Chapter 1
UNIX Introduction

UNIX History (1)

- Before Multics there was chaos, and afterwards, too
  - Multics:
    - **Multiplexed information and Computing Service**
    - **1965 ~ 1969**
    - **Bell labs, GE, MIT**
    - **Ken Thompson, Dennis Ritchie**

Lucent Technologies
Bell Labs Innovations

UNIX History (2)

- From Multics to something else
  - › Ken Thompson first written a game called "Space Travel" on Multics on GE machine in 1969.
  - › Implement "Space Travel" on PDP-7 again.
  - › Thompson began to design the shell, the editor and the assembler on PDP-7.
  - › In 1970, Brian Kernighan suggested the name "UNIX"

UNIX Genealogy

- AT&T
  - Version 7~10
  - System III ~ V
- UCB
  - BSD
- IBM、DEC、HP
  - OSF/1
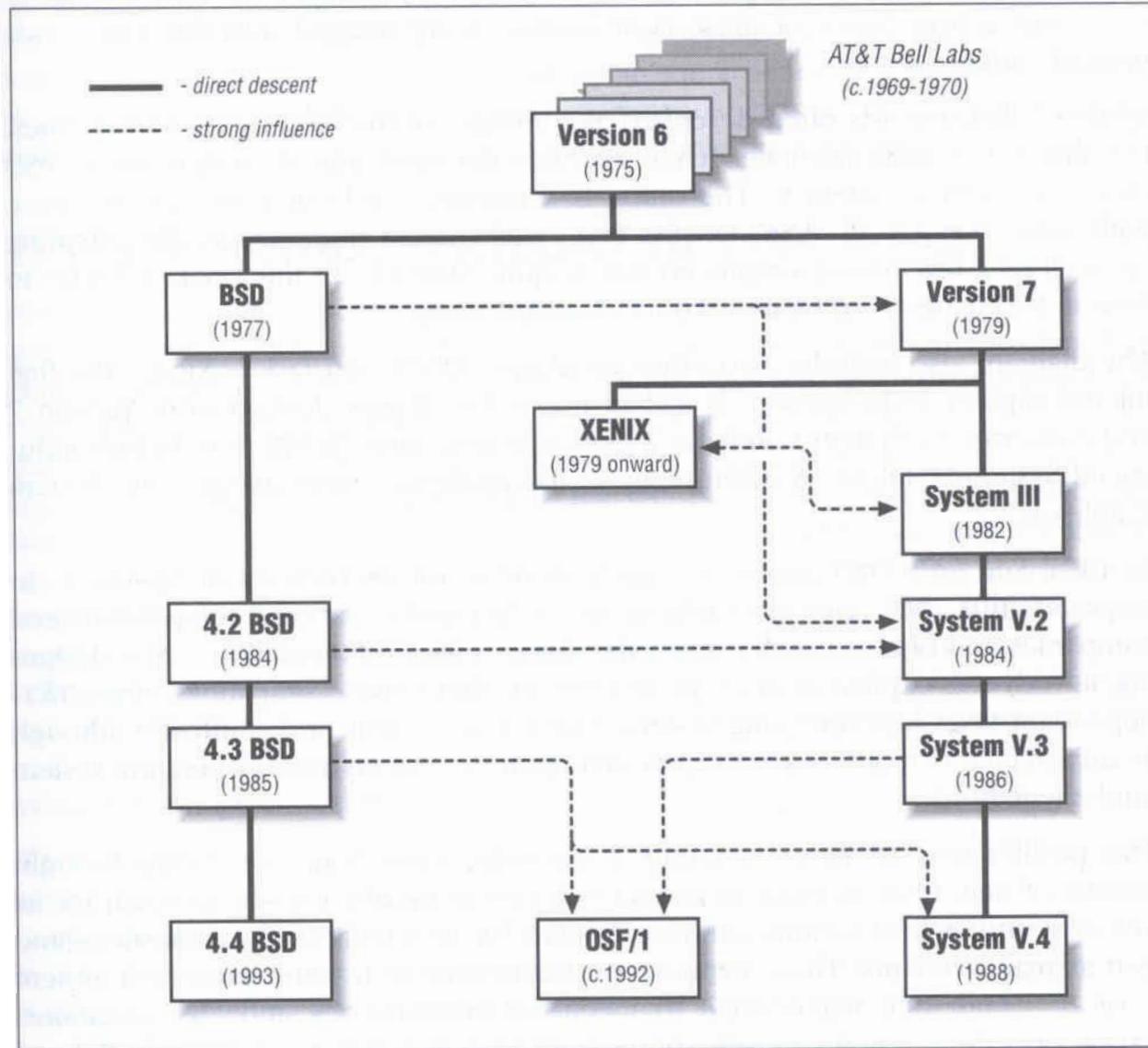
UNIX versions
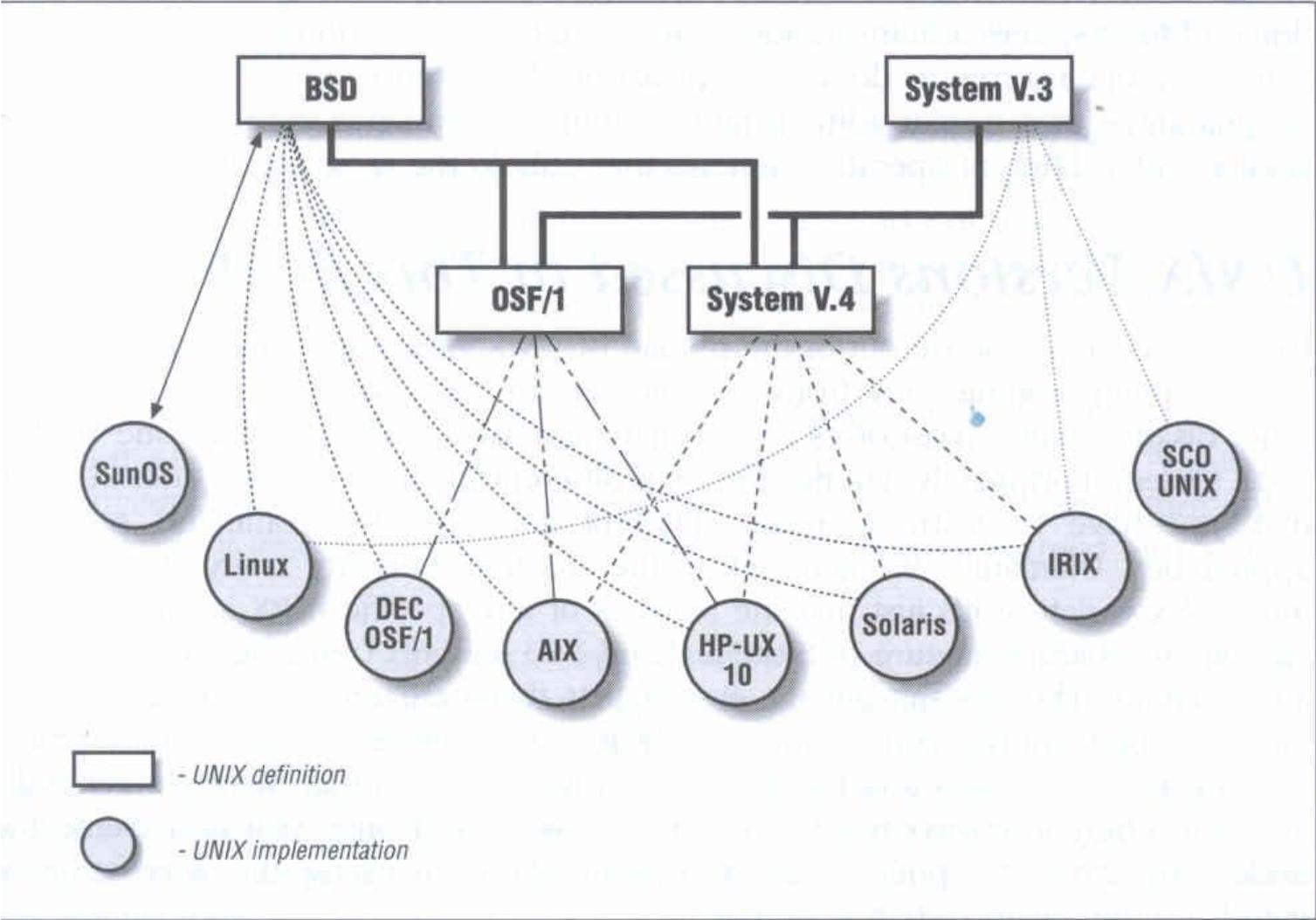
Figure 2: UNIX versions discussed in this book

Conventions

◉ Syntax of commands:
  › Anything between "[" & "]" – are optional.
  › Anything followed by "…" – can be repeated.
  › {a | b} – you should choose one of them.
  › Example:
    • bork [-x] { on | off } filename …
      bork on /etc/hosts   ◯
      bork –x /etc/hosts /etc/passwd   ◯
      bork –x /etc/hosts   X
      bork -h /etc/hosts   X

◉ Globing characters
  › "*" matches zero or more characters.
  › "?" match one character.
  › "~" means home directory
  › "~user" means home directory of user

Man Pages (manual)

