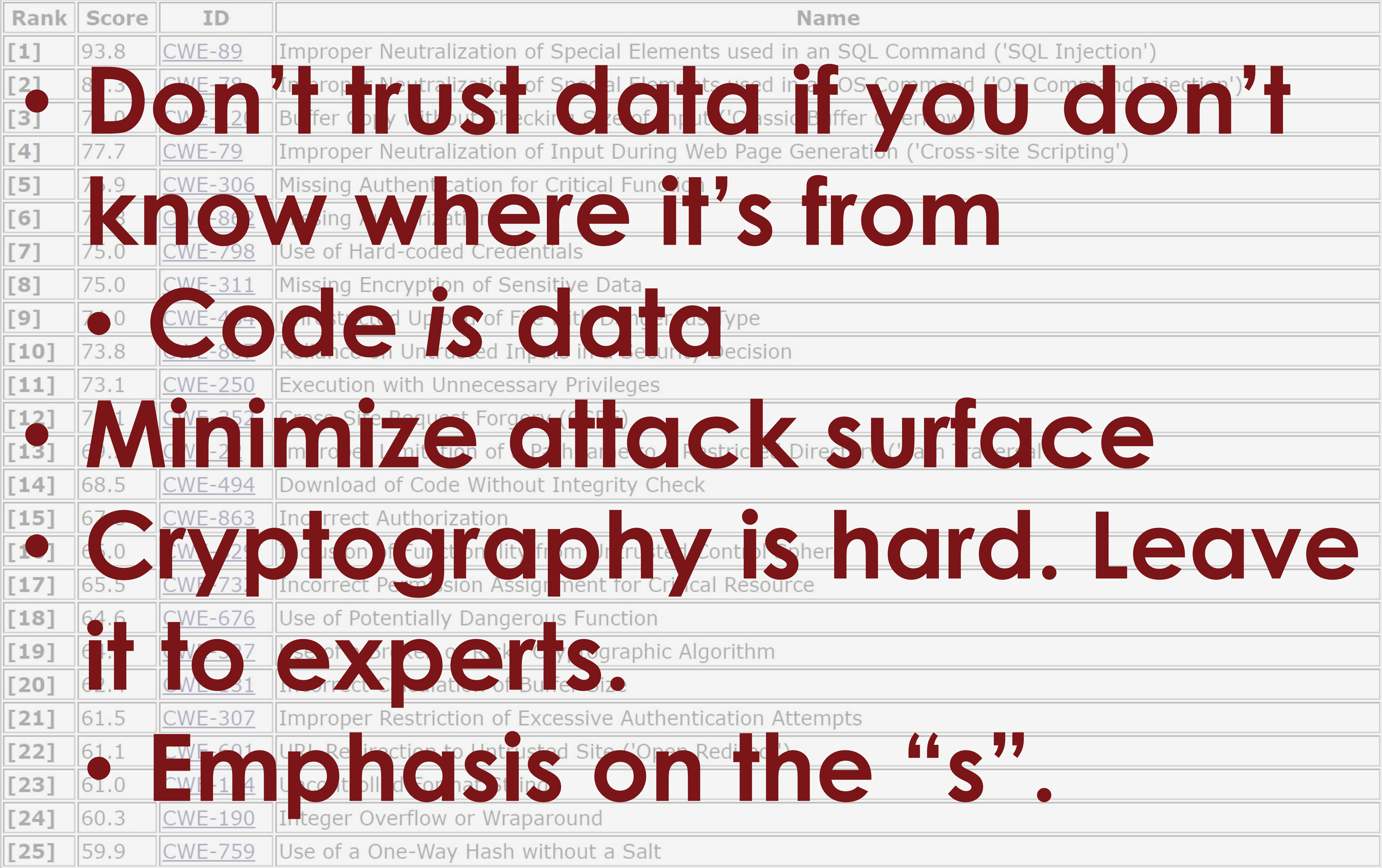
TL;DR Security

If you learn nothing else, learn these…

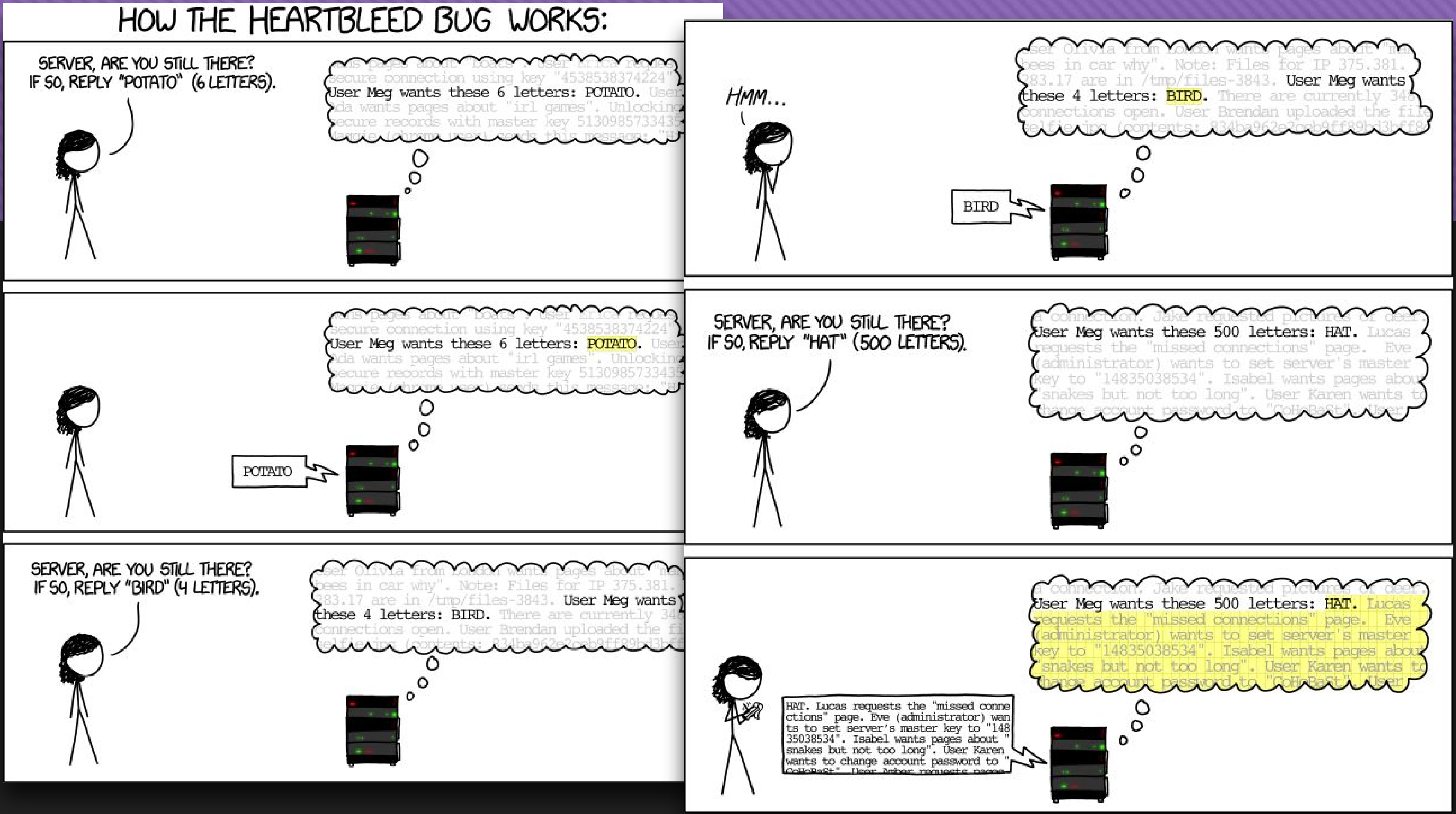
Common Weakness Enumeration

- http://cwe.mitre.org
- Collective database of the root causes of security bugs
- Hasn’t changed much in 10 years… ☹

- Don’t trust data if you don’t know where it’s from
  - Code *is* data
- Minimize attack surface
- Cryptography is hard. Leave it to experts.
  - Emphasis on the “s”.



