

CS590U

## Access Control: Theory and Practice

Lecture 1 (August 26)  
Introduction and Overview of  
Projects



### Instructor Info

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- Office hour
  - Tuesday 3pm to 4pm
  - Wednesday 2pm to 3pm
  - Thursday 3pm to 4pm



## Please fill out index cards

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- Name
- Preferred name
- Email address
- Taking or auditing
- Which department/program
- Which year
- Graduate-level security courses
- Advisor

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## Coursework

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- One homework      November 4      10%
- A course project
  - Pre-proposal      Sep 4
  - Project proposal      due Sep 30      20%
  - Lecture      Oct/Nov      20%
  - Mini defense      Dec      15%
  - Final report      Dec 16      35%

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## Pre-proposal (Due Sep. 4)

### Submit paper copy before class

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- List 2 to 4 project topics you find interesting
  - Why these topics interest you?
  - What are your plans?
  - What related backgrounds do you have?
- Propose new project ideas
  - Background, problem, plan, references ...

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## Why a Course on Access Control?



## What is Access Control?

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- Quote from Security Engineering by Ross Anderson
  - Its function is to control which principals (persons, processes, machines, ...) have access to which resources in the system --- which files they can read, which programs they can execute, and how they share data with other principals, and so on.

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## Access Control is Useful

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- Access control is Pervasive
  - OS (Unix, Windows), Databases, Java, Firewall, Middleware
- Quote from Security Engineering
  - Access control is the traditional center of gravity of computer security. It is where security engineering meets computer science.

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## Access Control is Interesting

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- Has (relatively) well-developed theory
  - 30+ years history
- Big gap between theory and practice
  - Potential fruitful future research areas
    - policy management and analysis
    - human factors
- No standard textbook/course exists

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## Principles of Access Control (Saltzer and Schroeder 75)

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1. Economy of mechanism
  - keep the design as simple and small as possible
2. Fail-safe defaults
  - default is no-access

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## Principles of Access Control

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3. Complete mediation
  - every access must be checked
4. Open design
  - security does not depend on the secrecy of mechanism

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## Principles of Access Control

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5. Separation of privilege
  - a system that requires two keys is more robust than one that requires one
6. Least privilege
  - every program and every user should operate using the least privilege necessary to complete the job

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## Principles of Access Control

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7. Least common mechanism
  - “minimize the amount of mechanism common to more than one user and depended on by all users”
8. Psychological acceptability
  - “human interface should be designed for ease of use”
  - the user’s mental image of his protection goals should match the mechanism

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## Project Ideas (For Details, See Syllabus)

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- Evaluating the Effectiveness of Access Control in SELinux.
- Static Analysis for Determining A Program's Access Requirements.
- Fine Grained Access Control in Databases.

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## Human Factors in Access Control (Also see Syllabus)

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- Understand usability evaluation
  - how to set up tests
  - how to interpret results
- Books
  - Usability Engineering (by Jakob Nielsen)
  - Human-Computer Interaction in the New Millennium (edited by John Carroll)

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## Project Ideas Related to Firewalls

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- Idea one
  - high-level language to hide low-level trickiness
  - from Inside Network Perimeter Security by Stephen Northcutt, et al.
- Idea two
  - central management and analysis of firewall policies
  - from several previous projects

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## Backgrounds on Trust Management



### What is Trust Management?

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- An approach to decentralized access control
  - principals can make statements
  - access control decisions are based on statements made by multiple principals
- Common characteristics of TM systems:
  - treat public keys as principals
  - use digitally signed credentials



## What One Can Express in $RT_0$

- B says that D is a student
- A says that B is a university
- A believes that someone is a student if a university says so
- C says that D is an ACM member
- A grants access to X to anyone who A believes is a student and C believes is an ACM member

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## What One Can Express in $RT_1$

- B says that D is a student that has name ..., department ..., year ...
- A says that only students of certain years and certain departments can do ....

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## What One Can Express by Adding Constraints to $RT_1$

- A says that B can admin any host in a domain purdue.edu
- B says that D can access any host in the domain cs.purdue.edu
- D wants to access arthur.cs.purdue.edu
- A should give D access
- Semantic foundation: Constraint Datalog

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## What Queries One Can Ask

- Is D authorized access X?
- Who can access X?
- What can A access?
- If someone is not fully trusted, what could happen in the future.

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## Automated Trust Negotiation

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- A and B each has a set of credentials; they want to exchange credentials to establish trust, but they also consider their credentials to be sensitive
- Automated Trust Negotiation

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## End of Lecture 1

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- Pre-proposal due Thursday next week (Sep 4)
- Welcome to meet with me to discuss project ideas
- Security reading group meet this Wednesday
  - join the mailing list security-reading-group from cs.purdue.edu machines

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