

Secure Operating Systems (CYB610)

Master of Science in Cybersecurity

Lecture 6: User Authentication

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Chapter

01

Topics

This chapter covers the following topics and concepts:

- **Password authentication**
- **One-Time Passwords**
- **Password Selection Criteria**
- **Access Control**
- **Implementation of Access Control**

Chapter

01

Goals

When you complete this chapter, you will be able to:

- **Know what is the “User authentication”**
- **Explain the password authentication**
- **Illustrate the implementation of access control**
- **Know the password likely for a user**



- “The process of verifying an identity claimed by or for a system entity.”

- driver's license
- passports
- voice recognition
- fingerprint
- retina matching





Identity	Password
Jane	qwerty
Pat	aaaaaa
Phillip	oct3lwitch
Roz	aaaaaa
Herman	guessme
Claire	aq3wm\$oto!4

Plaintext

Identity	Password
Jane	0x471aa2d2
Pat	0x13b9c32f
Phillip	0x01c142be
Roz	0x13b9c32f
Herman	0x5202aae2
Claire	0x488b8c27

Concealed



- The most common authentication mechanism for user to operating system is a **password**.
- A "word" known to computer and user.
- widely used line of defense against intruders
 - user provides name/login and password to the security system (**identification step**)
 - system compares password with the one stored for that specified login (**verification step**)
- The user ID:
 - determines that the user is authorized to access the system
 - determines the user's privileges
 - is used in access control





The **four** means of authenticating user identity are based on:

Something the individual knows

- password,
- PIN,
- Answers to prearranged questions

Something the individual possesses (token)

- Smartcard,
- Electronic keycard,
- Physical key

Something the individual is (static biometrics)

- Fingerprint,
- Retina,
- Face

something the individual does (dynamic biometrics)

- Voice pattern,
- Handwriting,
- Typing rhythm



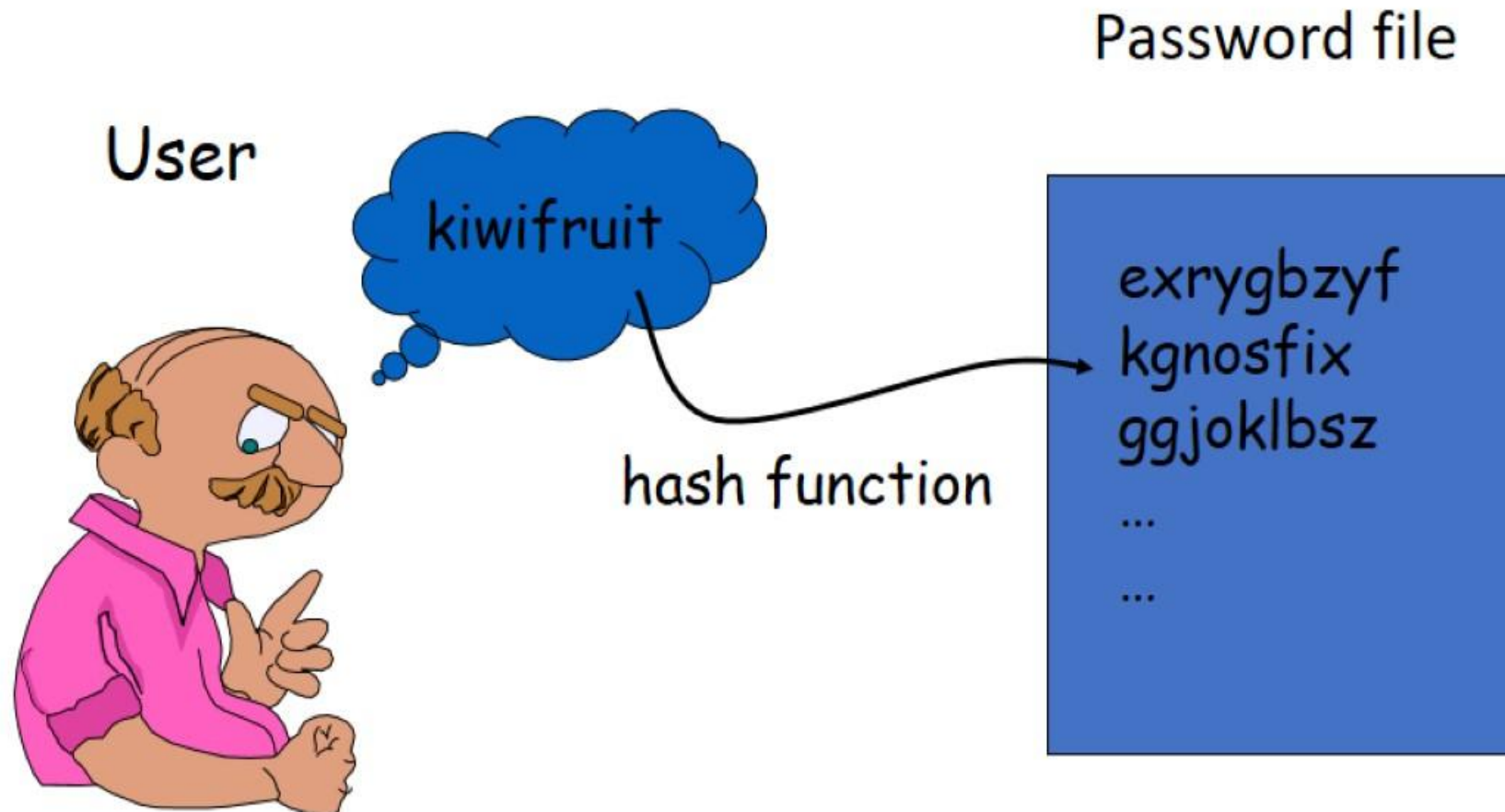
- Two or more forms can be **combined** for more **solid authentication**.
- a bank card and a PIN combine something the user has with something the user knows.



Why is “something you know” more popular than “something you have” and “something you are”?