Rank	Score	ID	Name
[1]	93.8	CWE-89	Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')
[2]	83.3	CWE-78	Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')
[3]	79.0	CWE-120	Buffer Copy without Checking Size of Input ('Classic Buffer Overflow')
[4]	77.7	CWE-79	Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')
[5]	76.9	CWE-306	Missing Authentication for Critical Function
[6]	76.8	CWE-862	Missing Authorization
[7]	75.0	CWE-798	Use of Hard-coded Credentials
[8]	75.0	CWE-311	Missing Encryption of Sensitive Data
[9]	74.0	CWE-434	Unrestricted Upload of File with Dangerous Type
[10]	73.8	CWE-807	Reliance on Untrusted Inputs in a Security Decision
[11]	73.1	CWE-250	Execution with Unnecessary Privileges
[12]	70.1	CWE-352	Cross-Site Request Forgery (CSRF)
[13]	69.3	CWE-22	Improper Limitation of a Pathname to a Restricted Directory ('Path Traversal')
[14]	68.5	CWE-494	Download of Code Without Integrity Check
[15]	67.8	CWE-863	Incorrect Authorization
[16]	66.0	CWE-829	Inclusion of Functionality from Untrusted Control Sphere
[17]	65.5	CWE-732	Incorrect Permission Assignment for Critical Resource
[18]	64.6	CWE-676	Use of Potentially Dangerous Function
[19]	64.1	CWE-327	Use of a Broken or Risky Cryptographic Algorithm
[20]	62.4	CWE-131	Incorrect Calculation of Buffer Size
[21]	61.5	CWE-307	Improper Restriction of Excessive Authentication Attempts
[22]	61.1	CWE-601	URL Redirection to Untrusted Site ('Open Redirect')
[23]	61.0	CWE-134	Uncontrolled Format String
[24]	60.3	CWE-190	Integer Overflow or Wraparound
[25]	59.9	CWE-759	Use of a One-Way Hash without a Salt


HOW THE HEARTBLEED BUG WORKS:
SERVER, ARE YOU STILL THERE? IF SO, REPLY "POTATO" (6 LETTERS).
secure connection using key "4538538374224". User Meg wants these 6 letters: POTATO. User Ada wants pages about "irl games". Unlocking secure records with master key 5130985733435
POTATO
SERVER, ARE YOU STILL THERE? IF SO, REPLY "BIRD" (4 LETTERS).
User Olivia from London wants pages about "bees in car why". Note: Files for IP 375.381.283.17 are in /tmp/files-3843. User Meg wants these 4 letters: BIRD. There are currently 346 connections open. User Brendan uploaded the file selfie.jpg (contents: 834ba962e2ceb9ff89bd3bff8
HMM...
BIRD
SERVER, ARE YOU STILL THERE? IF SO, REPLY "HAT" (500 LETTERS).
a connection. Jake requested pictures of deer. User Meg wants these 500 letters: HAT. Lucas requests the "missed connections" page. Eve (administrator) wants to set server's master key to "14835038534". Isabel wants pages about "snakes but not too long". User Karen wants to change account password to "CoHoBaSt". User
HAT. Lucas requests the "missed connections" page. Eve (administrator) wants to set server's master key to "14835038534". Isabel wants pages about "snakes but not too long". User Karen wants to change account password to "CoHoBaSt". User Amber requests pages

The Morris Worm

```
char buf[20];
gets(buf);
```

Mitigations

- CONSTANT VIGILANCE
  - Especially when working with strings
  - *Especially* especially when working with user input

