Testing in the Trenches

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What are these?

- Apache
- Cherokee
- lighttpd
- nginx
- Unicorn
- Tornado
- gws

Okay, what is this?

Liso

Web servers!

Web servers!

So, what's used to test them, can also test this:

Web servers!

So, what's used to test them, can also test this:

Liso

Idea 1: Stress Testing Tools

- apachebench – concurrency, GETs, HEADs, POSTs, custom header data
- Siege – bit more configurable with URLs file
- Read up online, find tests for web servers
- Run them on your Liso server
- If they work, cool
- If not, check to see if Liso supports them
- If not, cool
- Otherwise, you have work to do

Idea 2: Real World Browsers

- Chrome
- Firefox
- Safari
- Opera
- Konqueror
- Internet Explorer
- ...

Idea 3: Python Scripting

- Let libraries do it: `import urllib2`
- Rolling your own test suite:
  - Craft requests in files
  - Send via Python sockets
  - Check returned bytes

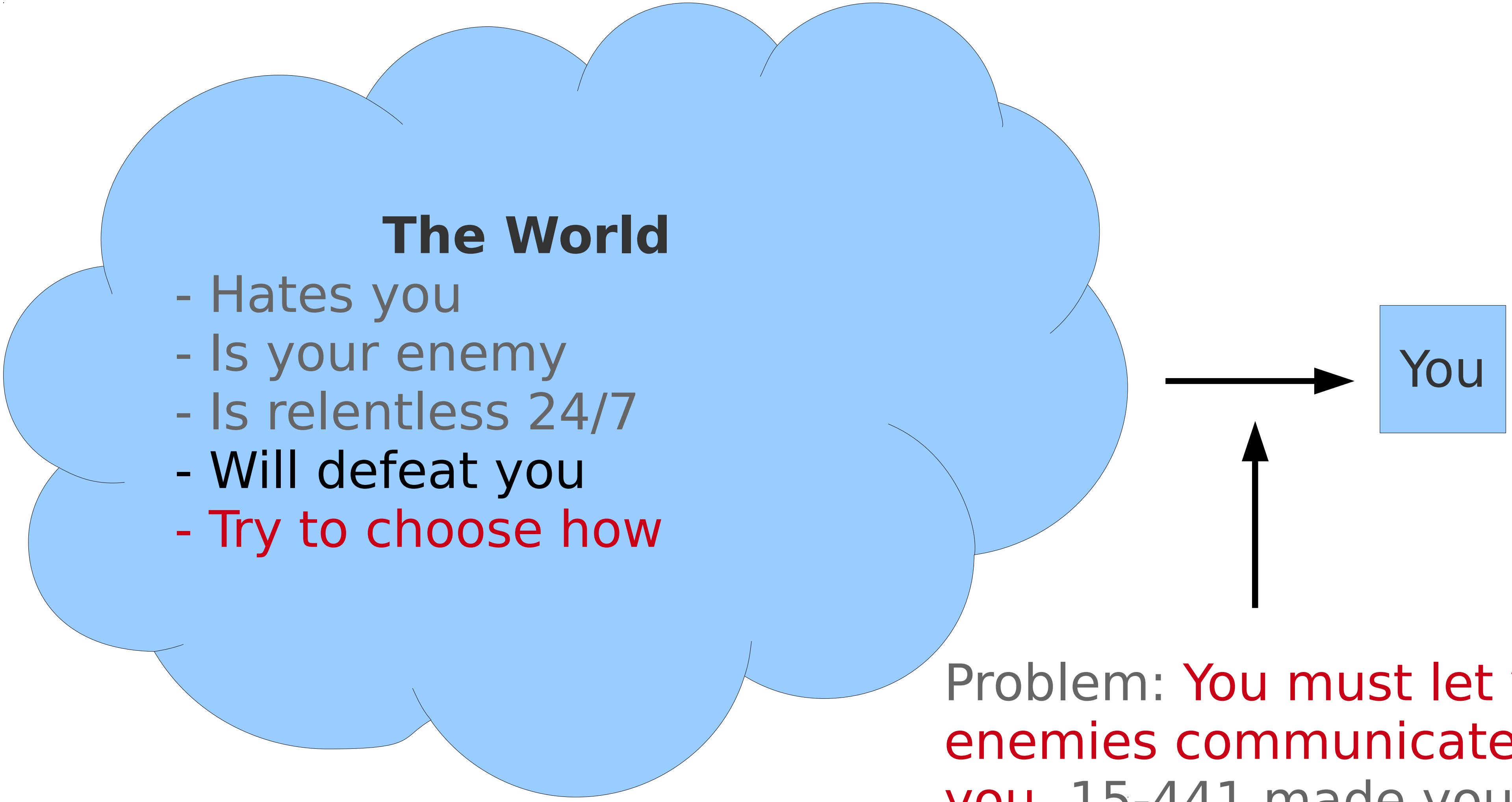
Testing: Think Evil, Be Evil

The World

- Hates you
- Is your enemy
- Is relentless 24/7
- Will defeat you
- Try to choose how

You

Testing: Think Evil, Be Evil



The World

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Problem: You must let your enemies communicate with you. 15-441 made you.

Networked Application Testing

- Always start with the previous picture
- Analyze interactions with The World
- That thin line in? port 80, or 443
- The World sends you bytes
- Think, what happens when I get:
