SATE IV Background

Vadim Okun, NIST

vadim.okun@nist.gov

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The SAMATE Project

http://samate.nist.gov/

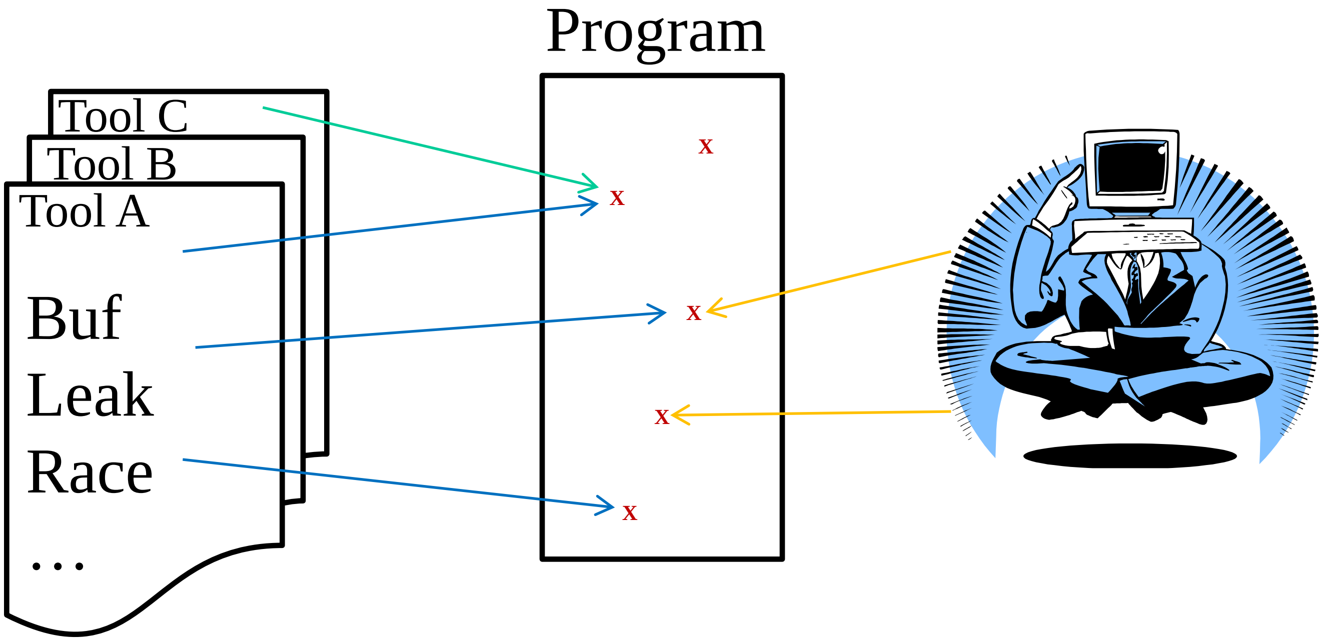
National Institute of Standards and Technology

Cautions on Using SATE Data

- Our analysis procedure has limitations
- In practice, users write special rules, suppress false positives, and write code in certain ways to minimize tool warnings
- There are many other factors that we did not consider: user interface, integration, etc.
- So do NOT use our analysis to rate/choose tools

Analyzing Source Code Analyzers

Security?
Quality?
Insignificant?
False?
?



Program

Tool C

Tool B

Tool A

Buf

Leak

Race

…

Warning Selection Methods

1. Random subset
2. Related to CVEs
3. Related to human findings
4. Synthetic test cases

SATE IV timeline

- Provide test sets to teams (31 July 2011)
- Teams run their tools, return reports (31 Oct)
- Analyze tool reports, with feedback from teams (12 March 2012)
- Experience sharing at workshop (here & now)
- Teams can submit a research paper (May)
- Publish data (Sep - Dec 2012)

