

## Lecture 16 Outline (May 4, 2015)

**Reading:** §6.4, 9.1–9.2

**Assignment:** Program 3, due May 8, 2015

1. Greetings and felicitations!
2. Clark-Wilson Model
  - a. Theme: military model does not provide enough controls for commercial fraud, etc. because it does not cover the right aspects of integrity
  - b. Components
    - i. Constrained Data Items (CDI) to which the model applies
    - ii. Unconstrained Data Items (UDIs) to which no integrity checks are applied
    - iii. Integrity Verification Procedures (IVP) that verify conformance to the integrity spec when IVP is run
    - iv. Transaction Procedures (TP) takes system from one well-formed state to another
3. Clark-Wilson Certification and Enforcement Rules
  - C1 All IVPs must ensure that all CDIs are in a valid state when the IVP is run.
  - C2 All TPs must be certified to be valid, and each TP is associated with a set of CDIs it is authorized to manipulate.
  - E1 The system must maintain these lists and must ensure only those TPs manipulate those CDIs.
  - E2 The system must maintain a list of User IDs, TP, and CDIs that that TP can manipulate on behalf of that user, and must ensure only those executions are performed.
  - C3 The list of relations in E2 must be certified to meet the separation of duty requirement.
  - E3 The system must authenticate the identity of each user attempting to execute a TP.
  - C4 All TPs must be certified to write to an append-only CDI (the log) all information necessary to reconstruct the operation.
  - C5 Any TP taking a UDI as an input must be certified to perform only valid transformations, else no transformations, for any possible value of the UDI. The transformation should take the input from a UDI to a CDI, or the UDI is rejected (typically, for edits as the keyboard is a UDI).
  - E4 Only the agent permitted to certify entities may change the list of such entities associated with a TP. An agent that can certify an entity may not have any execute rights with respect to that entity.
4. Cryptography
  - a. Codes vs. ciphers
  - b. Attacks: ciphertext only, known plaintext, chosen plaintext
  - c. Types: substitution, transposition
5. Classical Cryptography
  - a. Monoalphabetic (simple substitution):  $f(a) = a + k \bmod n$
  - b. Example: Caesar with  $k = 3$ , RENAISSANCE  $\rightarrow$  UHQDLVVDQFH
  - c. Polyalphabetic: Vigenère,  $f_i(a) = a + k_i \bmod n$
  - d. Cryptanalysis: first do index of coincidence to see if it is monoalphabetic or polyalphabetic, then Kasiski method.
  - e. Problem: eliminate periodicity of key