Week 10: Computer and Network Security, Computer Reliability
March 13, 2023
8.1 Introduction

• Computer systems are sometimes unreliable
  – Erroneous information in databases
  – Misinterpretation of database information
  – Malfunction of embedded systems

• Effects of computer errors
  – Inconvenience
  – Bad business decisions
  – Fatalities
8.2 Data-Entry or Data-Retrieval Errors
Disfranchised Voters

- November 2000 general election
- Florida disqualified thousands of voters
- Reason: People identified as felons
- Cause: Incorrect records in voter database
- Consequence: May have affected election’s outcome
False Arrests

- Sheila Jackson Stossier mistaken for Shirley Jackson
  - Arrested and spent five days in detention
- Roberto Hernandez mistaken for another Roberto Hernandez
  - Arrested twice and spent 12 days in jail
- Terry Dean Rogan arrested after someone stole his identity
  - Arrested five times, three times at gun point
Accuracy of NCIC Records

• March 2003: Justice Dept. announces FBI not responsible for accuracy of NCIC information
• Exempts NCIC from some provisions of Privacy Act of 1974
• Should government take responsibility for data correctness?
Dept. of Justice Position

- Impractical for FBI to be responsible for data’s accuracy
- Much information provided by other law enforcement and intelligence agencies
- Agents should be able to use discretion
- If provisions of Privacy Act strictly followed, much less information would be in NCIC
- Result: fewer arrests
Position of Privacy Advocates

- Number of records is increasing
- More erroneous records → more false arrests
- Accuracy of NCIC records more important than ever
Act Utilitarian Analysis: Database of Stolen Vehicles

Over 1 million cars stolen every year
Just over half are recovered, say 500,000
Assume NCIC is responsible for at least 20%
100,000 cars recovered because of NCIC
Benefit of $5,000 per car (owner gets car back; effects on national insurance rates; criminal doesn't profit)
Total value of NCIC stolen vehicle database: $500,000/year

Only a few stories of false arrests
Assume 1 false arrest per year (probably high)
Assume harm caused by false arrest $55,000 (size of award to Rogan)
Benefit surpasses harm by $445,000/year
Conclusion: Good to have NCIC stolen vehicles database
8.3 Software and Billing Errors
Errors When Data Are Correct

- Assume data correctly fed into computerized system
- System may still fail if there is an error in its programming
Comair Cancelled All Flights on Christmas Day, 2004

AP Photo/Al Behrman, File
Other System Malfunctions
8.4 Notable Software System Failures
Patriot Missile

- Designed as anti-aircraft missile
- Used in 1991 Gulf War to intercept Scud missiles
- One battery failed to shoot at Scud that killed 28 soldiers
- Designed to operate only a few hours at a time
- Kept in operation > 100 hours
- Tiny truncation errors added up
- Clock error of 0.3433 seconds $\rightarrow$ tracking error of 687 meters
Patriot Missile Failure

Figure from SCIENCE 255:1347. Copyright ©1992 by The American Association for the Advancement of Science. Reprinted with permission.
Direct Recording Electronic Voting Machines

• After problems with 2000 election, Congress passed Help America Vote Act of 2002
• HAVA provided money to states to replace punch card voting systems
• Many states used HAVA funds to purchase direct recording electronic (DRE) voting machines
• Brazil and India have run national elections using DRE voting machines exclusively
• In November 2006 1/3 of U.S. voters used DRE voting machines
Diebold Electronic Voting Machine
Class Discussion: What could be potential problems with EVMs?
8.8 Software Warranties and Vendor Liability
Shrinkwrap Warranties

• Some say you accept software “as is”
• Some offer 90-day replacement or money-back guarantee
• None accept liability for harm caused by use of software
Are software warranties enforceable?
Case Study: Incredible Bulk
Peter downloads a copy of the exciting new computer game Incredible Bulk for $49.95. The game is usable, but it contains some annoying bugs. The company never releases software patches fixing the bugs.

The next year the company releases Incredible Bulk II, which also costs $49.95 to download. According to the product description, the new release has many exciting new features. In addition, all of the annoying bugs of the original game have been fixed.

Was the company’s action ethical?
Class Discussion: Should companies and programmers take responsibility of software malfunctions or errors?
Moral Responsibility of Software Manufacturers

• If vendors were responsible for harmful consequences of defects
  – Companies would test software more
  – They would have to purchase liability insurance
  – Software would cost more
  – Start-ups would be affected more than big companies
  – Less innovation in software industry?
  – Software would be more reliable?

• Making vendors responsible for harmful consequences of defects may be a bad idea, but…

• Consumers should not have to pay for bug fixes