  - Good bytes – designed to work normally
  - Arbitrarily bad bytes – designed to break me
  - Completely random bytes – !@#$()*&##($*)

Taint Analysis – Kinda

- We aren't formal, we don't care
  - Formal verification – would be nice
  - Also, can't explore every possibility, but...
- We want a back-of-the-envelope approach
  - Start with thought experiments
  - The World, the thin line in, and You
  - Then make these happen in real life
  - Leave absolutely nothing to chance
  - Know what your server will do in every case

Leaving Nothing to Chance

- Think outside the box, many scenarios
- Check especially corner cases
- If you expect 4096 sized buffers
    - You better be checking 4095
    - and 4097
    - And 8192+, 200MB+...different client apps...etc.
    - We already know The World will...
    - **Never, ever, ever expect something from:**
    - What you think, or code you read

Oh, I know what that does.
or, in that case my code will...

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How wonderful, you can compile, link, execute, and simulate clients with the x86 component of your human brain...OH WAIT!

No, hell no.

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You better make a minimal test case.
And then run it.

No, hell no.

You better make a minimal test case.
And then run it.

Know what will happen by making it happen.

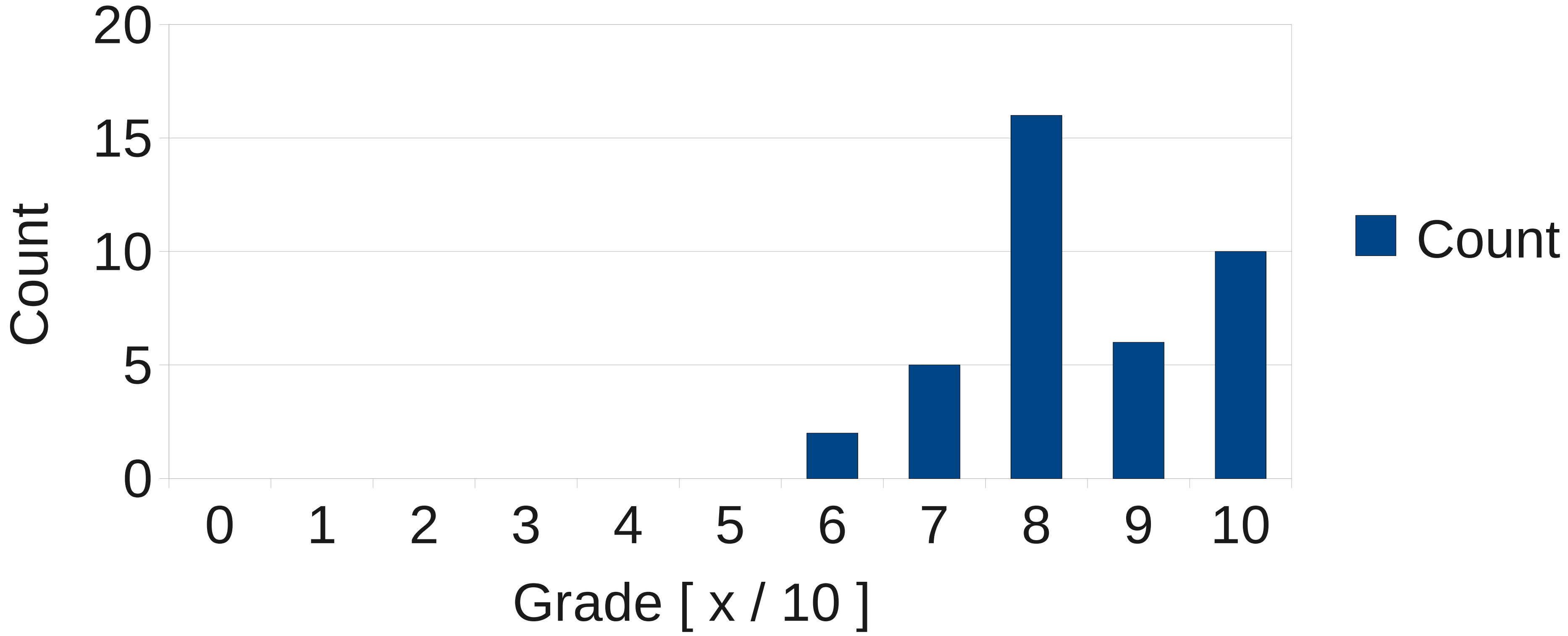
My advisor, Mahadev Satyanarayanan, is an Experimental Computer Scientist

