

bad news: computers aren't \* magic -:-

learning hard things

understanding complex systems

## about me

Engineer at Stripe



things my team is in charge of

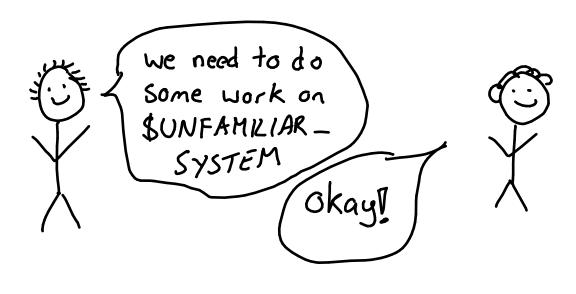
Edeployment? ECD!	y Enginx}
{service discovery}	¿Puppet}
Fload balancing	EOS versions?
Zinstances	and MORE !

technologies to know about

- Linux (what swap settings should we use?)

-TCP/IP (how should we set up this proxy tier?) -AWS (ONE MILLION SERVICES)

- HTTP (the Cache-Control header)



# Wizard skills

- → understand your systems

  → ask great questions
- read the code
- debug like a wizard
- → write down a design
- understand the big picture

Wizard skill: Understand your Systems

applications business ? lower we'll spend most of our time here " COMPUTER NETWORKING [ Linux ?

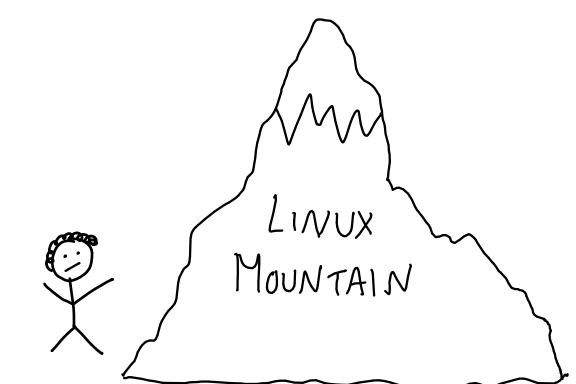


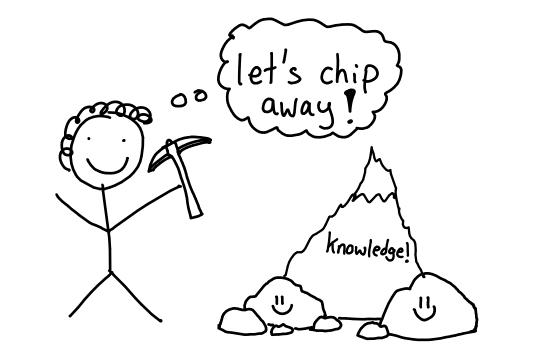
Why understand?

- \* understand jargon
  "OOM Killer" "layer 4 proxy"
  "userspace"
- \* debug really hard problems

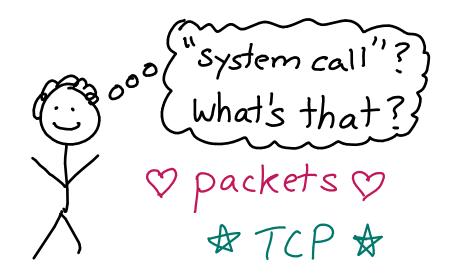
  See: rachel bythebay's posts •

\* innovate



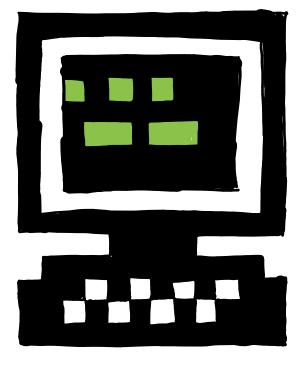


## learn fundamental concepts



Recurse Center

12 week programming retreat NYC



U Homework! U build a (very bad) TCP Stack from scratch I did it in Python ! time taken: ~ 1 week

### do experiments?

(Write a tiny)
operating
system

What happens if I (run out of memory) on purpose?

run out of memory on purpose

CH NO? There is

LINUX no more memory!

