Chapter 10
(Part 2)
Operating Systems

SOLARIS™

Linux

Chapter Goals

- Distinguish between fixed and dynamic partitions
- Define and apply partition selection algorithms
- Explain how demand paging creates the virtual memory illusion
- Explain the stages and transitions of the process life cycle
- Explain the processing of various CPU scheduling algorithms

Partition Memory Management

- **Fixed partitions** Main memory is divided into a particular number of partitions
- **Dynamic partitions** Partitions are created to fit the needs of the programs

Partition Memory Management

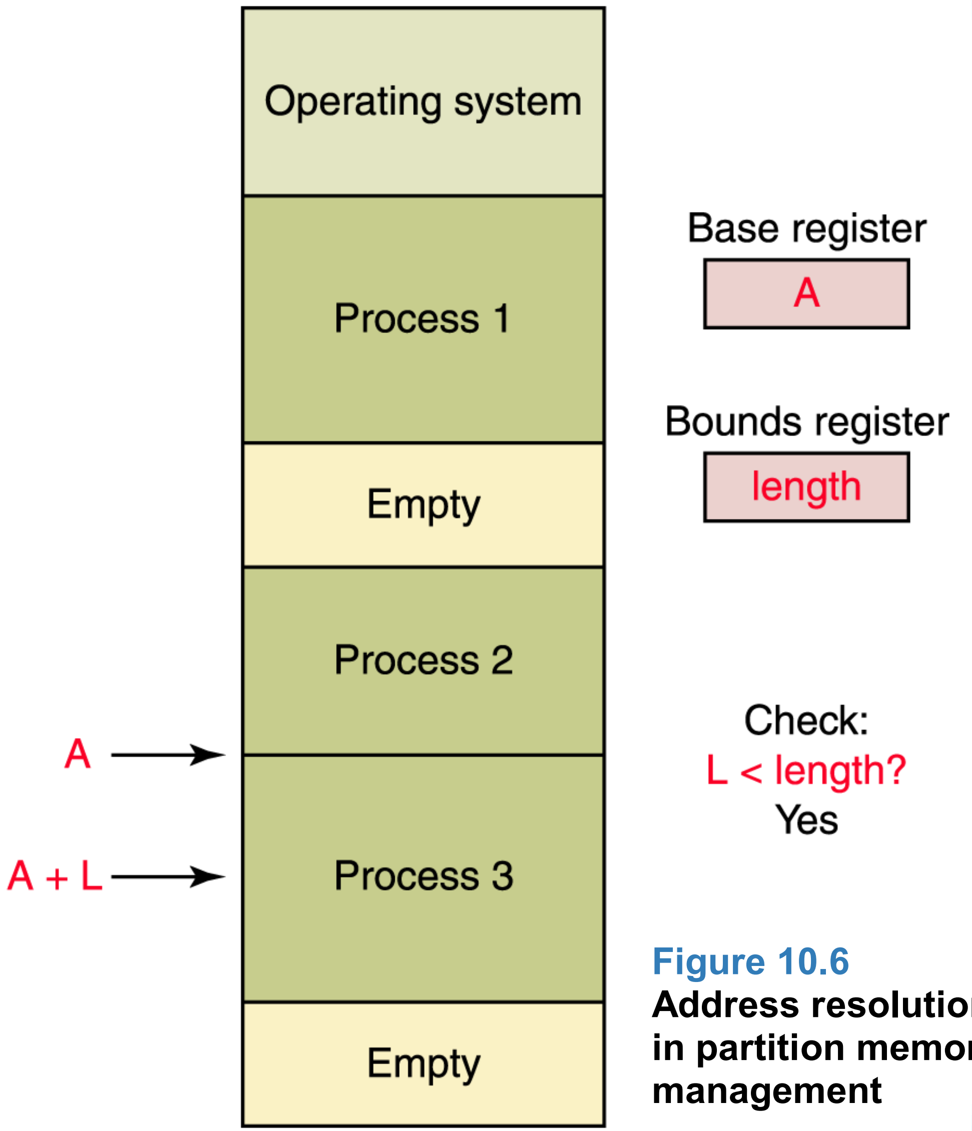

Figure 10.6
Address resolution in partition memory management

- At any point in time memory is divided into a set of partitions, some empty and some allocated to programs
- **Base register** A register that holds the beginning address of the current partition
- **Bounds register** A register that holds the length of the current partition

Partition Selection Algorithms

Which partition should we allocate to a new program?