I liked that about him. Maybe that says something about me as well.

So...

- This leads to robustness
- This leads to well-tested network code
- This leads to happy 100% in 15-441
- Think outside the box
- Test like crazy—as much as possible

Project 1 Checkpoint 1
Grade Distribution



The Wall of Shame

angx	15-441-project1
apodolsk	proj1
chunhowt	chunhowt-441-p1
ebreder	ebrederp1
hanl1	hanl1-p1-441
jchee	jchee-p1
jwloh	jwloh-p1
kailili	network-project1-kaili
moz	moz-project1
mengh	meng-project1
phoskins	phoskins-441-1
rggonzal	p1
siyoungo	siyoungo1
tbach	tbach-441-p1
xuanzhan	xuanzhan-p1
yueyuan	yy-441-proj1
zhuojil	zhuojil-p1

The Wall of Shame

angx	15-441-project1
apodolsk	proj1
chunhowt	chunhowt-441-p1
ebreder	ebrederp1
[illegible]	[illegible]
phoskins	phoskins-441-1
rggonzal	p1
siyoungo	siyoungo1
tbach	tbach-441-p1
xuanzhan	xuanzhan-p1
yueyuan	yy-441-proj1
zhuojil	zhuojil-p1

Review Reading Instructions:

“Name your project using this scheme (to avoid name collisions):
<andrewid>-15-441-project1”

Okay, we didn't detail the whole form, partly our fault; it was confusing :p

Leaderboard: Chaos Master

anandsur	00:17.92
chunhowt	00:18.18
ebreder	00:20.74
spradhan	00:21.06
adityaa1	00:22.26
kdalmia	00:22.97
abi	00:33.47
rggonzal	00:35.79
tbach	00:38.81
mteh	00:52.09

800 client connections;
random 50 write/read 32 Kibibytes;
two 5% chance disconnect events;
repeat for 100 trials

Leaderboard: BW King

abi	00:01.77
spradhan	00:01.79
anandsur	00:01.85
mteh	00:01.86
rggonzal	00:01.88
chunhowt	00:01.89
ebreder	00:01.89
tbach	00:01.98

minjaele replay.test 115.91 megabytes
Estimated: 3-6 memmove, disk write → 1.6 - 1.7 seconds

Numbers to Think About

- Select on 500 tcp fd's: 14.4491 microseconds
- Simple syscall: 0.2252 microseconds
- STREAM copy bandwidth: 3493.08 MB/sec
- Socket bandwidth using localhost: 2584.65 MB/sec
- Estimated disk write bandwidth: 79.1 MB/sec
- 116MB / 2584.65 MB/sec = .045 seconds (transfer)
- 116MB / 3493 MB/sec = 0.03 seconds (mem movement)
- *[3-6] = 0.09 – 0.18 seconds
- 116MB / 79.1 MB/sec = 1.47 seconds
- 1.47 + 0.045 + [0.09 – 0.18] = 1.6 – 1.7 seconds

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- Select on 500 tcp fd's: 14.4491 microseconds
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Thank you lmbench and dd.

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Fork me on GitHub

GitHub:

Git it, got it, good.

```
git clone git://github.com/theonewolf/15-441-Recitation-Sessions.git
```