Participating teams

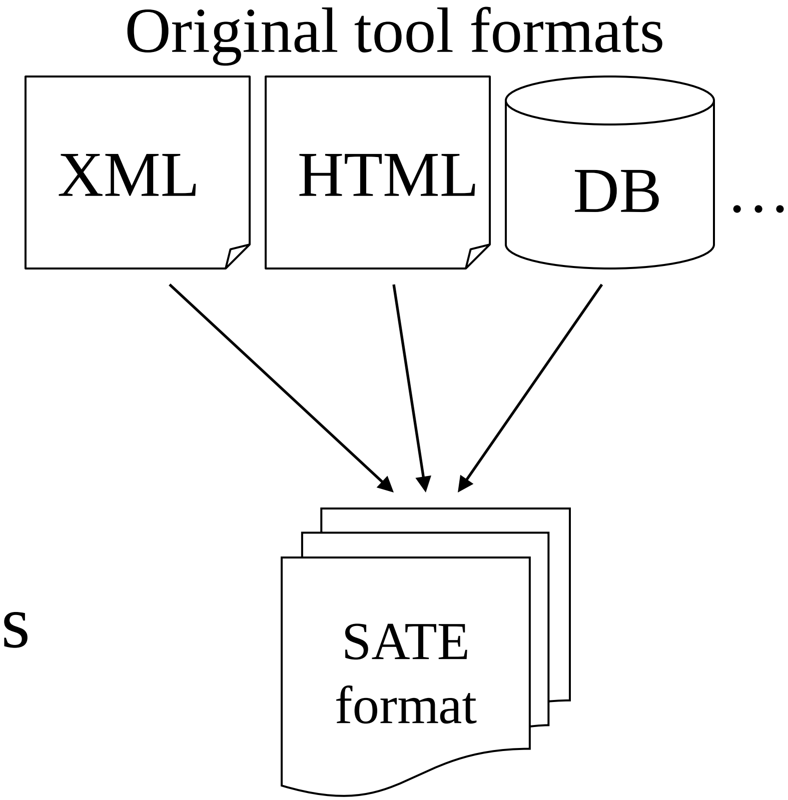
- Buguroo BugScout
- Concordia University Marfcat
- Cppcheck
- Grammatech CodeSonar
- LDRA Testbed
- Monoidics INFER
- Parasoft C++test and Jtest
- Red Lizard Software Goanna

Test cases

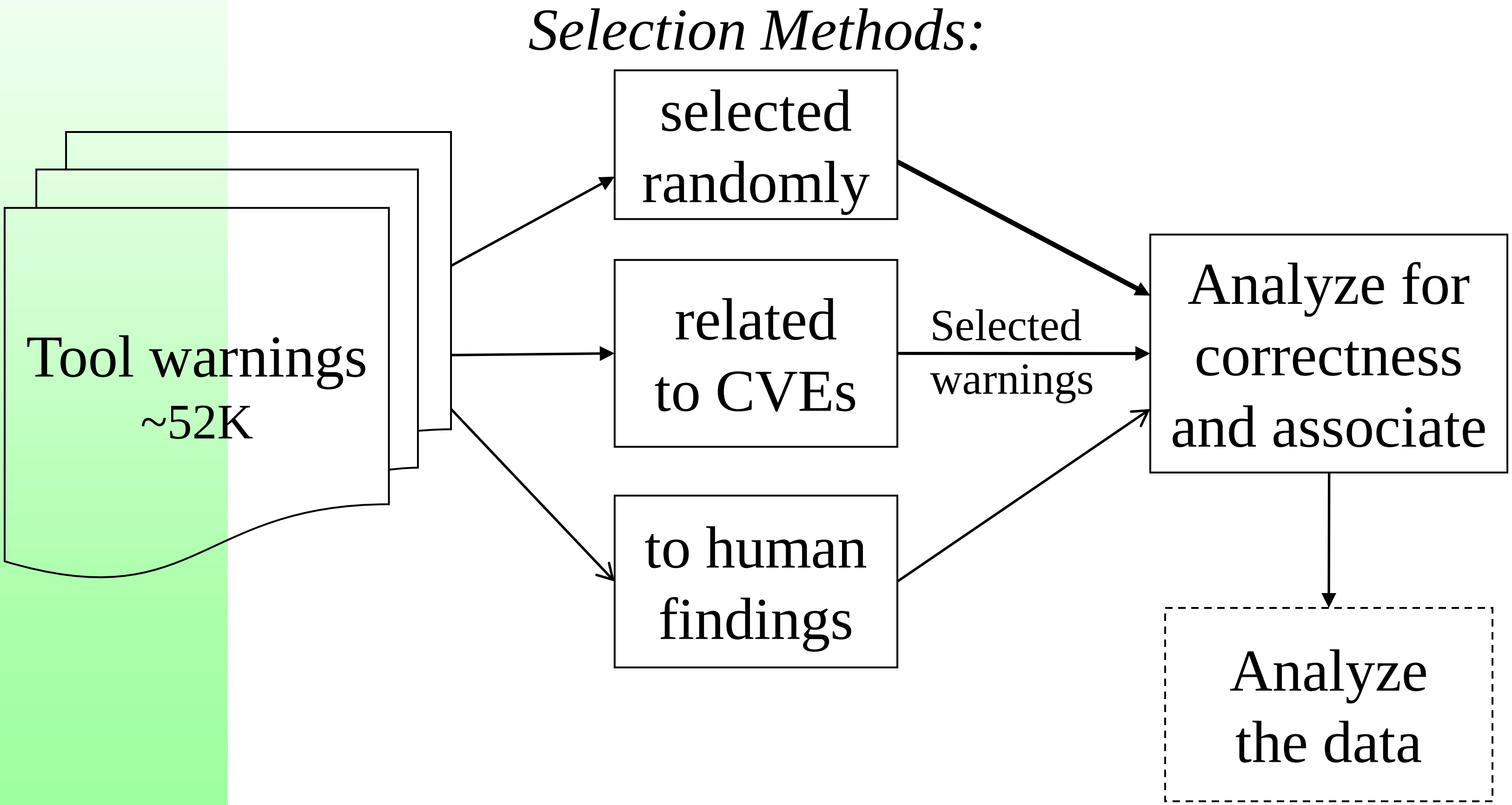
- CVE-selected vulnerable/fixed pairs:
  - Dovecot: secure IMAP and POP3 server – C
  - Wireshark: network protocol analyzer – C
  - Tomcat: servlet container – Java
  - Jetty: servlet container – Java
  - WordPress: blogging – PHP – no tool runs ☹
    - All are open source programs
    - 96k LoC (Jetty) to 1.6M LoC (Wireshark)
- 59k synthetic C/C++ and Java test cases