Cost: passwords are free

Convenience: easier for System Administrator to reset password than to issue user a new thumb



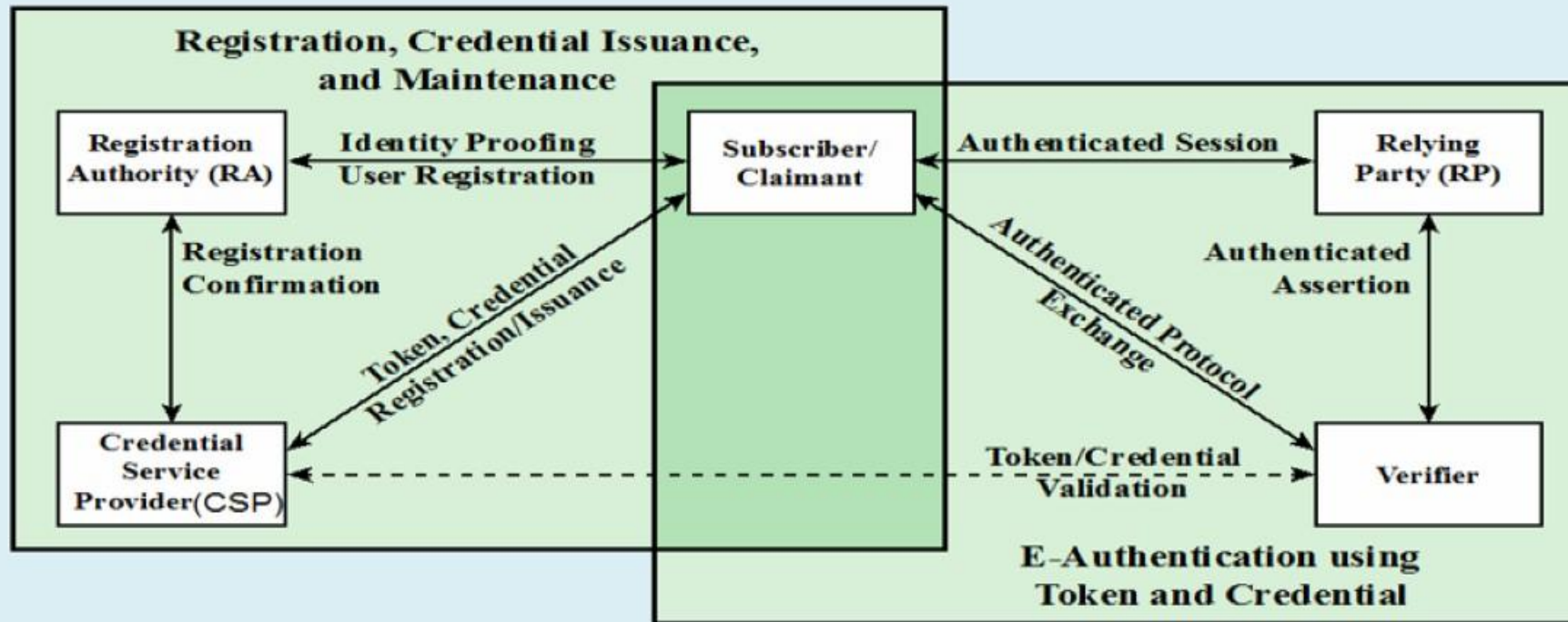


Figure 3.1 The NIST SP 800-63-2 E-Authentication Architectural Model



- **Hash function $h : \text{strings} \rightarrow \text{strings}$**
 - Given $h(\text{password})$, hard to find password
 - No known algorithm better than trial and error
- **User password stored as $h(\text{password})$**
- **When user enters password**
 - System computes $h(\text{password})$
 - Compares with entry in password file
- **No passwords stored on disk**



➤ Loss

- if the user loses the password, a new one must be assigned.

➤ Use

- Supplying a password for each access to a file can be inconvenient and time consuming.

➤ Disclosure

- If a password is disclosed to an unauthorized individual, the file becomes immediately accessible.
- If the user changes the password, all the other users must be informed of the new password because their old password will fail.

➤ Revocation

- To revoke one user's access right to a file, someone must change the password, thereby causing the same problems as disclosure.