- ◉ man pages (<u>man</u>ual)
  - › Contain descriptions of
    - Individual command.
      - $ man cp
    - Configuration File
      - $ man rc.local
    - Library routines
      - $ man strcpy

Man command

⊙ Command

> $ man [-s section] *title*   (AT&T)

> $ man [section] *title* (BSD)

- $ man printf   **(bash printf command)**
- $ man 3 printf   **(C Standard printf func.)**
- $ man -k exit   **(keyword search)**
- $ man 3 intro   **(section introduction)**

⊙ Man pages organization

AT&T	BSD	Contents
1	1	User-Level **commands** and applications
2	2	**System calls** and kernel error code
3	3	**Library** calls
4	5	Standard file format
5	7	Miscellaneous files and documents
6	6	Games and demonstrations
7	4	Device Drivers and network protocols
1m	8	System administration commands
9	9	Obscure kernel specs and interfaces

UNIX Concepts - ID

◉ User ID, Group ID
  › $ **id** lwhsu
    • uid=13115(lwhsu) gid=300(gcs)
      groups=300(gcs),0(wheel),100(faculty),800(security),700(ta),888(wwwadm)
  › $ **id** 13115
    • uid=13115(lwhsu) gid=300(gcs)
      groups=300(gcs),0(wheel),100(faculty),800(security),700(ta),888(wwwadm)

◉ Super user
  › root
    • uid=0(root) gid=0(wheel) groups=0(wheel), ...

◉ Other Important Users
  › daemon: Owner of many system processes
  › operator: System &
  › bin: Binaries Commands and Source
  › nobody: Unprivileged user

UNIX Concepts - Files

- ⦿ $ ls -l
  - › d rwx--x--x 12 lwhsu gcp 1024 Sep 23 16:47 public_html/

File type

File access mode

Inode count

File user owner

File group owner

File size

Last modify time (mtime)

Name

UNIX Concepts - File types

⦿ File types

symbol	File types
b	Block device file
c	Character device file
d	Directory
l	symbolic Link
s	Socket
p	named Pipe
-	Regular file

⦿ **file** command

› determine file type

- $ file .tcshrc ➜ .tcshrc: ASCII text
- $ file /bin ➜ /bin: directory
- $ file /bin/sh ➜ /bin/sh: ELF 64-bit LSB executable, x86-64, version 1 (FreeBSD), for FreeBSD 8.0 (800049), dynamically linked (uses shared libs), FreeBSD-style, stripped

› /usr/ports/sysutils/file

UNIX Concepts - File Access Mode

- <u>rwx</u> <u>r-x</u> <u>r-x</u>
- <u>421</u> <u>421</u> <u>421</u>
  - › user, group, other privileges
- chmod command
  - › % **chmod** *access-string   file*
    - • **% chmod u+x test.sh**
    - • **% chmod go-w .tcshrc**
    - • **% chmod u+w,r-w hehe haha**
    - • **% chmod −R 755 public_html/**

ACCESS CLASS One or more of:	OPERATOR	ACCESS TYPE One or more of:
u	+ (Add designated access)	r
g	- (Remove designated access)	w
o	= (Set exact access specified)	x
a (for all 3)		...
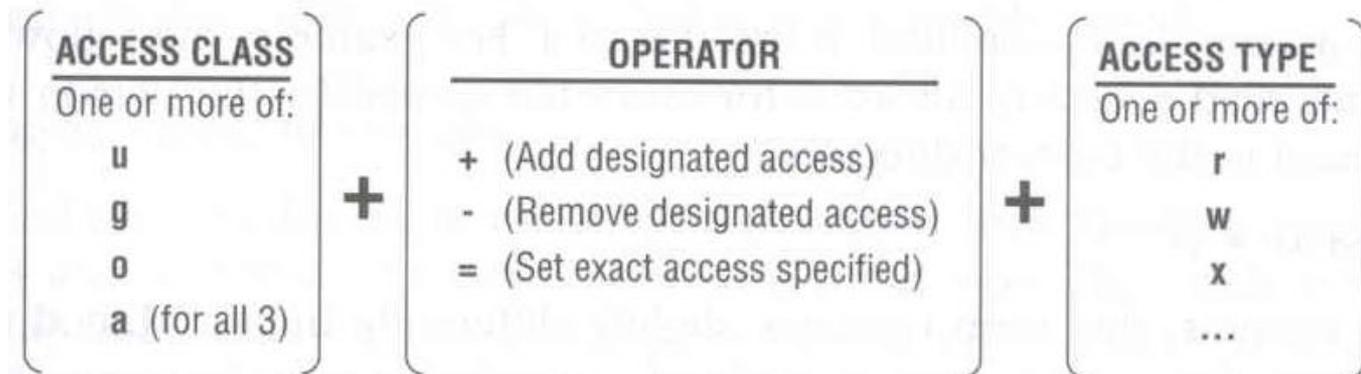
UNIX Concepts - File Protection

| Command	Minimum Access Needed	
	On file itself	On directory file is in
cd /home/test		x
ls /home/test/*.c		r
ls −s /home/test/*.c		rx
cat runme	r	x
cat >> runme	w	x
run-binary	x	x
run-script	rx	x
rm rumme		wx