- **First fit** Allocate program to the first partition big enough to hold it
- **Best fit** Allocated program to the smallest partition big enough to hold it
- **Worst fit** Allocate program to the largest partition big enough to hold it

Paged Memory Management

- **Paged memory technique** A memory management technique in which processes are divided into fixed-size **pages** and stored in memory **frames** when loaded into memory
  - **Frame** A fixed-size portion of *main memory* that holds a process page
  - **Page** A fixed-size portion of a *process* that is stored into a memory frame
  - **Page-map table** (PMT) A table used by the operating system to keep track of page/frame relationships

Paged Memory Management

P1 PMT

Page	Frame
0	5
1	12
2	15
3	7
4	22

P2 PMT

Page	Frame
0	10
1	18
2	1
3	11

Memory

Frame	Contents
0	
1	P2/Page2
2	
3	
4	
5	P1/Page0
6	
7	P1/Page3
8	
9	
10	P2/Page0
11	P2/Page3
12	P1/Page1
13	
14	
15	P1/Page2

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.
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Figure 10.7
A paged memory management approach

- To produce a physical address, you first look up the page in the PMT to find the frame number in which it is stored
- Then multiply the frame number by the frame size and add the offset to get the physical address

Paged Memory Management

- **Demand paging** An important extension of paged memory management
  - Not all parts of a program actually have to be in memory at the same time
  - In demand paging, the pages are brought into memory on demand
- **Page swap** The act of bringing in a page from secondary memory, which often causes another page to be written back to secondary memory

Paged Memory Management

- The demand paging approach gives rise to the idea of **virtual memory**, the illusion that there are no restrictions on the size of a program
- Too much page swapping, however, is called **thrashing** and can seriously degrade system performance.