offline
dictionary
attack

popular
password attack

workstation
hijacking

exploiting
multiple
password use

specific account
attack

password
guessing against
single user

exploiting user
mistakes

electronic
monitoring



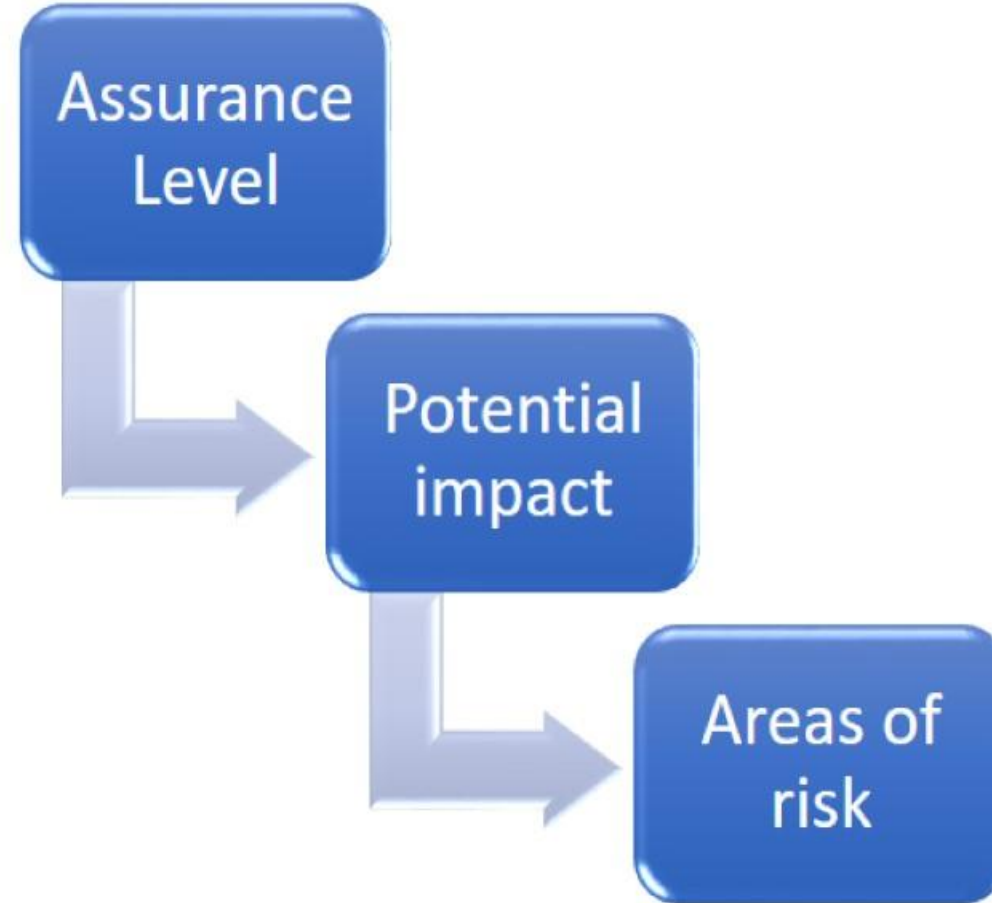
1. Controls to prevent unauthorized access to password file
2. Intrusion detection measures
3. Rapid re-issuance of compromised passwords
4. Account lockout mechanisms
5. Policies to inhibit users from selecting common passwords
6. Training in and enforcement of password policies
7. Automatic workstation logout
8. Policies against similar passwords on network devices



- Limiting users to certain workstations or certain times of access.
- Using additional authentication information is called *multifactor authentication*
- Two forms of authentication (which is, not surprisingly, known as *two-factor authentication*) are better than one,



- There are three separate concepts:





Describes an organization's degree of certainty that a user has presented a credential that refers to his or her identity

More specifically is defined as:

The degree of confidence in the vetting process used to establish the identity of the individual to whom the credential was issued

The degree of confidence that the individual who uses the credential is the individual to whom the credential was issued

Four levels of assurance

Level 1

- Little or no confidence in the asserted identity's validity

Level 2

- Some confidence in the asserted identity's validity

Level 3

- High confidence in the asserted identity's validity

Level 4

- Very high confidence in the asserted identity's validity



There are three levels of potential impact on organizations or individuals should there be a breach (failure) of security:

➤ **Low**

- An authentication error could be expected to have a limited adverse effect on organizational operations, organizational assets, or individuals

➤ **Moderate**

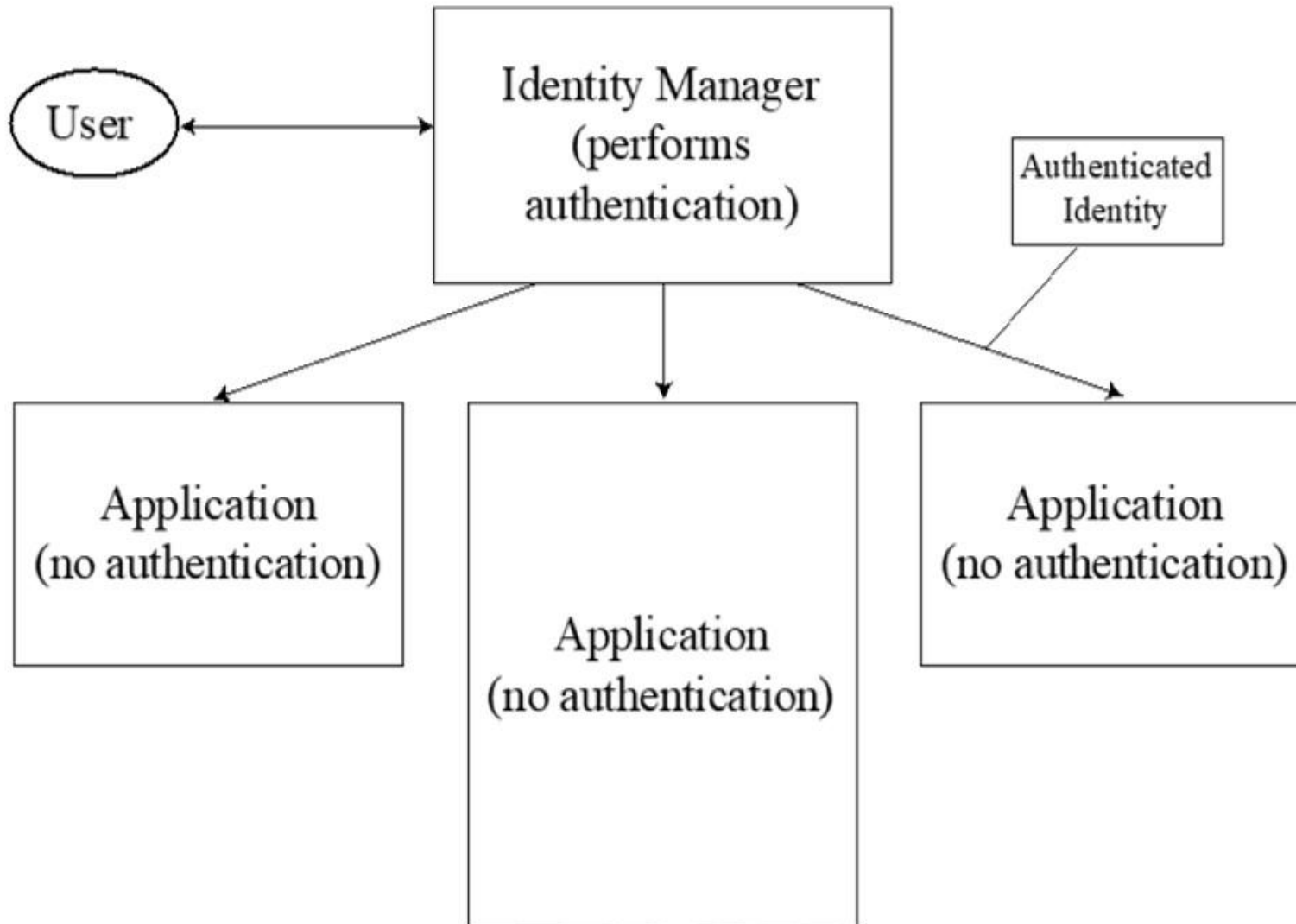
- An authentication error could be expected to have a serious adverse effect