Time to start

killer killing things?

try to write an operating system

how do you write a keyboard driver from scratch?

things that are missing when you have no os

when you have no Os -files -threads

-files -threads -programs -virtual memory

- hard drive - networking

- keyboard

Rules of programming experiments

experiments

· it doesn't have to be good

· it doesn't have to work · you have to learn something

也以此也也

→ read books ←

LINUX KERNEL DEVELOPMENT ROBERT LOVE

NETWORKING FOR
SYSTEM ADMINISTRATORS
MICHAEL LUCAS

read things that are too hard

Work with it in your job I can do some work )
With that HTTP proxy! When you don't understand something, dig in opo that's weird...

o(I learned something) \_ new ]!!

Reasons a computer might swap -> actually no free RAM

-> it's "mostly" out of RAM (see vm. swappiness) -> a cgroup is out of RAM -> bad vm. over commit\_ratio overcommit allocation = Swap + RAM x

"Understanding the Linux virtual memory manager"

200 pages docs + 400 pages code

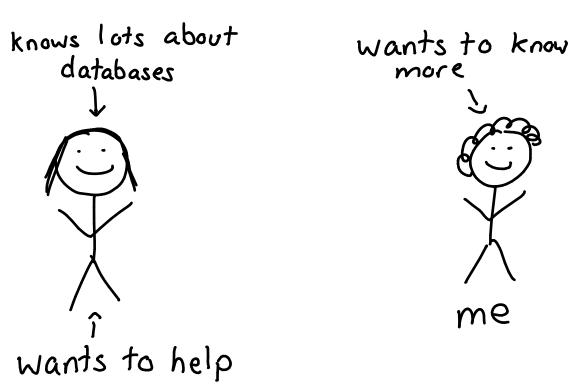
Mel Gorman, 2007

and sysctl/vm.txt

don't forget: it takes a long time

"learn to program in 10 years" 2003 here is an I will install awesome new 100 different Linux distros V computer mom what's a system call? 2013 2017 still a ways to go! 1)

Wizard skill: ask great questions



#### state what you know



stating what I know

-> helps organize my thoughts

-> reveals misunderstandings

-> avoids answers that are

too basic / too advanced

don't ask the most experienced person

probably a better choice your coworker with a bit more experience the databases than you

why this is great

-> less load on more experienced
person
-> lower bus factor

-> less exp. person gets to growlestablish knowledge

#### do some research

so I found out that creating database indexes takes time and I have questions about how that affects performance...

ask yes/no questions does \$DATABASE do hash joins?

yes! but only in this specific situation...

"how did you do that" [[ I fixed it ]) can I watch you do that?

ask in public I don't understand,...

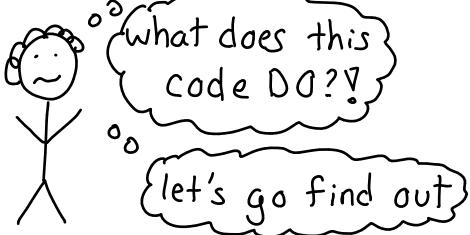
Senior Engineer wizard skill:

read the code

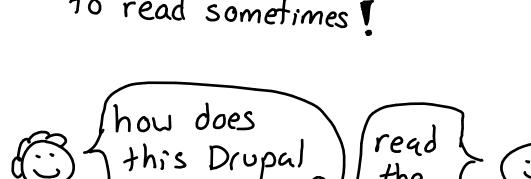
understand a mystery error message

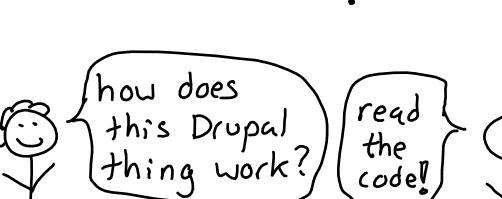
print("it's broken")

no docs? no problem!



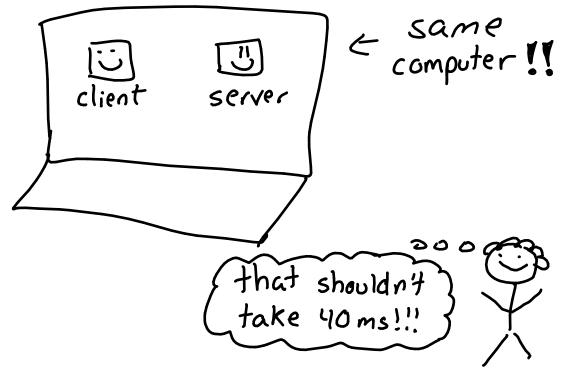
even hard codebases are possible to read sometimes \





# debug like a Wizard

a story ? hello!!!) client ... 40 ms passes ...



