

Lecture 17

Access Control

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Access Control

- ❖ A “language” for expressing access control policy: who can access what, how and when...
- ❖ **Enforcement of access control**
 - ❖ Identify all resources (objects) and their granularity
 - ❖ Identify all potential users (subjects)
 - ❖ Specify rules for subject/object interaction
 - ❖ Guard them in real time

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Model and Terminology

- ❖ **Subjects:** users or processes
- ❖ **Objects:** resources (files, memory, printers, routers, plotters, disks, processes, etc., etc.,...)

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Focus of AC

- ❖ **What a subject is allowed to do**
- ❖ **What may be done with an object**

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Access Modes

- ❖ "look" at object, e.g.:
 - ❖ Read file
 - ❖ Check printer queue
 - ❖ Print remote screen
 - ❖ Query database
 - ❖ etc., etc.

- ❖ "change" object, e.g.:
 - ❖ Write/append/erase file
 - ❖ Print or fax
 - ❖ Display on screen
 - ❖ etc., etc.

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Access Rights

execute, read, append, and write

	Execute	Append	Read	Write
Observe			X	X
Alter		X		X

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UNIX

- ❖ **execute:** execute (program) file, search directory
- ❖ **read:** read from file, list directory
- ❖ **write:** write (re-write or append) file, create or rename file in directory

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Example: Windows NT/2000 (NTFS)

- ❖ **execute**
- ❖ **read**
- ❖ **write**
- ❖ **delete**
- ❖ **change permission**
- ❖ **change ownership**

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AC Types

Who is in charge of setting AC policy?

- ❖ Discretionary: resource owner
- ❖ Mandatory: system-wide policy

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Access Control Structures

- ❖ Access Control Matrix
- ❖ Capabilities
- ❖ Access Control Lists

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Access Control Matrix

		Object		
		Bill.doc	Edit.exe	Fun.com
Subject	Alice	{0}	{execute}	{execute, read}
	Bob	{read, write}	{execute}	{execute, read, write}

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Access Control Lists

Keep access rights to an object with that object:

- **ACL for bill.doc:**
 - Bob: read, write
- **ACL for edit.exe:**
 - Alice: execute;
 - Bob: execute
- **ACL for fun.com:**
 - Alice: execute, read;
 - Bill: execute, read, write
 - As many ACLs as there objects
 - Each ACL either signed or stored in protected place
 - Hard to Manage

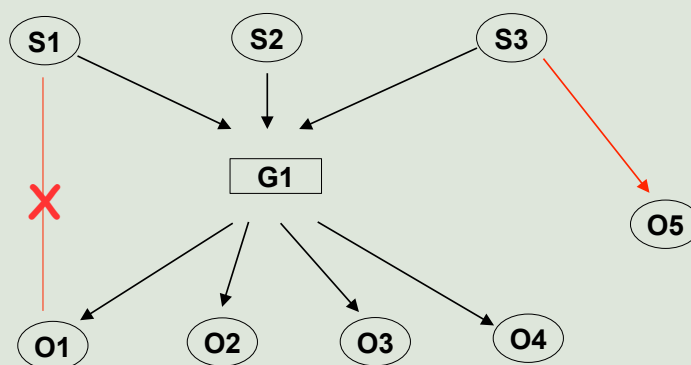
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Access Control Lists (1)

- ❖ Managing access rights can be difficult
- ❖ Groups can be helpful...
- ❖ Groups simplify definition of access control policies

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Access Control Lists (2)



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Capabilities

- ❖ Capabilities are associated with discretionary access control
- ❖ Reason: difficult to get full view of who has permission to access an object
- ❖ Very difficult to revoke a capability (owners/objects have to keep track of all issued capabilities)

- As many capabilities as there are subject/object pairs
- Each capability either signed or otherwise protected
- Hard to revoke in a distributed setting

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Capabilities (1)

Keep access rights with the subject:

❖ Alice's capabilities:

- ❖ [edit.exe:execute];
- ❖ [fun.com:execute,read]

❖ Bob's capabilities:

- ❖ [bill.doc:read,write]
- ❖ [edit.exe:execute]
- ❖ [fun.com:execute,read,write]

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In summary

- ❖ **Centralized Systems: ACLs are better**
- ❖ **Distributed Systems: capabilities are better**

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ROLE BASED ACCESS CONTROL (RBAC)

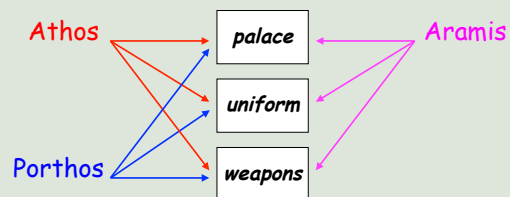
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RBAC Basics

- Users are associated with roles.
- Roles are associated with permissions.
- A user has permission only if s/he has a role associated with that permission.

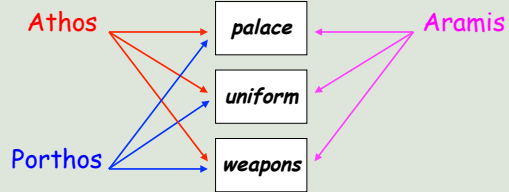
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Example: The Three Musketeers (User/Permission Association)



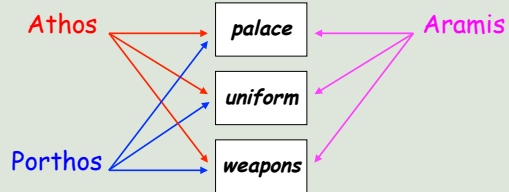
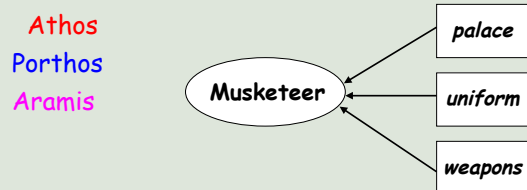
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Example: The Three Musketeers (RBAC)



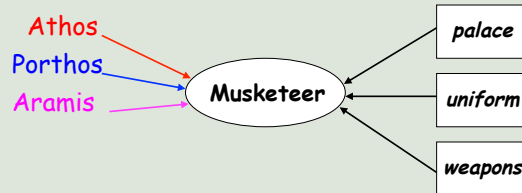
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Example: The Three Musketeers (RBAC)

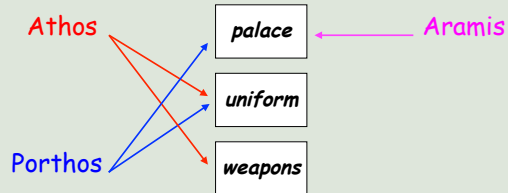


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Example: The Three Musketeers

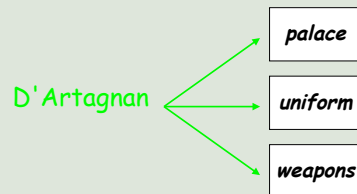
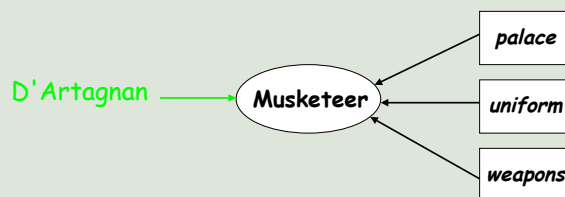


Here RBAC doesn't work...



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Example: (D'Artagnon becomes a Musketeer)



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