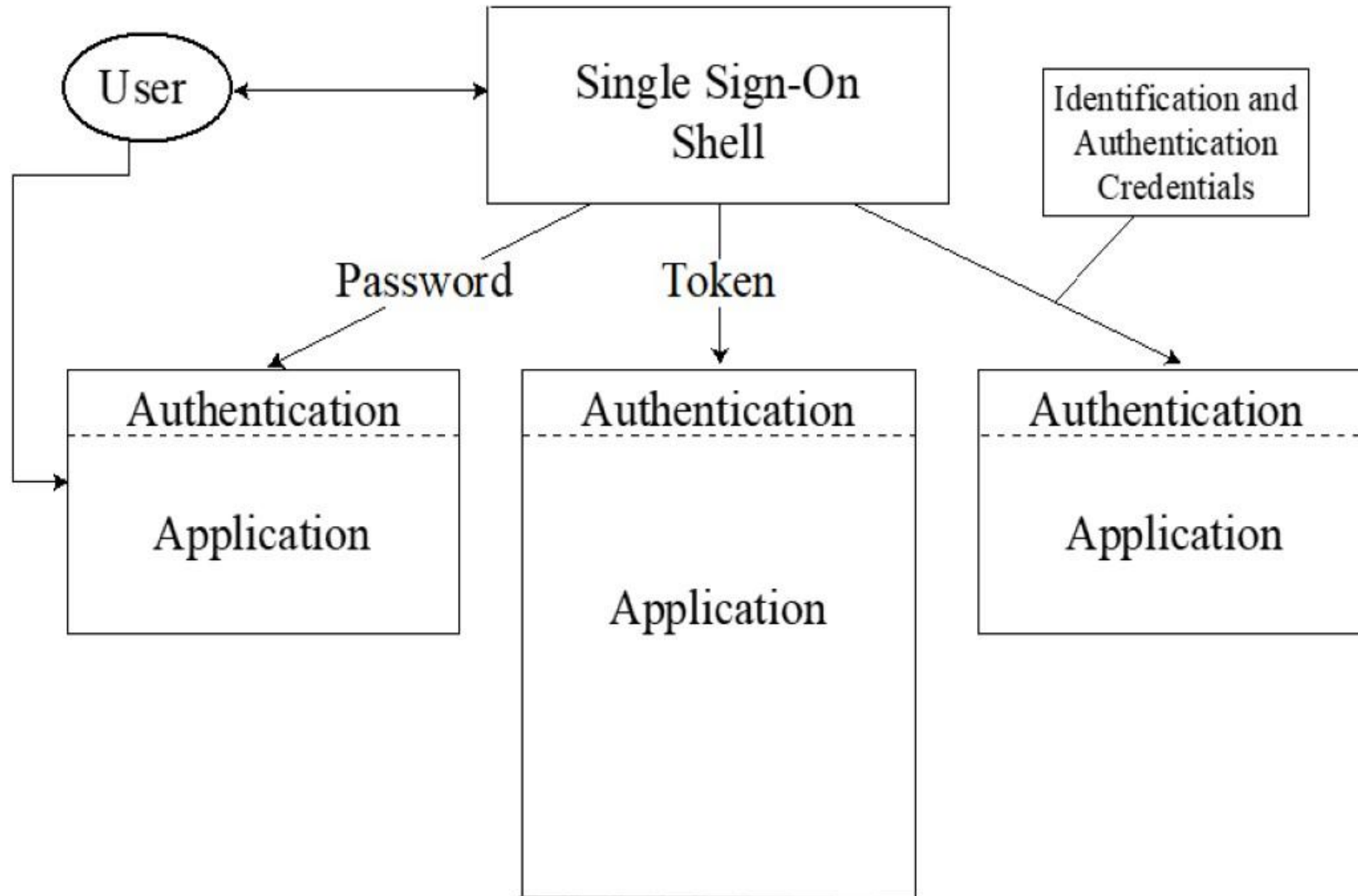
➤ **High**

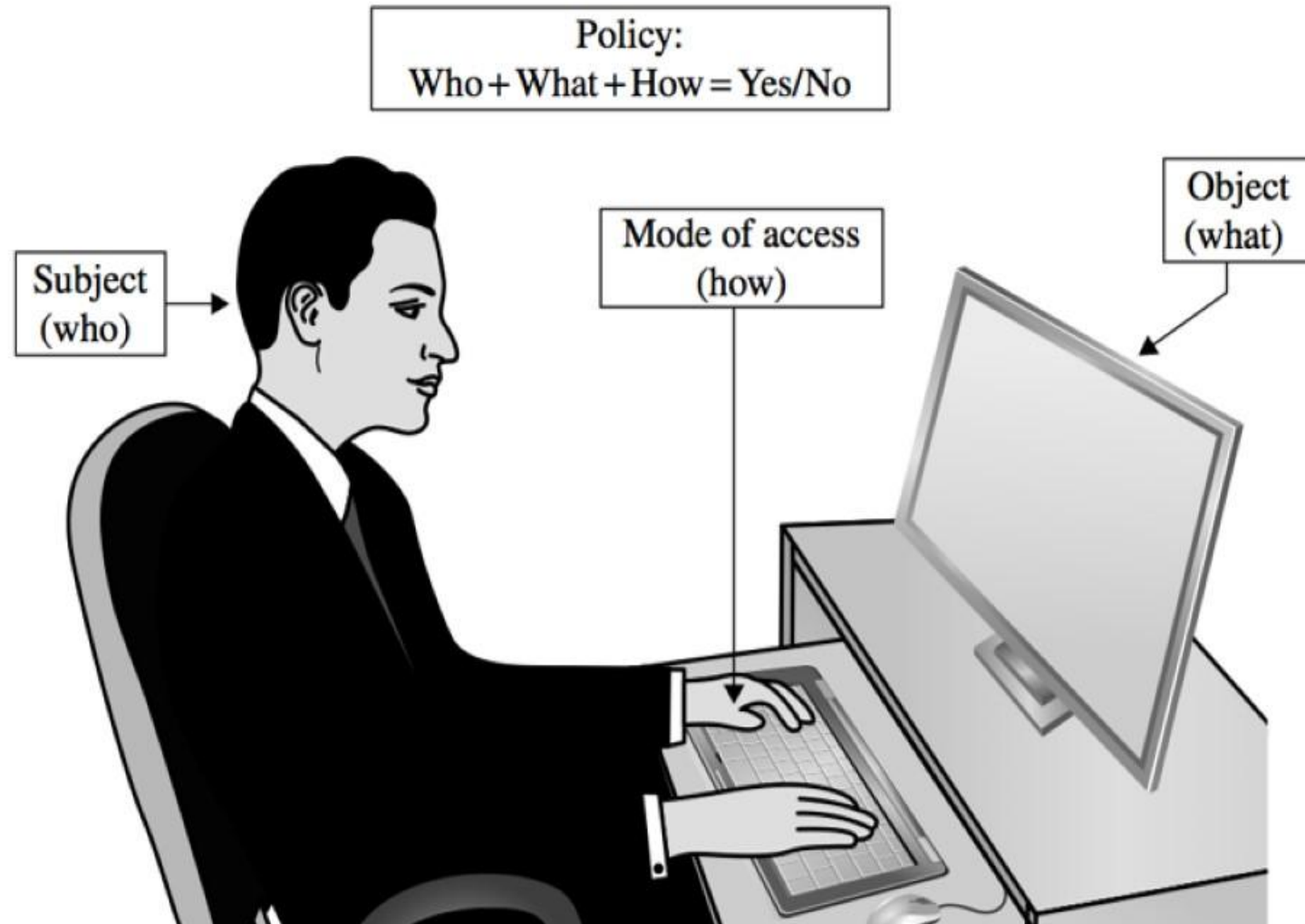
- An authentication error could be expected to have a severe or catastrophic adverse effect



- Two parts to access control
- **Authentication:** Are you who you say you are?
 - Determine whether access is allowed
 - Authenticate human to machine