Process Management

- The Process States

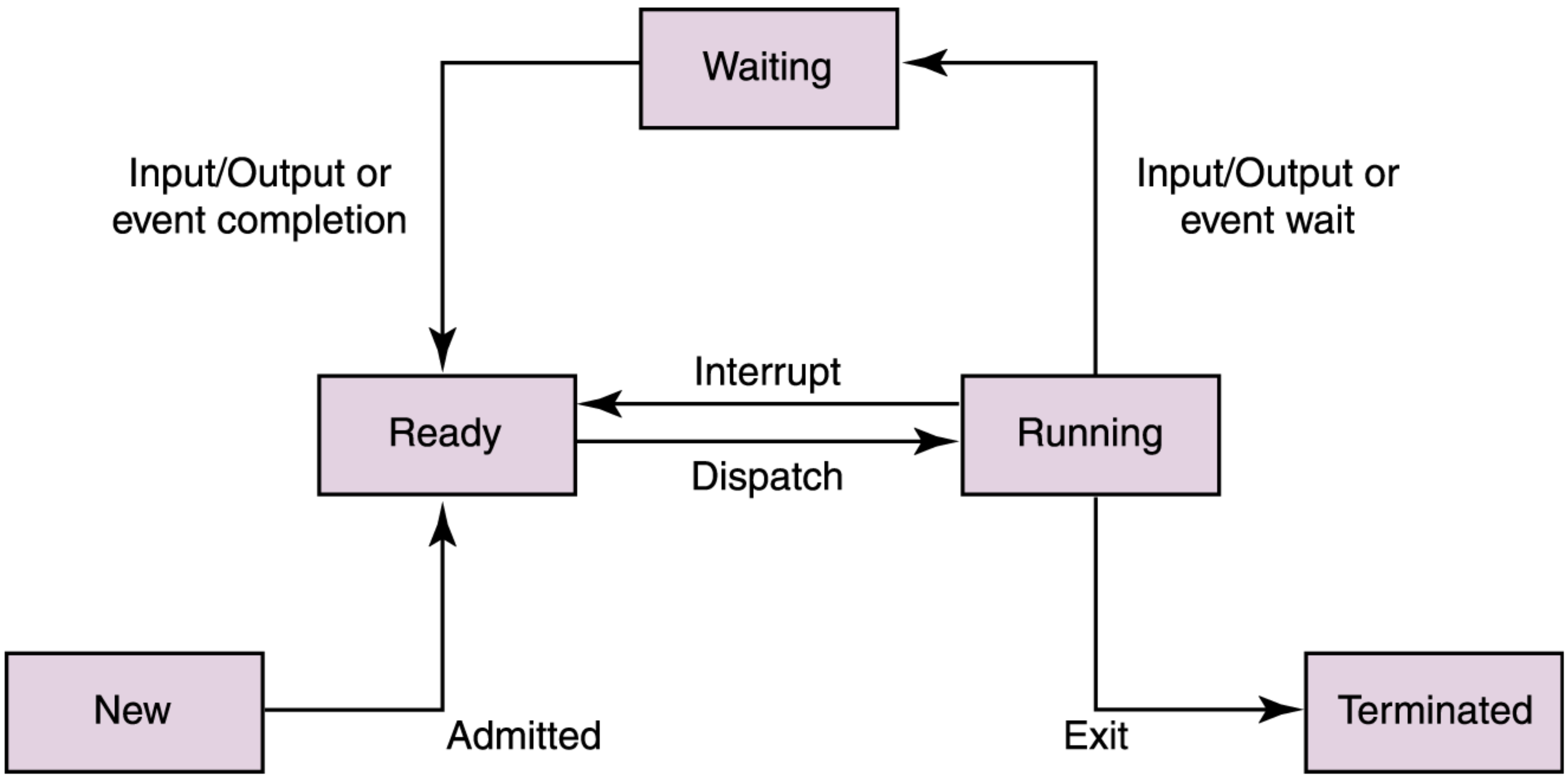


Figure 10.8 **The process life cycle**

The Process Control Block

- The operating system must manage a large amount of data for each active process
- Usually that data is stored in a data structure called a process control block **(PCB)**
- Each state is represented by a list of PCBs, one for each process in that state

The Process Control Block

- Keep in mind that there is only one CPU and therefore only one set of CPU registers
  - These registers contain the values for the currently executing process
- Each time a process is moved to the running state:
  - Register values for the currently running process are stored into its PCB
  - Register values of the new running state are loaded into the CPU
  - This exchange of information is called a **context switch**

CPU Scheduling

- **CPU Scheduling** The act of determining which process in the *ready* state should be moved to the *running* state
  - Many processes may be in the ready state
  - Only one process can be in the running state, making progress at any one time

- *Which one gets to move from ready to running?*

CPU Scheduling

- **Nonpreemptive scheduling** The currently executing process gives up the CPU voluntarily
- **Preemptive scheduling** The operating system decides to favor another process, preempting the currently executing process
- **Turnaround time** The amount of time between when a process arrives in the ready state the first time and when it exits the running state for the last time

CPU Scheduling Algorithms

First-Come, First-Served

- Processes are moved to the CPU in the order in which they arrive in the running state

