigler, Aaron Merrey

Red Hat  
fche@redhat.com, amerey@redhat.com

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What's the matter? Bugs got into your code?

# What do we do?

- Install **prerequisite data** for debugging  
this is our topic today
- Use the debugger to find the bugs  
not talking about this
- But I use python or node.js or ...  
not talking to you
- But I use go lang or rust or ...  
relevant but not my focus
- But I don't use a debugger!  
what about **crash** or **systemtap** or **perf** or **dyninst** or **abrt** or  
**abigail** or **hpctoolkit** or **valgrind** or ...?

# congratulations, you need debuginfo!

- Compilers generate metadata about the object code.  
CFLAGS+=-g
- Maps between source and object code for text and data
- Quality, quantity differ by compiler and by optimization level
- GCC + DWARF is world-class for debuggable optimized code
- Tools can compress (semantic DWZ or zlib ELF compression)
- Subset formats also exist (CTF, BTF, minidebuginfo, STABS)
- Often stripped by distribution packaging, sometimes lost
- Don't forget about source code!

# why is it not already there?

- SIZE: 5-15x the size of the stripped executable

- Fedora 33 x86-64:

| program        | stripped   | unstripped                  |
|----------------|------------|-----------------------------|
| linux 5.10-7   | 87,783,856 | 827,022,016                 |
| cc1plus 10.2.1 | 27,828,480 | 149,611,208 + 57,241,783dwz |

- Don't forget about source code!

- More stats:

| distro                 | main repo | debug repo |
|------------------------|-----------|------------|
| rhel 7.6 x86-64        | 3.4 GB    | 11 GB      |
| rhel 8.0 baseos x86-64 | 0.9 GB    | 2.5 GB     |

## where is debuginfo - fedora/rhel

- stripped after the build process
- not lost: -debuginfo and -debugsource subrpms

```
% gdb /bin/vi
Reading symbols from /bin/vi...
(No debugging symbols found in /bin/vi)
Missing separate debuginfos, use:
dnf debuginfo-install vim-minimal-8.1.1912-1.fc30.x86_64
```

- available for easy downloading
- ... if you're root, if you have disk space for whole package, if if
- <https://fedoraproject.org/wiki/StackTraces>

# where is debuginfo - ubuntu

- stripped after the build process
- not lost: packaged into `-dbg` and `-dbgsym` packages

```
% gdb /bin/vi
Reading symbols from /bin/vi...
(No debugging symbols found in /bin/vi)
```

- available for downloading - not as easy
- ... if you're root, if you guess the right debsources, if you have disk space for whole package, if if if
- <https://wiki.ubuntu.com/DebuggingProgramCrash>

## where is debuginfo - arch linux

- never created during the build process
- KKKHHHAAAAANNNNNN!!!!
- recompile with custom CFLAGS
- ... if you're root – heck you're always root on arch
- [https://wiki.archlinux.org/index.php/Debug\\_-\\_Getting\\_Traces](https://wiki.archlinux.org/index.php/Debug_-_Getting_Traces)

- Like Fedora, many packages build debuginfo subpackages
- Optional FUSE server maps local debuginfo paths to NixOS CDN via HTTP.
- <https://github.com/edolstra/dwarffs>
- So close!

# addressing the depends and what-ifs

- Need a way of quickly delivering the debuginfo needed.
- ... without user privilege
- ... from distro packages archives
- ... or from private build trees
- ... without transferring unneeded debuginfo
- ... wherever the data may be found
- Don't forget about source code!

- A simple HTTP fileserver of debuginfo to debugger-like tools
- Server released as a component of elfutils in late 2019
- Indexes files and package archives by buildid
- Several public servers online since early 2020
- Start as ordinary process, or container

```
% debuginfod -v -R -F /path/to/rpms /path/to/build/tree  
[...] Opened database /$HOME/.debuginfod.sqlite  
[...] started http server on IPv4 IPv6 port=8002  
[...] search concurrency 8  
[...] fts traversed source paths in 0.431082s, scanned=2247
```

- Exposes operational stats as Prometheus `/metrics`
- Relays missed queries to upstream federated servers

- Set an environment variable or two:

```
% export DEBUGINFOD_URLS="http://server:8002/ \  
                        https://debuginfod.elfutils.org/"  
% export DEBUGINFOD_PROGRESS=1 # optional
```

- Capable clients extract buildid, make quick HTTP queries for artifact type of interest (source/debuginfo)

```
% gdb /bin/ls  
% eu-stack -v -p $$  
% debuginfod-find source ./a.out /path/to/foo.c
```

- Available as a library and as a command line tool
- Client code also built into server, enabling federation

# buildids make it all work

- Unique hash code embedded into object files as ELF note.

```
% readelf -n /bin/vi | grep Build.ID:
```

```
Build ID: 2e7fbdf093032d4fdb1fd24c2542d19e05c2f027
```

- Permanent identifier (same build  $\leftrightarrow$  same build-id)
- Stripped binaries, debuginfo, core dumps all keep a copy
- Enables binary identity-based webapi:

`http://server:port/buildid/HEXCODE/debuginfo`

`http://server:port/buildid/HEXCODE/source/PATH/T0/F00.c`

insert demo here

- <https://sourceware.org/elfutils/Debuginfod.html>
- #elfutils ON [irc.freenode.net](https://www.freenode.net)
- <https://dwarf.org/>
- <https://developers.redhat.com/blog/>
- try:

```
export DEBUGINFOD_URLS=https://debuginfod.elfutils.org/
```

for access to selected Fedora, CentOS, OpenSUSE, Debian, Ubuntu, VoidLinux packages

- more public distro servers soon!