 - Or authenticate machine to machine
- **Authorization:** Are you allowed to do that?
 - Once you have access, what can you do?
 - Enforces limits on actions
- **Note:** “access control” often used as a synonym for authorization







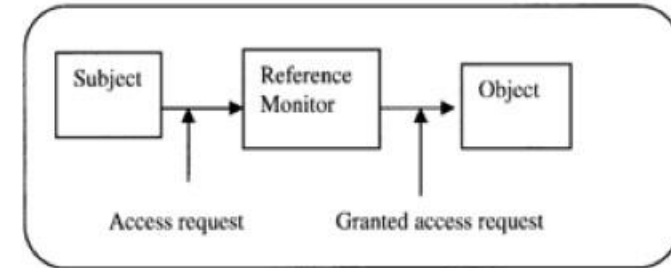
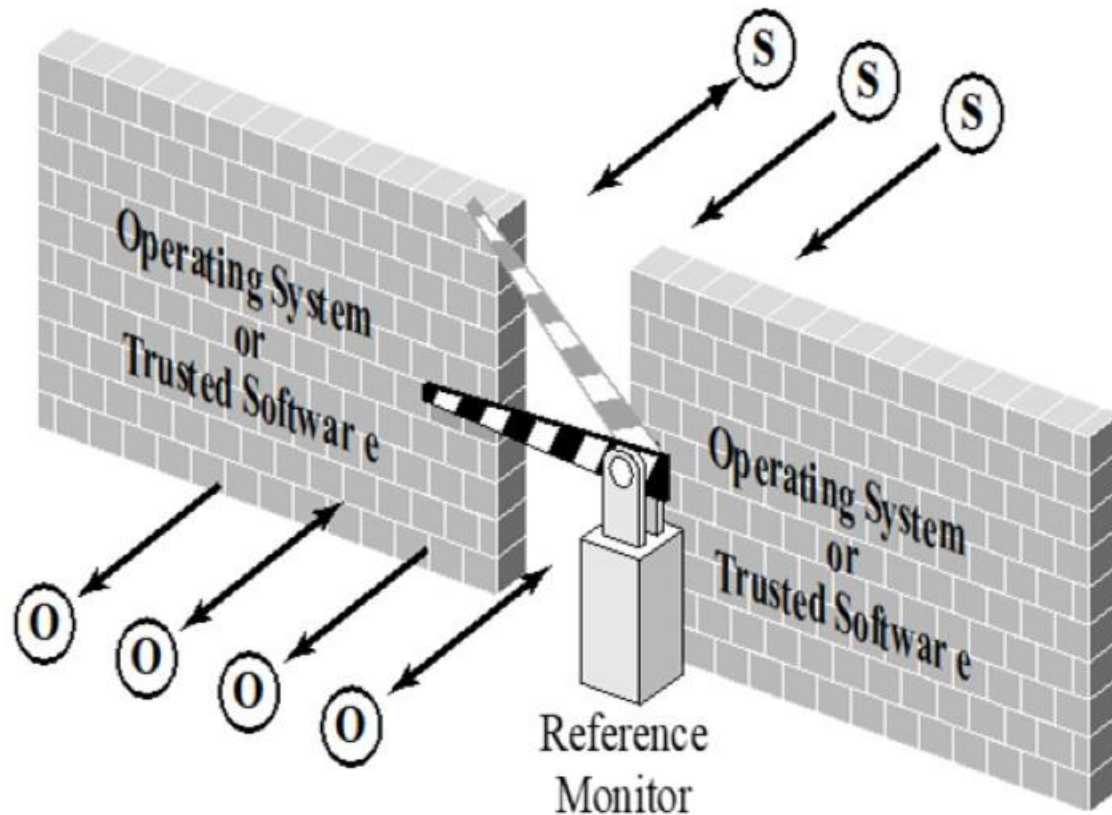