Shortest Job Next

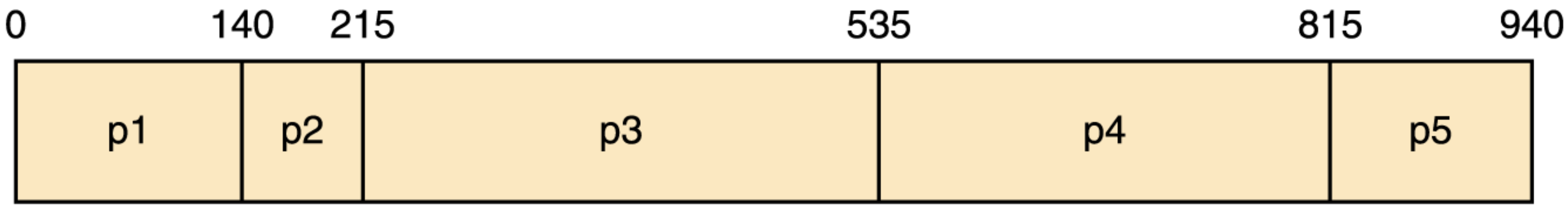
- Process with shortest estimated running time in the ready state is moved into the running state first

Round Robin

- Each process runs for a specified time slice and moves from the running state to the ready state to await its next turn if not finished

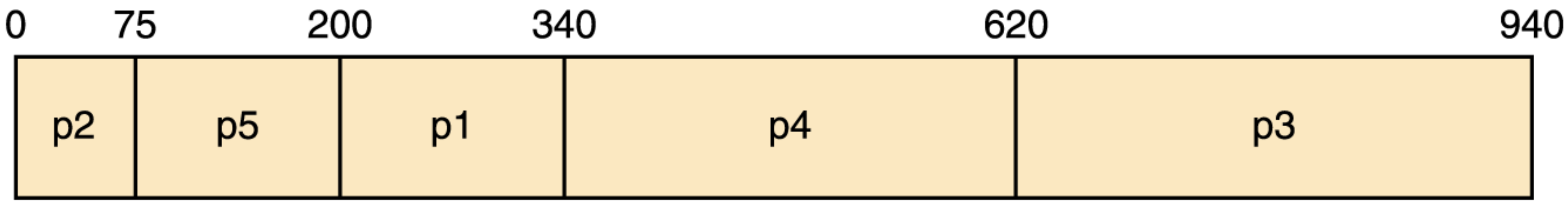
First-Come, First-Served

Process	Service time
p1	140
p2	75
p3	320
p4	280
p5	125



Shortest Job Next

- Looks at all processes in the ready state and dispatches the one with the smallest service time

