Undo

GDB: A Lot More Than You Knew

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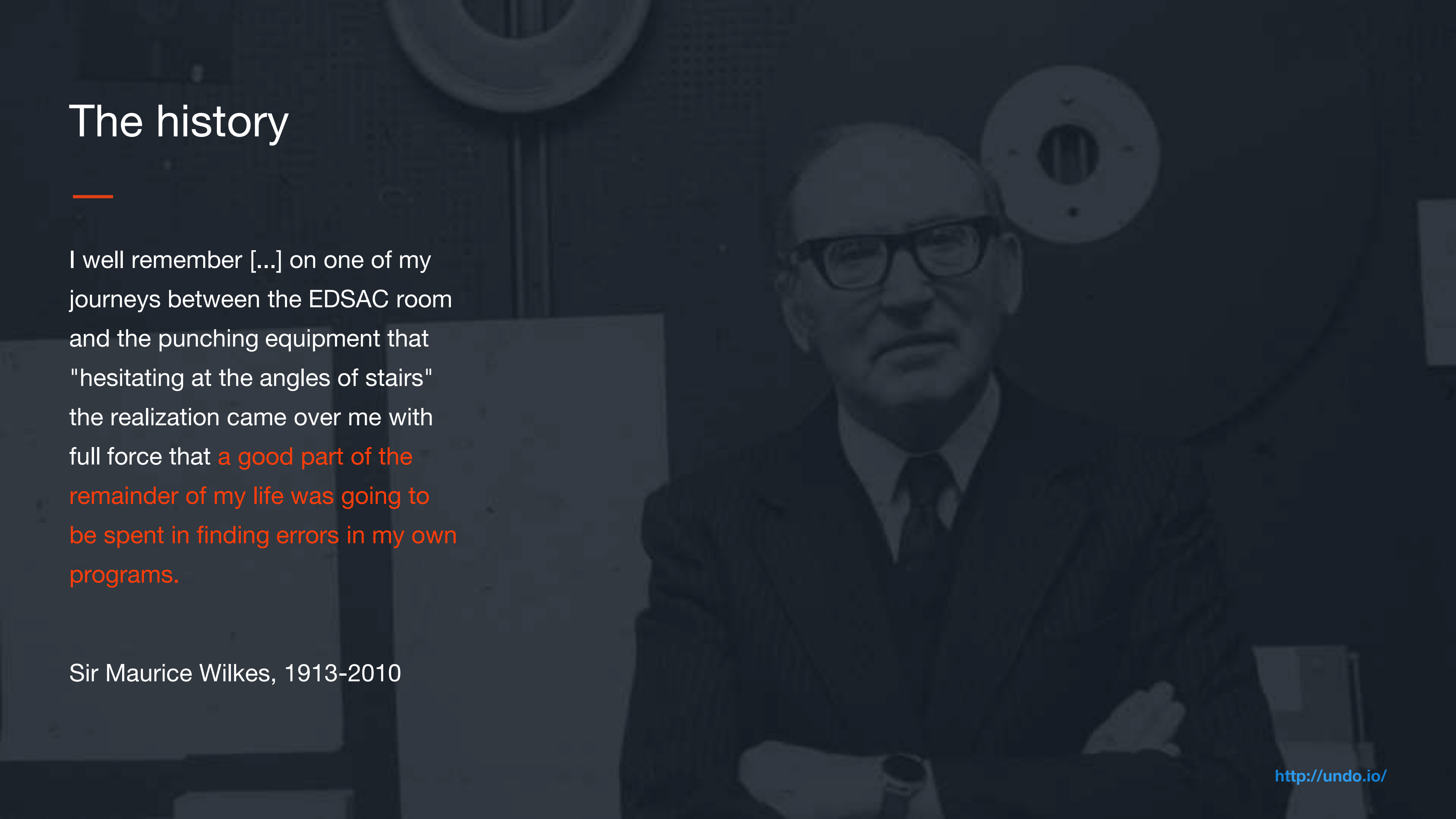
The history



I well remember [...] on one of my journeys between the EDSAC room and the punching equipment that "hesitating at the angles of stairs" the realization came over me with full force that a good part of the remainder of my life was going to be spent in finding errors in my own programs.

Sir Maurice Wilkes, 1913-2010

Disclaimer: random bunch of stuff

Learnt along the way, talking to customers

Lots I don't know, lots inevitably missing

- please help me improve these slides!

Most of this is about knowing what you don't know

- **`info gdb`** is quite a useful manual

GDB - more than you knew

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TUI: Text User Interface

- As useful as it is poorly named!