➤ Goals:

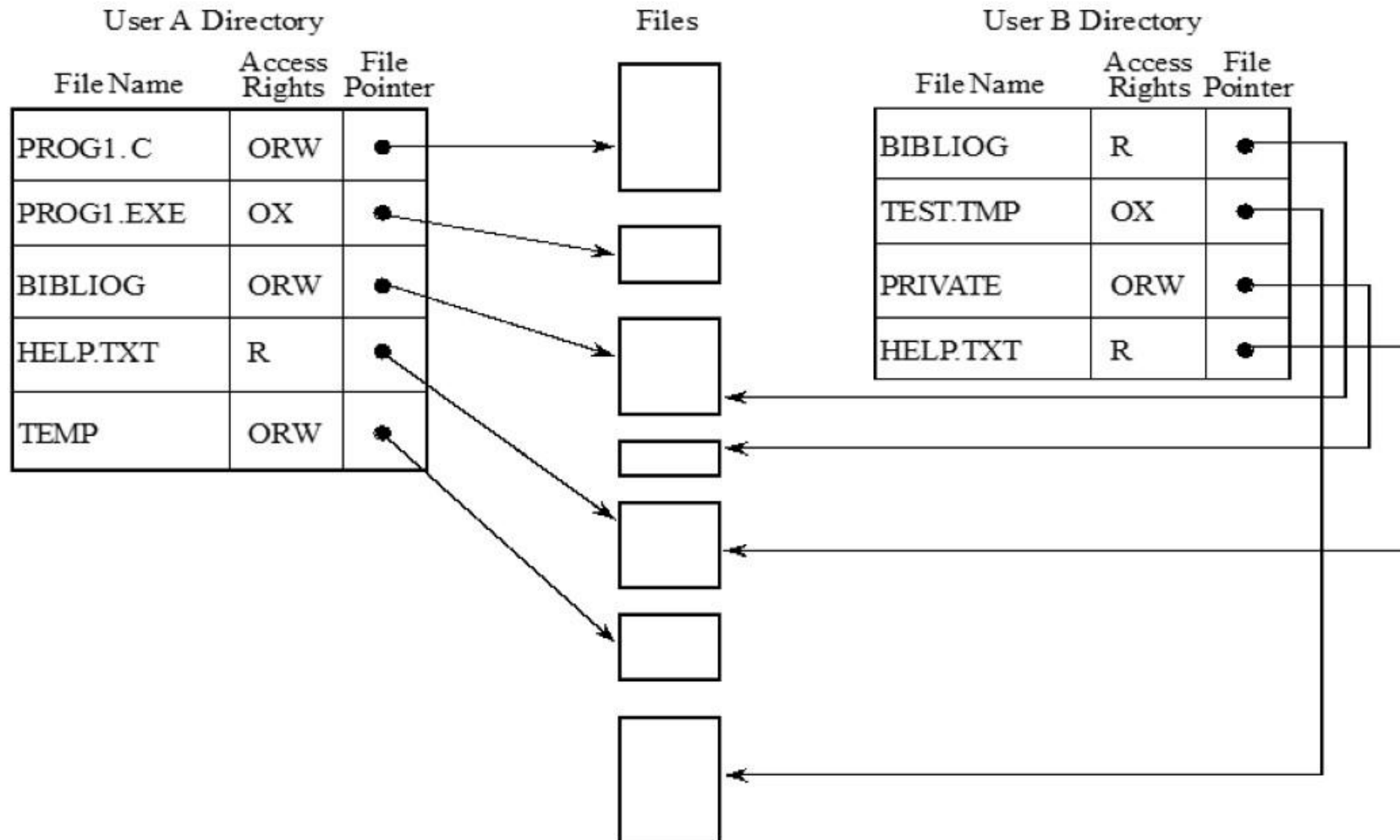
- Check every access
- Enforce the least privilege
- Verify acceptable usage



- Reference monitor
- Access control directory
- Access control matrix
- Access control list
- Privilege list
- Capability
- Procedure-oriented access control
- Role-based access control

