Midterm Exam Review

COMPSCI210 Recitation

5 Oct 2012

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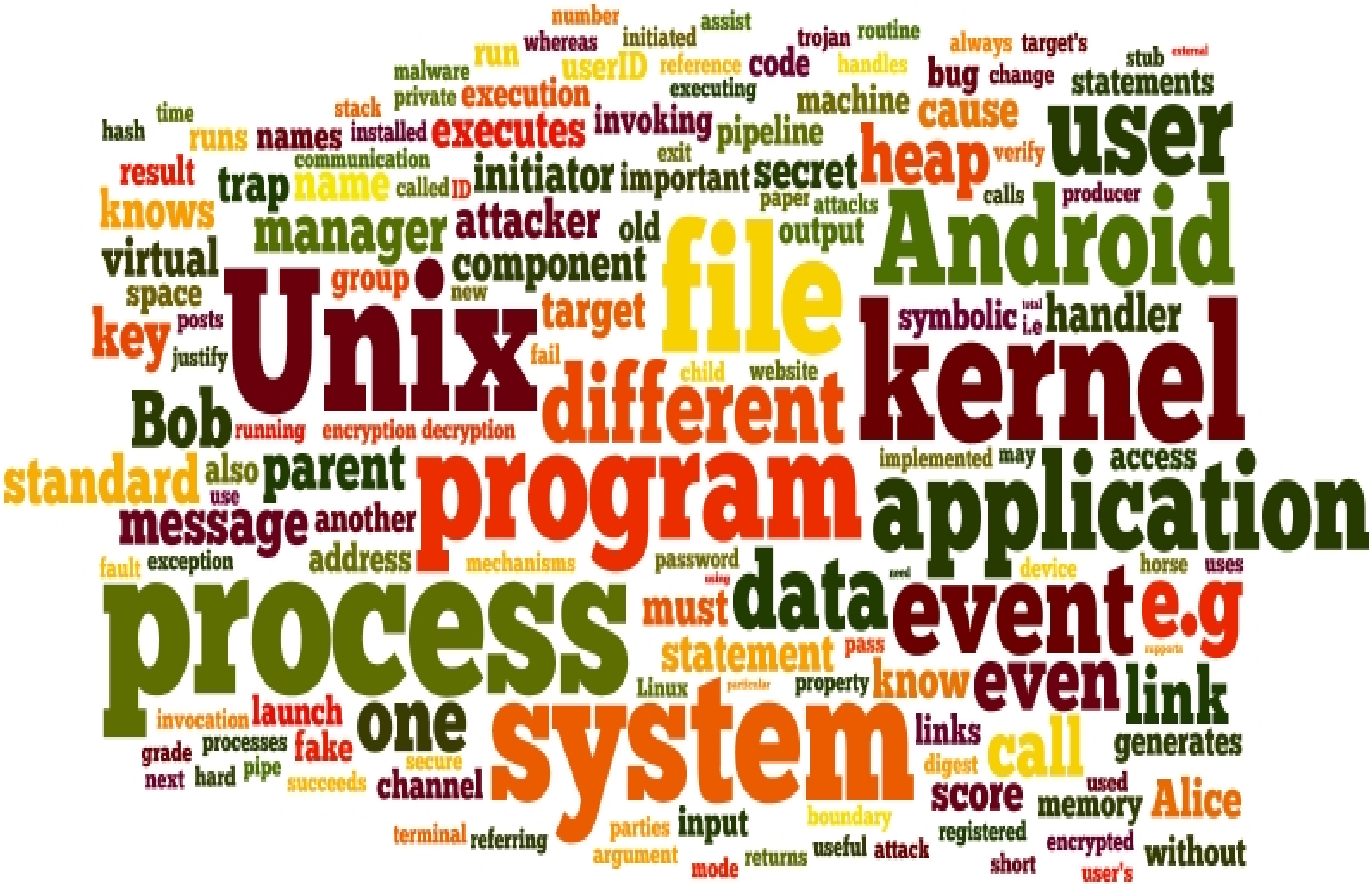