UNIX Concepts - Process

◉ Process: A working program

> Foreground

- Remain attached to the terminal

> Background

- Can not communicate with terminal

◉ Process Life Cycle

> fork, exec
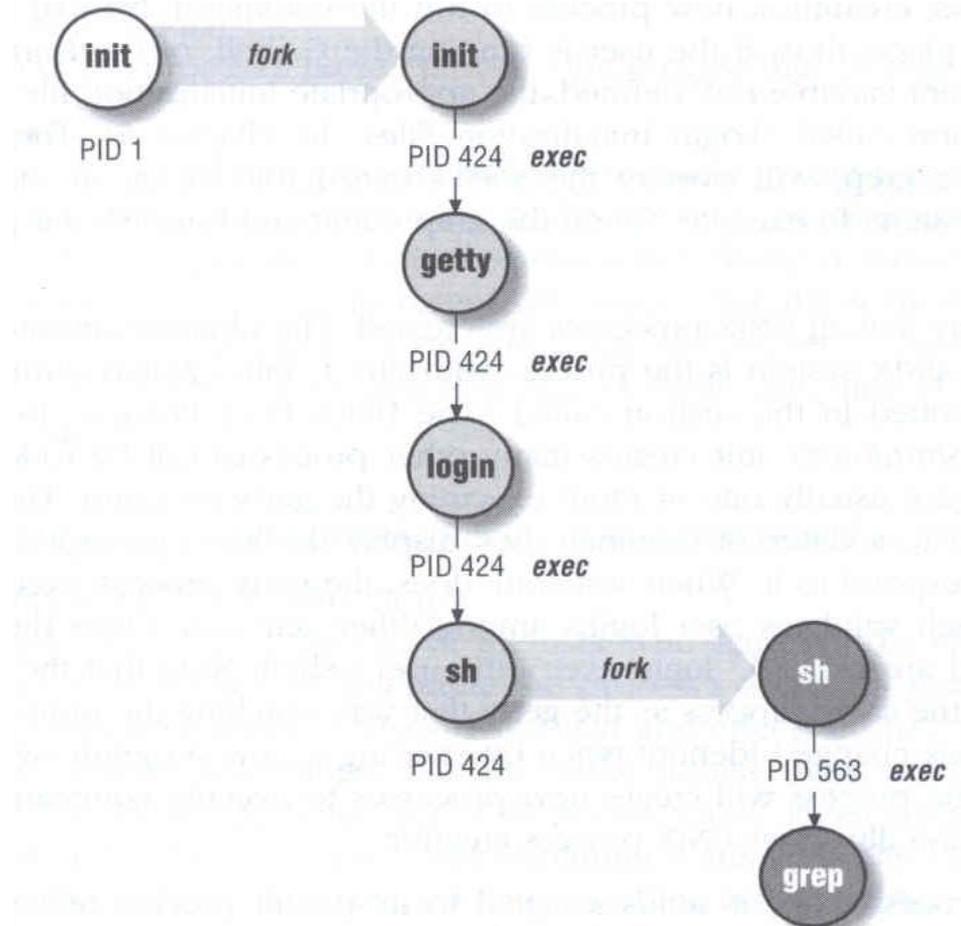
UNIX Concepts - Watching Process

◉ ps command

  › ps –aux, ps –auxww

    • USER, PID, %CPU, %MEM, VSZ RSS, TTY, STAT, START, TIME, COMMAND

      • D: in Disk

      • I: Idle

      • R: Running

      • S: Sleeping

```
USER         PID  %CPU  %MEM     VSZ     RSS   TT   STAT  STARTED       TIME  COMMAND
root           0   0.0   0.0       0       0   ??   WLs   30Aug08    0:00.01  [swapper]
lwhsu      83736   0.0   0.5    1416     812   p4   R+      2:30PM    0:00.00  ps auxww
```

      • man ps…

UNIX Concepts - Kill Process

⊙ kill command

> % **kill** –[*signal_name*] pid

> % **kill** –[*signal_number*] pid

- % kill **–HUP 88192**   (hang up, reset)
- % kill **-1 88192**
- % kill **–TERM 12345**   (software termination)
- % kill **–15 12345**
- % kill **–KILL 3456**   (kill program at OS level)
- % kill **-9 3456**