Unforgivable Vulnerabilities

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Introduction

- Vulnerabilities are a fact of life

- Many vulnerabilities simply shouldn’t be in software anymore

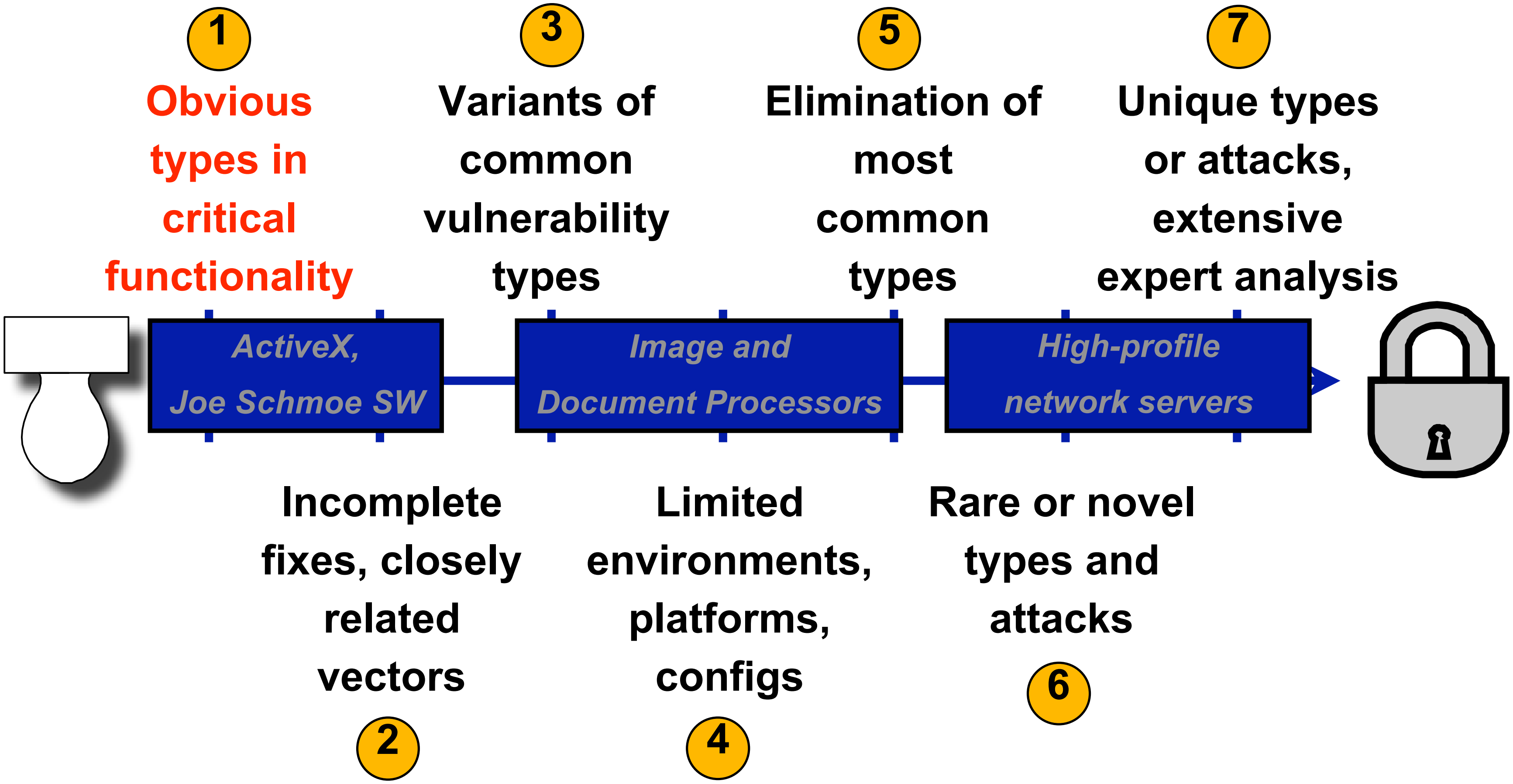
- Everything’s obvious to smart people like us!

- How to identify the worst of the worst?