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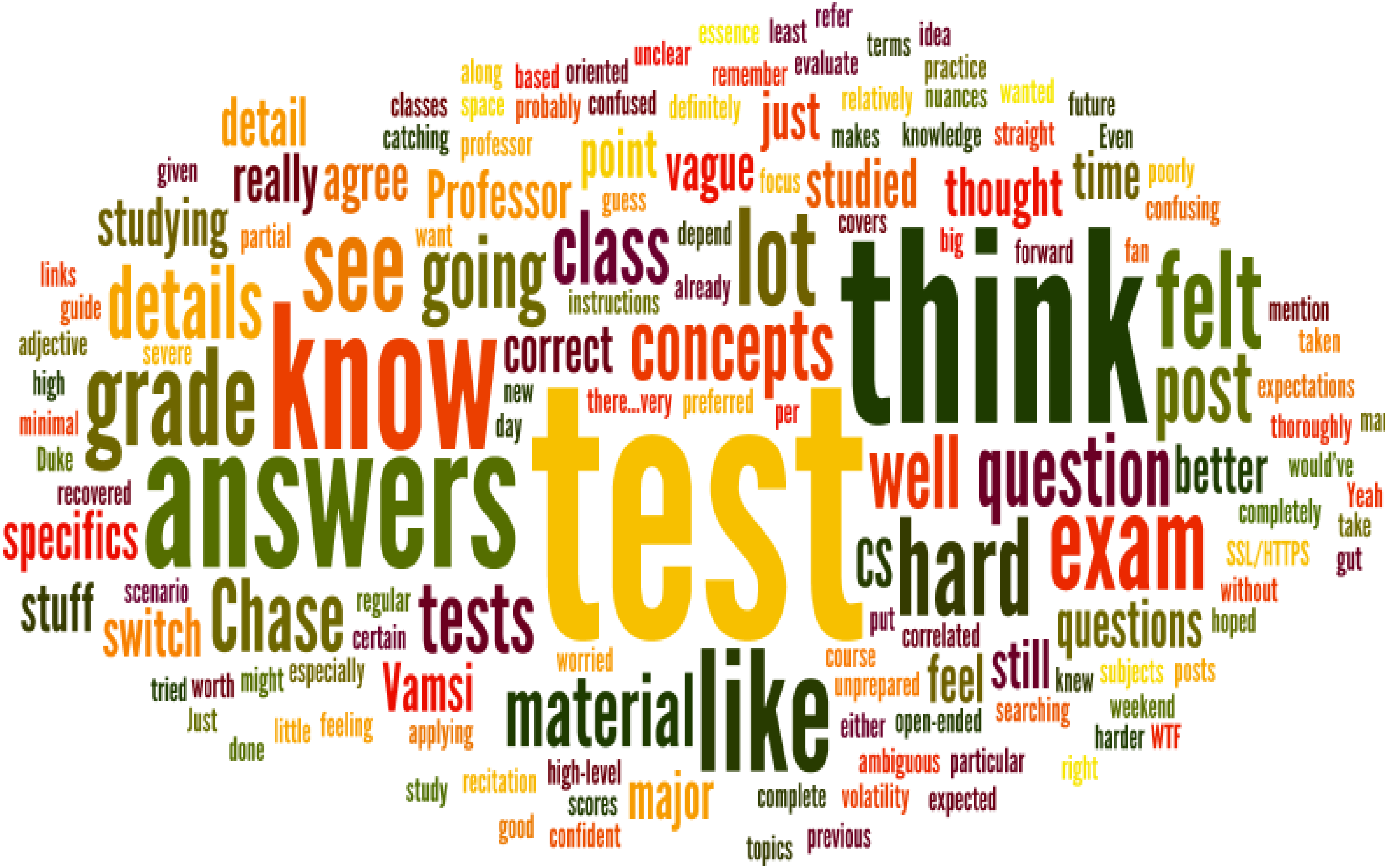
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My biased view