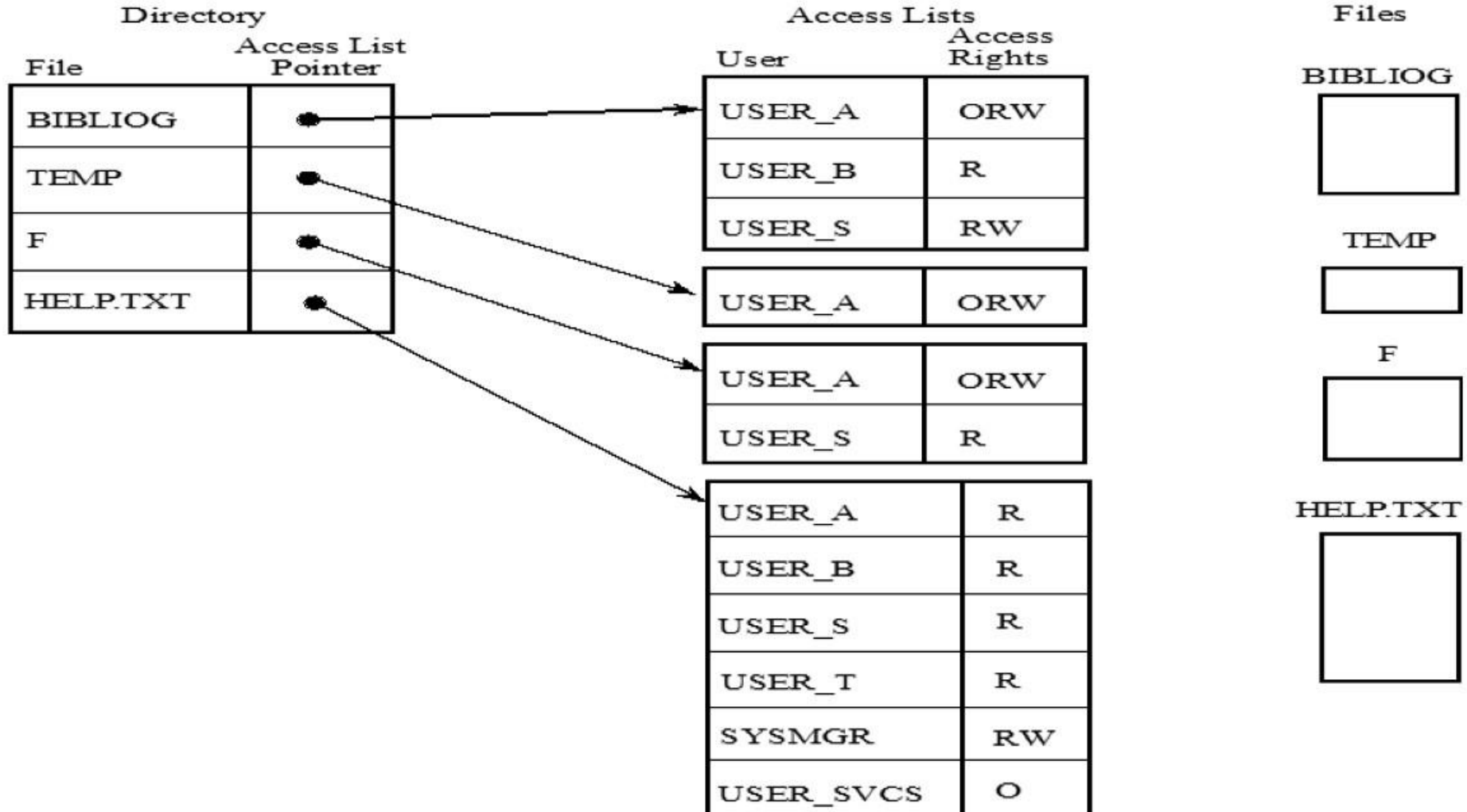


- **The subject**, for example a user, initiates an access request for a specified system resource, such as a Web resource.
- **The request** goes to the reference monitor.
- **The job of the reference monitor** is to check on the hierarchy of rules that specify certain restrictions.
- A set of such rules is called an *access control list* (ACL).
- The access control hierarchy is based on the URL path for a Web access, or file path for a file access such as in a directory.
- When a request for access is made, the monitor or server goes in turn through each ACL rule, continuing until it encounters a rule that prevents it from continuing and results in a request rejection or comes to the last rule for that resource, resulting into access right being it granted.





	BIBLIOG	TEMP	F	HELP.TXT	C_COMP	LINKER	SYS_CLOCK	PRINTER
USER A	ORW	ORW	ORW	R	X	X	R	W
USER B	R	-	-	R	X	X	R	W
USER S	RW	-	R	R	X	X	R	W
USER T	-	-	-	R	X	X	R	W
SYS_MGR	-	-	-	RW	OX	OX	ORW	O
USER_SVCS	-	-	-	O	X	X	R	W





Think of a word



- Is the word you thought of long?
 - Is it uncommon?
 - Is it hard to spell or pronounce?
-
- The answer to all three of these questions is probably **no**.



- If people prefer short passwords to long ones, the penetrator will plan to try all passwords but to try them in order by length.
- There are only $26^1 + 26^2 + 26^3 = 18,278$ passwords of length 3 or less.
- At the assumed rate of one password per millisecond, all of these passwords can be checked in 18.278 seconds,