TUI top tips

ctrl-x-a: toggle to/from TUI mode
ctrl-l: refresh the screen
ctrl-p / ctrl-n: prev, next, commands
ctrl-x-2: second window; cycle through

GDB has Python!

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Full Python interpreter with access to standard modules

(Unless your gdb installation is messed up!)

The **`gdb`** python module gives most access to gdb

`(gdb) python gdb.execute()` to do gdb commands

`(gdb) python gdb.parse_and_eval()` to get data from inferior

`(gdb) python help(‘gdb’)` to see online help

Python Pretty Printers

```
class MyPrinter(object):
    def __init__(self,val):
        self.val = val
    def to_string(self):
        return ( self.val[‘member’])

import gdb.printing
pp = gdb.printing.RegexpCollectionPrettyPrinter('mystruct')
pp.add_printer('mystruct', '^mystruct$', MyPrinter)
gdb.printing.register_pretty_printer( gdb.current_objfile(), pp)
```

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UndoDB: perfect!
        But expensive :-)

.gdbinit

My ~/.gdbinit is nice and simple:

```
  set history save on
  set print pretty on
  set pagination off
   set confirm off
```

If you’re funky, it’s easy for weird stuff to happen.

Hint: have a project gdbinit with lots of stuff in it, and source that.

Remote debugging

Debug over serial/sockets to a remote server
Start gdbserver localhost:2000 ./a.out
Then connect from a gdb with e.g. ‘target remote localhost:2000’

Multiprocess Debugging

Debug multiple ‘inferiors’ simultaneously
Add new inferiors
Follow fork/exec

Multiprocess Debugging

```
set follow-fork-mode child|parent
set detach-on-fork off
info inferiors
inferior N
set follow-exec-mode new|same
add-inferior <count> <name>
remove-inferior N
clone-inferior
print $_inferior
```

Non-stop mode

Other threads continue while you’re at the prompt

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```
set non-stop on
continue -a
```

Make sure you set pagination off otherwise bad stuff happens!

Breakpoints and watchpoints

`watch foo`	stop when foo is modified
`watch -l foo`	watch location
`rwatch foo`	stop when foo is read
`watch foo thread 3`	stop when thread 3 modifies foo
`watch foo if foo > 10`	stop when foo is > 10

thread apply

```
thread apply 1-4 print $sp
thread apply all backtrace
Thread apply all backtrace full
```

calling inferior functions

`call foo()` will call foo in your inferior
But beware, print may well do too, e.g.

```
                  print foo()
                  print foo+bar  (if C++)
                  print errno
```

And beware, below will call **`strcpy()`** *and* **`malloc()`**!

```
                  call strcpy( buffer, "Hello, world!\n")
```

Dynamic Printf

Use dprintf to put printf’s in your code without recompiling, e.g.

```
    dprintf mutex_lock,"m is %p m->magic is %u\n",m,m->magic
```

control how the printfs happen:

```
    set dprintf-style gdb|call|agent
    set dprintf-function fprintf
    set dprintf-channel mylog
```

Catchpoints

Catchpoints are like breakpoints but catch certain events, such as C++ exceptions

- e.g. **`catch catch`** to stop when C++ exceptions are caught
- e.g. **`catch syscall nanosleep`** to stop at nanosleep system call
- e.g. **`catch syscall 100`** to stop at system call number 100

More Python

Create your own commands

```
class my_command( gdb.Command):
    '''doc string'''
    def __init__( self):
        gdb.Command.__init__( self, 'my-command', gdb.COMMAND_NONE)
    def invoke( self, args, from_tty):
         do_bunch_of_python()
my_command()
```

Yet More Python

Hook certain kinds of events

```
def stop_handler( ev):
    print( 'stop event!')
    if isinstance( ev, gdb.SignalEvent):
        print( 'its a signal: ' + ev.stop_signal)

gdb.events.stop.connect( stop_handler)
```

Other cool things...

`tbreak`	temporary breakpoint
`rbreak`	reg-ex breakpoint
`command`	list of commands to be executed when breakpoint hit
`silent`	special command to suppress output on breakpoint hit
`save breakpoints`	save a list of breakpoints to a script
`save history`	save history of executed gdb commands
`info line foo.c:42`	show PC for line
`info line * $pc`	show line begin/end for current program counter

And finally...

- gcc's -g and -O are orthogonal; gcc -Og is optimised but doesn't mess up debug
- see also gdb dashboard on github