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Integrating the Common Weakness Enumeration into a Secure Programming Course

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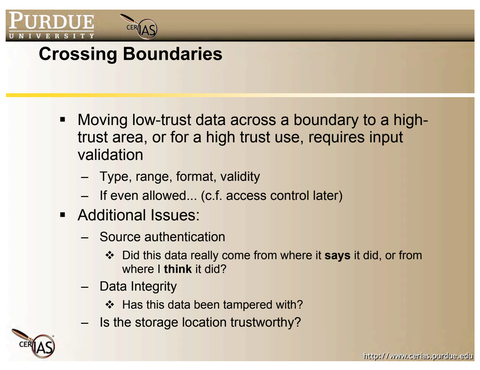
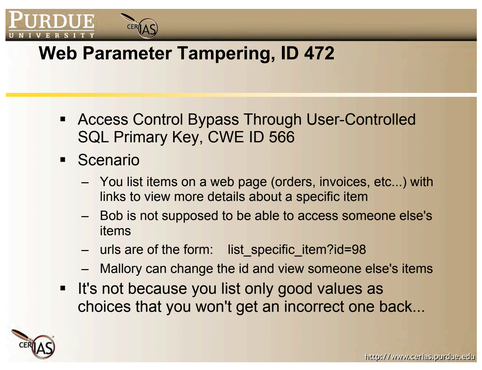
CS390S: Secure Programming

- Since Fall 2002
- Review common mistakes
  - Buffer Overflows
  - Format String Vulnerabilities
  - etc...
- Concepts
  - Trust Management
  - Input Validation
  - Meta-Characters and escapes
  - Character encodings
  - etc...
- **Is the coverage representative?**
- **Is the coverage done correctly?**
- **How do employers know what students learned in the class?**

New Slides Based on View



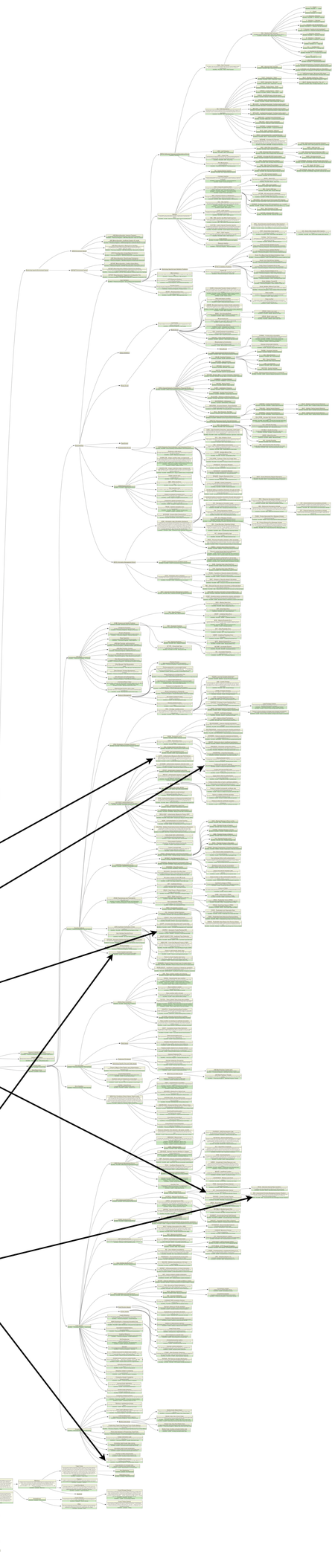


Conclusions

- Creating views is work intensive
- Views highlight missing CWE IDs
  - Feedback improves the CWE
  - Course declared CWE compatible
  - Course quality improved
  - More examples and cases
  - Strong linkage of concepts to a systematic empirical collection
- Views could help form the basis of new taxonomies or ontologies

The Common Weakness Enumeration

- Compatibility declarations, Spring 2007
- Group CVE entries by similarity
- CWE ID given to each
- Entries are linked in a tree (parent/children)
  - **Tree is huge! (see on right)**
- Organization is often more appopriate for code scanners than teaching
- Example: No branch matching trust management concepts



New CWE Views Needed For Teaching

Goal: Re-organize CWE entries in a tree that matches the concept to be taught

Example: Trust

Legend: Matched CWE IDs Missing CWE IDs

- **Trust Boundary Problems**
  - Inconsistent validation mechanisms
    - Same source handled differently in different code locations
    - At different times
    - In different circumstances
    - From different sources
      - Authentication Bypass by Alternate Path/Channel, ID 288
      - Unprotected Alternate Channel, ID 420
  - Ill-defined trust boundaries
  - Trust Boundary Violation, ID 501
  - Misplaced or Absent Trust Boundaries
    - Self-reported information
      - Trusting self-reported IP address, ID 291
      - Self-reported & reverse DNS name, ID 292
      - Using referrer field for authentication, ID 293
    - Trusting the client
      - Client-Side Makes Server Security Decisions
      - Server trusting client-side-controlled data
        - "Trusting Cookie Information" is Use of Cookies, ID 565
        - Web Parameter Tampering, ID 472
          - Access Control Bypass Through User-Controlled SQL Primary Key, ID 566
    - Trusting Events
      - Trust of system event data, ID 360
      - Unprotected Windows Messaging Channel ('Shatter'), ID 422
    - Trusting the integrity of shared data writable by others
      - Misused Authentication: getlogin (not reentrant), ID 558
- **Cryptographic Trust Assurance**
  - Certificate Issues, ID 295
    - Failure to follow chain of trust in certificate validation, ID 296)
    - "Failure to validate host-specific certificate data" ID 297
    - No OpenSSL Certificate Check Performed before this Use, ID 599
    - Failure to validate certificate expiration, ID 298
    - Failure to check for certificate revocation, ID 299
    - Race condition in checking for certificate revocation, ID 370
  - Use of Encrypted Cookies
    - Counterexample: Plaintext Storage in Cookie, ID 315 (different perspective on 565, but essentially the same mistake)

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