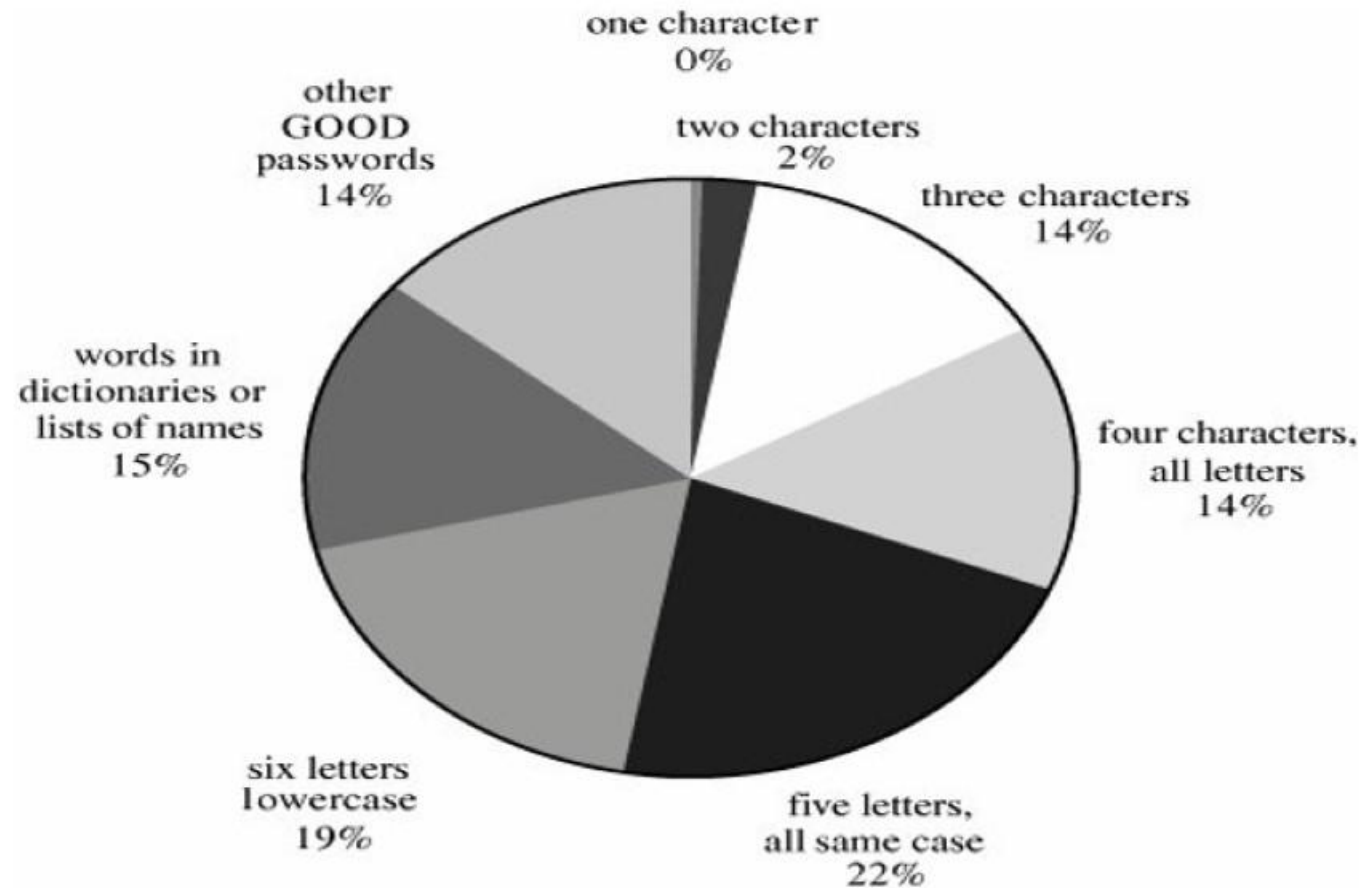
- The trials to 4 or 5 characters raise the count only to 475 seconds (about 8 minutes) or 12,356 seconds (about 3.5 hours), respectively.
- People tend to choose names or words they can remember
- Many computing systems have spelling checkers that can be used to check for spelling errors and typographic mistakes in documents.
- Trying all of these words as passwords takes only 80 seconds.



- People typically choose personal passwords, such as the name of a spouse, a child, a brother or sister, a pet, a street name, or something memorable or familiar.
- If we restrict our password attempts to just names of people (first names), streets, projects, and so forth, we generate a list of only a few hundred possibilities at most.



Figure 4-15. Users' Password Choices.





- The British online bank found users still choosing weak passwords :
 - A full 50 percent of passwords for their online banking service were family members' names
 - 23 percent children's names
 - 19 percent a spouse or partner
 - 9 percent their own



Default Password List

Last updated: 02.22.2010

Vendor	Model	Version	Access Type	Username	Password	Privileges	Notes
3COM	CoreBuilder	7000/6000/3500/2500	Telnet	debug	synnet		
3COM	CoreBuilder	7000/6000/3500/2500	Telnet	tech	tech		
3COM	HiPerARC	v4.1.x	Telnet	adm	(none)		
3COM	LANplex	2500	Telnet	debug	synnet		
3COM	LANplex	2500	Telnet	tech	tech		
3COM	LinkSwitch	2000/2700	Telnet	tech	tech		
Huawei	E960			admin	admin	Admin	
3COM	NetBuilder		SNMP		LM1	snmp-read	
3COM	Netbuilder		Multi	admin	(none)	Admin	
3COM	Office Connect ISDN Routers	5x0	Telnet	n/a	PASSWORD	Admin	
3COM	SuperStack II Switch	2200	Telnet	debug	synnet		
3COM	SuperStack II Switch	2700	Telnet	tech	tech		
3COM	OfficeConnect 812 ADSL		Multi	adminltd	adminltd	Admin	
3COM	Wireless AP	ANY	Multi	admin	comcomcom	Admin	Works o
3COM	CellPlex	7000	Telnet	tech	tech	User	
3COM	cellplex	7000	Telnet	admin	admin	Admin	
3COM	cellplex	7000		operator	(none)	Admin	
3COM	HiPerARC	v4.1.x	Telnet	adm	(none)	Admin	
3COM	3Com SuperStack 3 Switch 3300XM			security	security	Admin	
3COM	superstack II	1100/3300		3comcso	RIP000	initialize	resets a
3COM	LANplex	2500	Telnet	tech	(none)	Admin	



GeodSoft

Good and Bad Passwords How-To

An Example List of Common and Bad Passwords

I have removed the long list of common passwords due to excessive traffic levels, and may restore it sometime after they return to normal. I wish I had never created this list, even though it has become by far the most popular page on this site. All such lists are intellectually dishonest, regardless of how accurate they may be, or how carefully they were prepared. Most people who do not find their password in such a list develop a false sense of security. The simple fact is that any competent cracker will be working from a list many times larger than the largest common password list, and the cracker's list will include virtually every word in any common password list. If your password can be found in any dictionary or online "word" list, where words include such character sequences as "qwerty", "abcd1234", or "thx1138", you have a password just as bad as those listed in common password lists. If you have made any unusual transformations (such as described in [Creating Text](#))

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[common.htm](#)

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geodsoft.com/howto/password/common.htm



- Several network sites post dictionaries of phrases, science fiction characters, places, mythological names, Chinese words, and other specialized lists.
- All these lists are posted to help site administrators identify users who have chosen weak passwords.
- but the same dictionaries can also be used by attackers of sites



- Now Internet sites offer so-called password recovery software as freeware or shareware.





In this lecture we talked about :

- User authentication and its definition and we know that it is the process of verifying an identity claimed by or for a system entity.
- The most common authentication mechanism for user to operating system is a password.
- We discussed the access control.
- We discussed the Probable Passwords and the Passwords Likely for a User.



Thank You