40 ms = 25 requests/second

wireshark client LHTTP headers) rest of request

response Server client: "packet 1"

Server: < waiting for packet 2 >

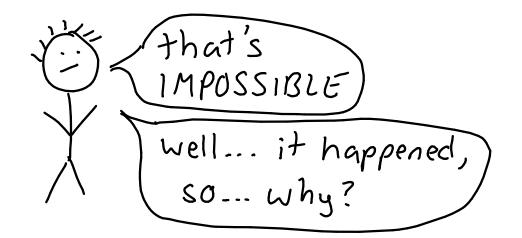
client: < waiting for ACK >

Server: "ok I'm bored here's an Ack" client: YAT! Here's your second packet Server: all done?

setting TCP\_NODELAY
makes the client stop waiting

how I got better at debugging

Remember the bug is happening for a logical reason



### Be confident I can fix it

before: (maybe this) is too hard



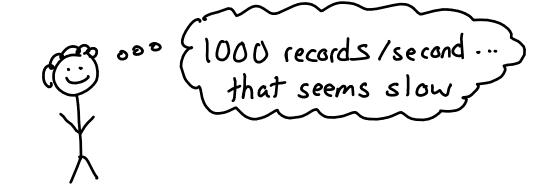
things I learned

→ 1000 records / second

isn't a lot

→floating point exponentiation is slow

### train my intuitions



computers are fast

computers-are-fast. qithub.io

indexed database table 10 million rows

how many times per second can you select \* from table where id=1

1 10 100 1000 10000 100000 [mil 10 mil 100 mil

#### 55 000

computers-are-fast.github.io

know my debugging toolkit

STHING but I don't know how to find out hefore:

now: I'll use topdump!



A SMALL -tool Handbook
FOR ANYONE WHO WRITES (OR RUNS!!
PROGRAMS ON LINUX COMPUTERS



#### most importantly: I learned to like it



now: Something something facial expression: determination

wizard skill: Write down a design

(let's zoom out?)

many names: · design doc · project brief · tech spec · architecture doc · RFC

my stripe career (what's a design doc? seems like a)
(waste of time) these are SO USEFUL

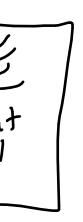
what I was scared of



erone

#### design small projects

30 minutes



thank you (SO MUCH)

other team's

Write the announcement email first

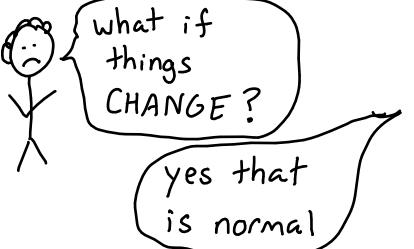
- - · why is this important? · how does it impact other teams?
  - · how do we know it's Working?

write a "premortem"

imagine the project failed. Why?

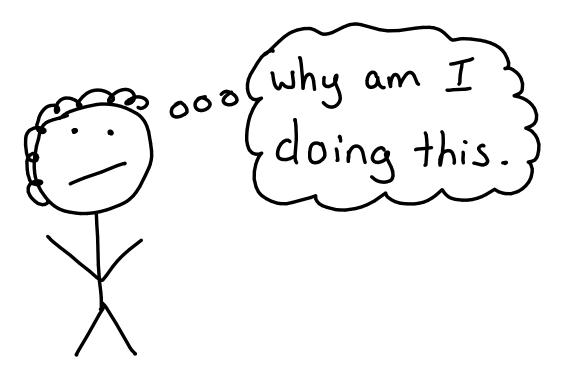
HBR article from 2007

# track changes





Wizard skill: 5.3 understand the big picture



approach project planning

With excitement + curiosity

1) figure out why it's important

2 do something else

understanding the big picture

better technical decisions

working on projects

people care about is AWESOME



### Wizard skills derstand your syst

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\* read something hard \*

## thanks 💙

blog: jvns.ca
zines:jvns.ca/zines

twitter: @bork

drawing by Liz Baillie

# Come get a zine ! NETWORKINGI

@bork jvns.ca/zines jvns.ca