Tool reports

- Teams converted reports to SATE format
  - SAFES format - optional
  - Some original reports
- Described environment in which they ran tool
- Some teams tuned their tools
- Some teams provided analysis of their tool warnings



Analysis procedure for CVE-selected test cases



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Warning Subset Selection

For vulnerable versions only

- We assigned severity if a tool did not
- Avoid warnings with severity 5 (lowest)
- Statistically select from each warning class
- Select more warnings from higher severities
- Select 30 warnings from each of 15 tool reports
  - 1 report had only 6 warnings
  - Did not analyze Marfcat warnings
- Total is 426

Correctness categories

- True security weakness
- True quality weakness
- True but insignificant weakness
- Weakness status unknown
- Not a weakness

CVEs

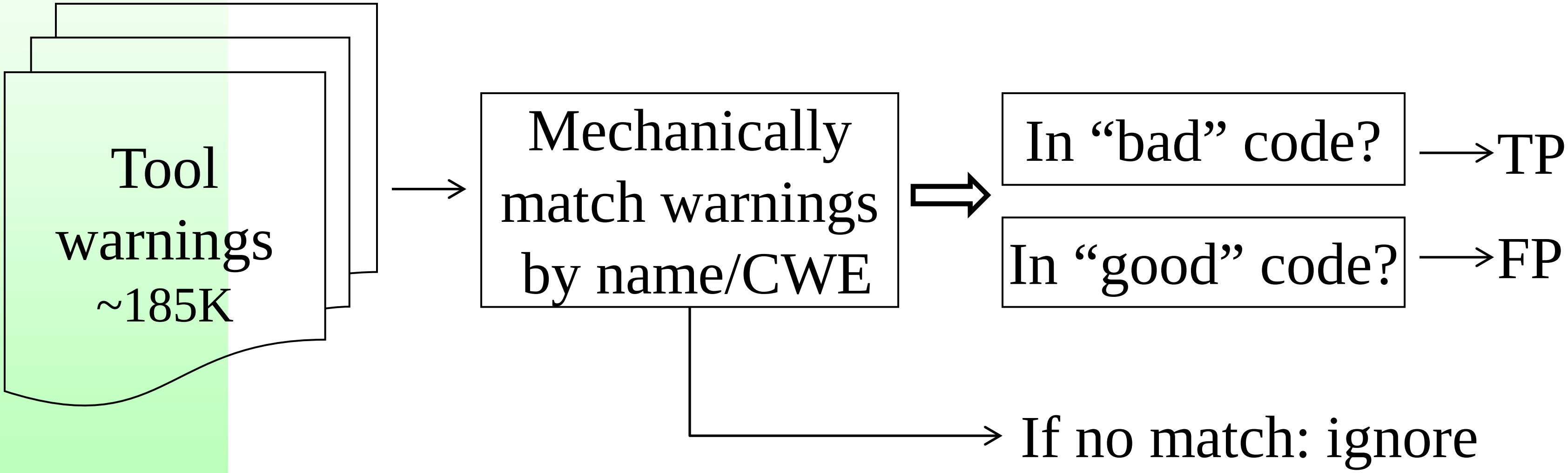
- Identify the CVEs
  - – Locations in code
- Find related warnings from tools
- Can tools discriminate between versions
  - – Or report for a fixed version also?
- Goal: focus our analysis on real-life exploitable vulnerabilities

Human findings

For IPMI protocol of Wireshark only

- Security experts analyze test case
  - Mike Cooper and David Lindsay from Cigital
- Look for important weaknesses
  - Root cause, with an example trace
- Look for related warnings from tools

Analysis procedure for synthetic test cases



- Precisely characterized weaknesses
- Mechanical matching is not perfect

SATE over time

- 2008: First try: analyze warnings
- 2009: Subset selection, more analysis categories, human findings
- 2010: CVE-selected test cases, improved analysis guidelines
- IV: Added synthetic test cases

Differences from SATE 2010

- Synthetic test cases
- Same test cases for CVE-selected and sample analysis
- Describe CVEs better
- Test cases pre-compiled in a Virtual Machine
- More time to run tools, analyze outputs

- Still, much can be improved…

Thanks to teams!