- A bit challenging
  - Tests your reading comprehension skills under time pressure
- Thought provoking
  - Not a brain dump test
- Opportunity for learning
  - Just an another class
- Tests your confidence
  - Not difficult to score but easy to get lost

Terminology so far ..

- Entity
  - Principal, Identity, Attribute, Label
- Component
- Context
- Connector
- Channel
- Trusted computing base
- Authentication
- Authorization
- Reference monitor
  - Subject, Object, Guard

- Process
- Thread
- Kernel
- Address space
- Files
- Pipes
- Sockets
- Binder
- Event

Systems/Abstractions

- Traditional single node
  - Unix
  - Linux
- Mobile
  - Android/Linux
- Web
  - Chromium/Linux
- Network basics
  - Client/Server

Security, an overview

We reduce it to three intertwined issues:

1. **What program am I running?**
   - Can this program be trusted? Who says?
   - Can I be sure that the program has not been tampered?
2. **Who am I talking to?**
   - Can this entity be trusted?
   - Can I be sure the communication has not been tampered?
3. **Should I approve this request?** R(op, subject, object)
   - Who is the requester? (subject)
   - What program is speaking for the requester?
   - Does the subject have the required permissions?

Elements of security

- **Isolation/protection**
  - Sandboxes and boundaries prevent unchecked access.
- **Integrity**
  - Fingerprint data to detect tampering.
  - Encrypt data to prevent access or tampering.
- **Authentication**
  - Identify a peer by proof that it possesses a secret.
- **Identity and attributes**
  - Identities have credentials: names, tags, roles...
- **Authorization == access control**
  - Guard checks credentials against an access policy.

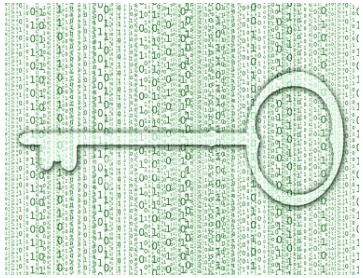




Access Control

- Triplet
  - {op, subject, object}
- Components run within contexts (isolated sandboxes).
- Each component/context is associated with an identity with some attributes (subject).
- Components use system calls to interact across context boundaries, or access shared objects.
- Each object has some access attributes.
- Principle of least privilege limits the damage a component can do if it “goes rogue”.

Crypto primitives



Encrypt/Decrypt

Signing

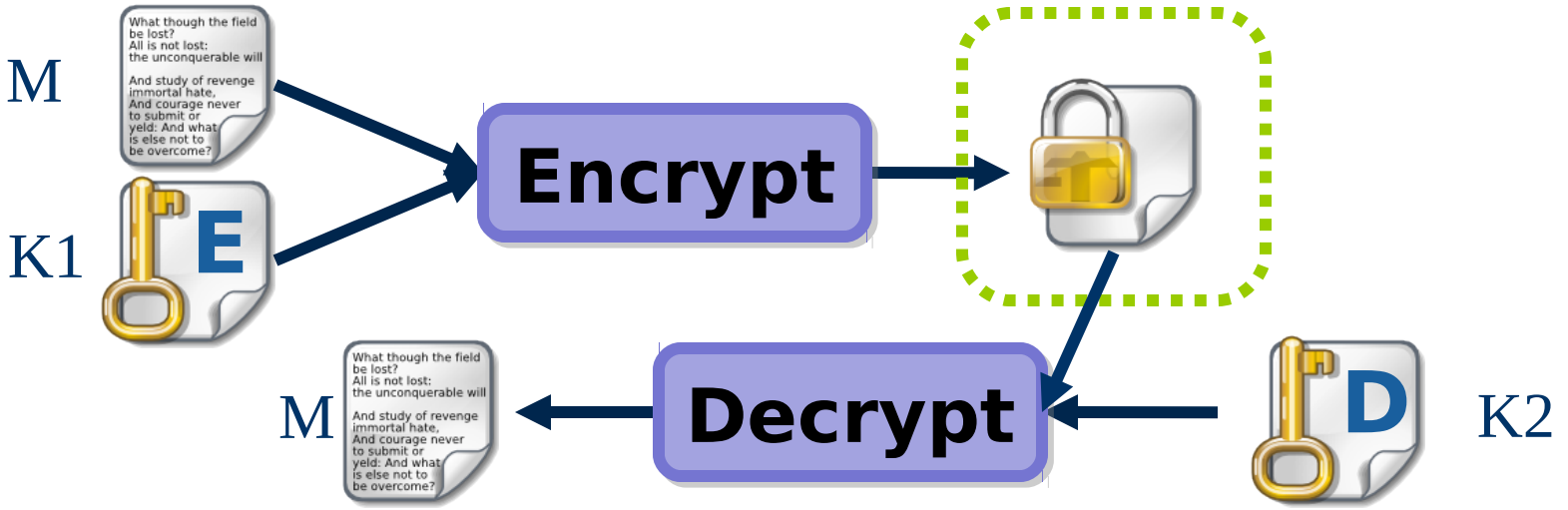
Use a shared secret key (symmetric) or use a keypair one public, one private (asymmetric)

Secure hashing

useful for fingerprinting data

Cryptography for Busy People

- **Standard crypto functions parameterized by keys.**
  - **Fixed-width "random" value (length matters, e.g., 256-bit)**
  - **Symmetric (DES: fast, requires shared key K1 = K2)**
  - **Asymmetric (RSA: slow, uses two keys)**
- **"Believed to be computationally infeasible" to break**



[Image: Landon Cox]

Two Flavors of “Signature”

- A digest encrypted with a private asymmetric key is called a digital signature
  - “Proves” that a particular identity sent the message.
    - “Proves” the message has not been tampered.
    - “Unforgeable”
  - The sender cannot deny sending the message.
    - “non-repudiable”
  - Can be legally binding in the United States
- A digest encrypted with a shared symmetric key is called a message authentication code (MAC).
    - faster, but…

Nonce

- Verifies the freshness of a message
- Eavesdropping
  - serverNonce
- Tampering
  - clientNonce