- What issues should give pause to consumers, and nightmares to vendors?

- Raw vulnerability numbers don’t tell the whole story

Typical Vulnerability History of a Product



1 Obvious types in critical functionality

2 Incomplete fixes, closely related vectors

3 Variants of common vulnerability types

4 Limited environments, platforms, configs

5 Elimination of most common types

6 Rare or novel types and attacks

7 Unique types or attacks, extensive expert analysis

ActiveX, Joe Schmoe SW

Image and Document Processors

High-profile network servers

Criteria for an "Unforgivable" Vulnerability

- Precedence: Many have made the same mistake

Required

- Documentation: The mistake is well-documented

Required

- Obviousness: The attacks are obvious
- Attack Simplicity: The manipulations are very simple
- Found in Five: Able to be found with 5 minutes of effort

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Required

We hold these vulnerabilities to be self-evident…

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The Lucky 13

AAA…AAA

User/Password

Filenames

Common Commands

Buffer overflow

(CWE-120)

<SCRIPT>

User/Password

Body, subject, title, to, from

XSS

(CWE-79)

“../..” or “/full/path”

Get/Send Command

File sharing

Directory Traversal

(CWE-23)

template=http://example.com/c99

Any include/require

that interpolates

$_GET, $_POST, etc.

Remote File Inclusion

(CWE-98)

’ OR 1=1

User/Password

id or other

numeric field

SQL Injection

(CWE-89)

-rwxrwxrwx myprog

Executables

Libraries

Configuration Files

World-Writable Files

(CWE-276, 279)

The Lucky 13 (Continued)

http://example/admin/script.cgi

Admin functionality

Library code with

executable extensions

Direct Request

(CWE-425)

authenticated=1

Form field

Cookie

Auth bypass

(CWE-472)

tebj lbhe bja pelcgb

Substitution

Cipher

Crypto

(CWE-327)

Help

Selected from

privileged Windows

executable

Privilege Escalation

(CWE-271)

ln –s /tmp/App.dat /etc/passwd

sleep 100000

Log files

Temporary files

Command-line args

Symlink Following

(CWE-61)

User: psychyore

Pass: psychyore

Hard-coded

Default?

Hard-coded Pass

(CWE-259)

Length: 0xffffffff

Width: 0xffffffff

Arbitrary

length, width,

height, size…

Integer overflow

(CWE-190)

Shall We Play a Game?

Do you have any more nominations?

Is the research community effectively getting the message across?

How long will it take one of these problems to show up in your favorite software?

How many Black Hat talks in new technologies demonstrate these problems?

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VAAL-idation

- Vulnerability Assessment Assurance Levels (Litchfield)
  - Level of confidence: “how secure is software X?”
  - Based on an audit of a product
  - Depth of analysis: “how much effort was put into analysis?”
  - VAAL != Common Criteria
- Move away from those pesky vulnerability counts!
- Communicate to consumers and each other

The professional research community needs to stop pretending that basic research is magic and become more consumer-friendly. This means metrics.

Proposed VAAL Dimensions

- Access Constraints
  - Privileges/restrictions needed for access
- Feature Frequency
- Potential Severity
- Novelty
  - How new/unusual is the vuln/attack?
- Vector Depth
  - How “close together” are the entry point and the vulnerability?
- Manipulation Complexity
  - <SCRIPT> or RSnake head-scratcher?
- Ubiquity
  - Configuration, Platforms, Environments
- Level of Effort
  - Shhhh, never let them see you sweat

Unforgivable Vulnerabilities in VAAL-speak

- Low access constraints
- Very high feature frequency
- Very low novelty
- Low manipulation complexity
- Low level of effort

- Not directly applicable
  - Potential severity
  - Vector depth
  - Ubiquity

Related Work

- **Attack Surface Measurement (Howard, Manadhata, and Wing)**
- **Threat Modeling (*Trike*, *STRIDE*, Snyder)**
- **SAMATE: Software Assurance Metrics and Tool Evaluation (NIST)**
- **Security Quality Score (Wysopal/Veracode)**
- **CVSS: Common Vulnerability Scoring System (FIRST)**

- **See paper for details and more references**

Questions?