Authorization

UT CS361S

SPRING 2021

LECTURE NOTES

Authentication/Authorization

Validating Identity

Permissions Assigned to a Validated Identity

Access Controls

The mechanism by which authorization permissions are managed

Within most information systems, the most common controls:

- (C)reate
- (R)ead
- (U)pdate
- (D)elete

Most other controls can be thought of as a form of one of these

Every-day Approaches

ACCESS CONTROL LISTS

CAPABILITIES

One View of ACL/Capabilities

User	Accounting Data
Sam	rw
Alice	rw
Bob	r

Figure 4.4: Access control list (ACL)

User	Operating System	Accounts Program	Accounting Data	Audit Trail
Bob	rx	r	r	r

Figure 4.5: A capability

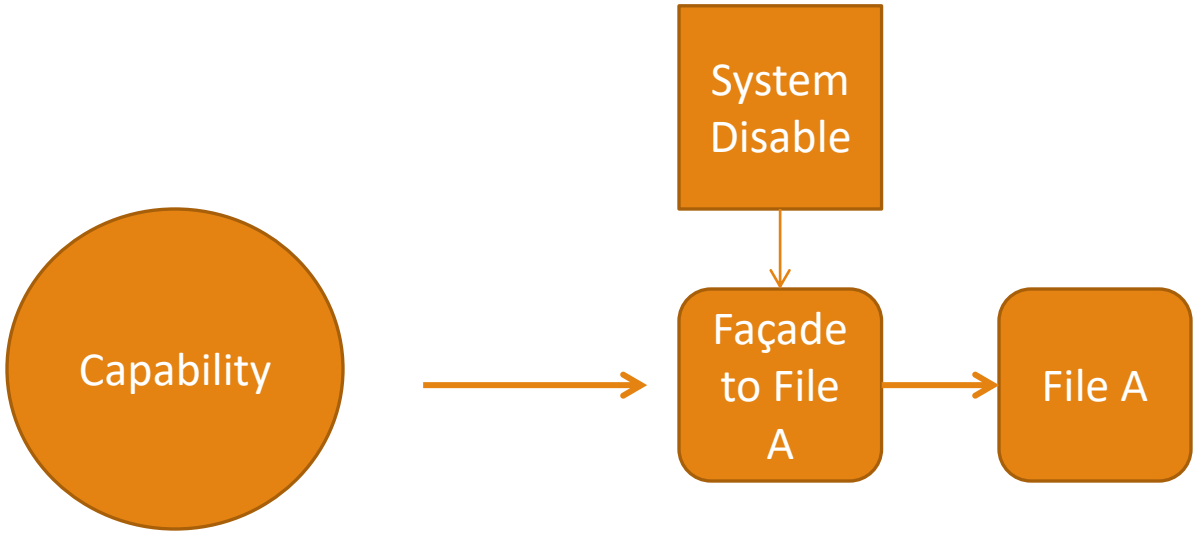
Broader Concept

A ***capability*** is an *enabling* technology for access

An ***access control list*** is a *filtering* technology for access

Opponents of capabilities argue that you cannot change a file's status

They just don't understand capabilities



MAC vs DAC

Mandatory Access Controls – what is permitted is determined by policy

Discretionary Access Controls – what is permitted is determined by user

Multi-Level Security (MLS)

Often seen as synonymous with MAC

Users and data are assigned classifications

What users are permitted to do with data depends on both labels

Bell Lapadula Model

Design emerged from military document classification

Enforces two properties

- *Simple Security Property:* No Read Up (NRU)
- **-Property:* No Write Down (NWD)

The *-property was the big innovation of BLP. It *assumed* trojans and buggy code!

This is a well defined security policy

- It is relatively easy to determine if the mechanisms enforce the policy
- If it's the right policy it works great!

Problems of BLP

If the security officer can “temporarily declassify” all of the protections go away

- Strong tranquility: security labels never change during operation
- Weak tranquility: labels never change in a way that violates security policy
  - The idea here is “least privilege”. Even if you have TS, start at unclassified
  - As you access info that is higher, your level increases

The system can get fragmented into pieces that can’t communicate

Also, what do you do with an App that has to straddle?

- A document editor used to redact a TS document to Classified

Doesn’t deal with creation of subjects or objects

Biba model

Upside-down BLP

- You can only read up and write down
- The goal is *integrity* not *confidentiality*

Partially used in Vista. Uses the NoWriteUp.

- Most files are “medium” or higher. IE is “low”
- So, things downloaded can read most files, *but not write to them!*

This was the first formal model of integrity

- Struggled in real-world because of the exceptions and straddling issues

Inference

Information sharing often involves some kind of “scrubbing”

In MLS, a report is redacted before moving down a security layer

In privacy-preserving systems, data is often *anonymized*

The problem, of course, is inference

- People can often be identified by their medical records even with names removed
- And, of course, we’ve seen this with AOL and Google

Inference Control

Characteristic formula – the query instructions to get some set

Query set – the set produced by a characteristic formula

Sensitive Statistics – stats that deanonymize information:

- For example, if the set is too small, than we've identified an individual by attributes

Query Size

You can limit how small a result is from a query

But you also have to worry about returning N-1!!

Also, you have to deal with using multiple queries to get a smaller than N intersection

Role Based Access Control

- RBAC
- Users assigned roles, permissions based on roles
- Is this MAC or DAC?
- Lessons from the field: what goes wrong in RBAC?

Authorization Principles

- Least Privilege
- Separation of Duties