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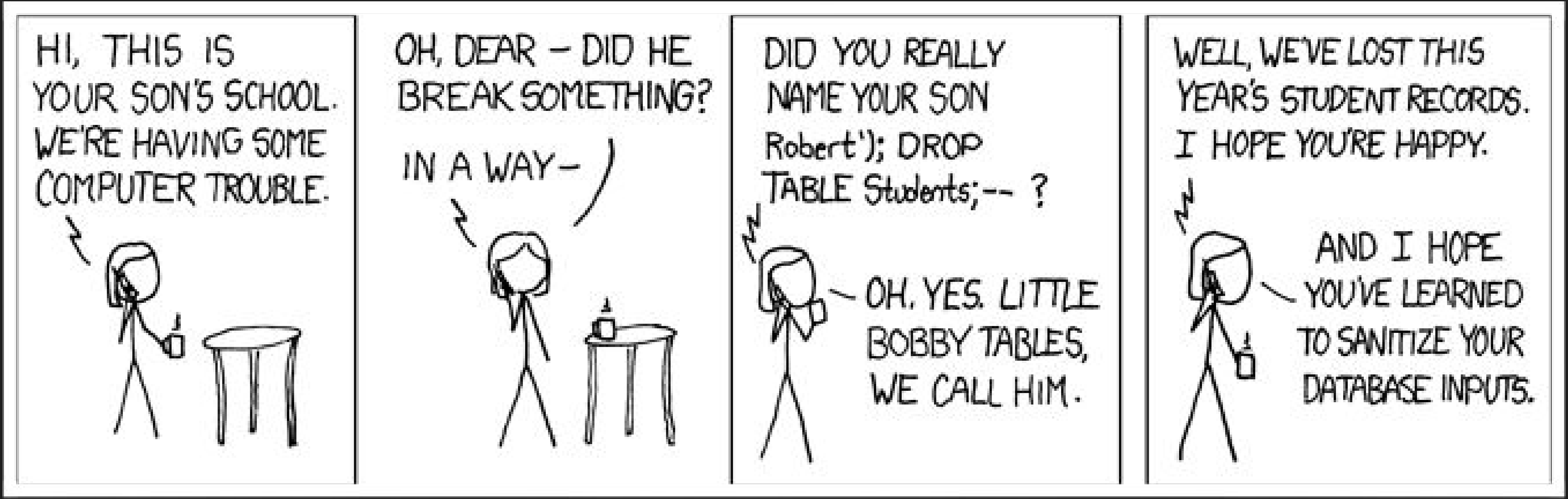
- Strict warnings
- Analysis tools
- Fuzz testing
- Other languages

Don’t Trust Unauthenticated Data…
…And Code *Is* Data


HI, THIS IS YOUR SON'S SCHOOL. WE'RE HAVING SOME COMPUTER TROUBLE.
OH, DEAR – DID HE BREAK SOMETHING?
IN A WAY–
DID YOU REALLY NAME YOUR SON Robert'); DROP TABLE Students;-- ?
OH. YES. LITTLE BOBBY TABLES, WE CALL HIM.
WELL, WE'VE LOST THIS YEAR'S STUDENT RECORDS. I HOPE YOU'RE HAPPY.
AND I HOPE YOU'VE LEARNED TO SANITIZE YOUR DATABASE INPUTS.

Mitigations

- Blacklisting bad constructs: good
- Whitelisting good constructs: better
- Authenticate source *and* detect tampering

Minimize Attack Surface

Mitigations

- Run with least privileges
- Remove debugging tools in release.
- Don’t try to circumvent “annoying” security features… they’re there for a reason.

Do Not Roll Your Own Crypto

"Any person can invent a security system so clever that she or he can't think of how to break it."

--Bruce Schneier

Mitigations

- Do not implement your own crypto algorithms
- Do not trust closed-source crypto algorithms unless you have no alternative
- Follow best practices

TL;DR

- Don’t trust unverified data
- Code is data
- Minimize attack surface
- Follow best practices