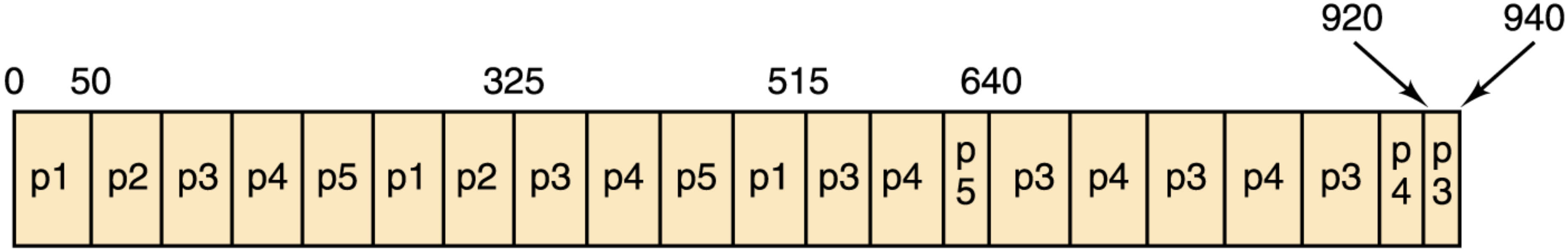


Round Robin

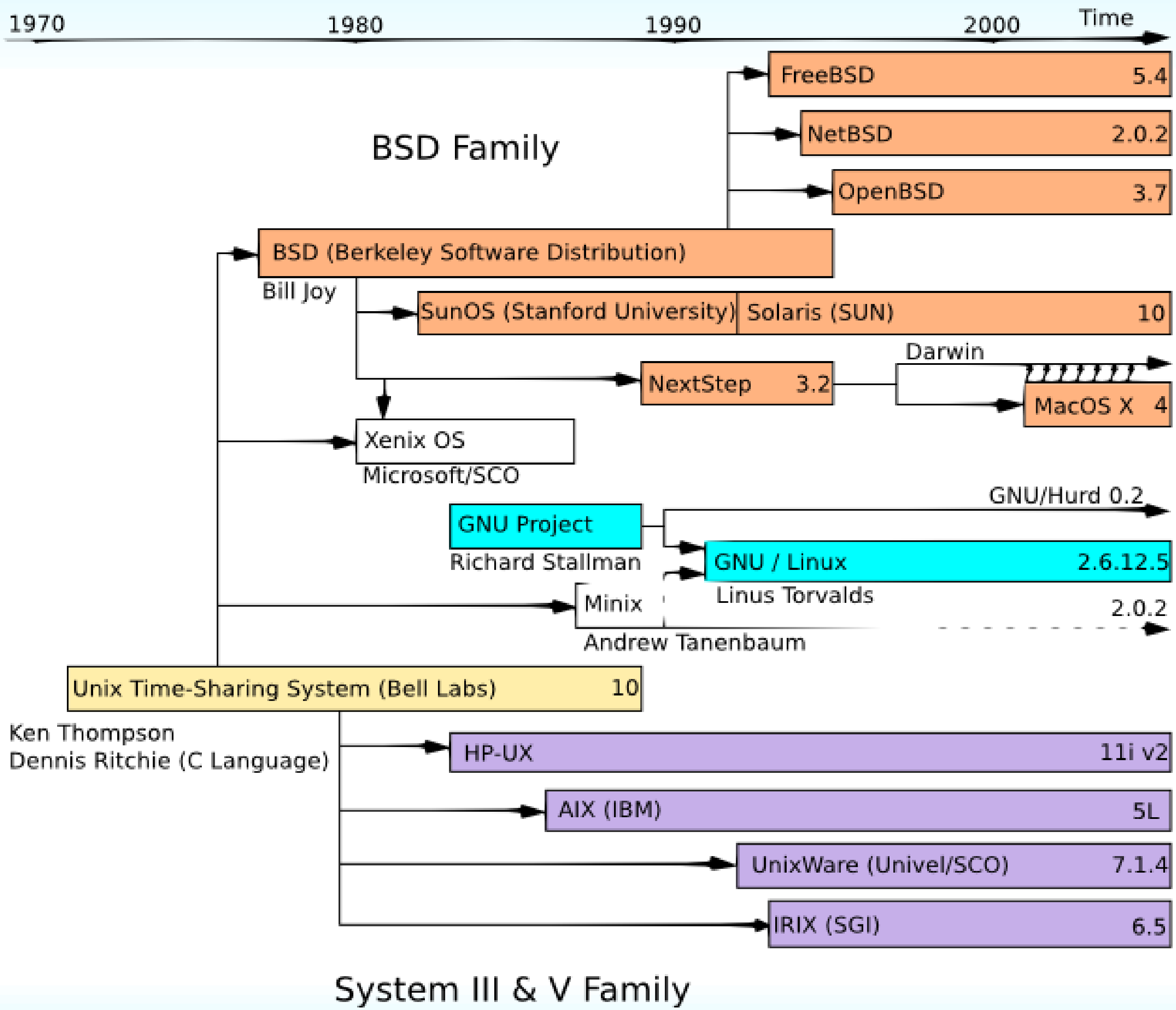
- Distributes the processing time equitably among all ready processes
- The algorithm establishes a particular **time slice** (or time quantum), which is the amount of time each process receives before being preempted and returned to the ready state to allow another process its turn

Round Robin

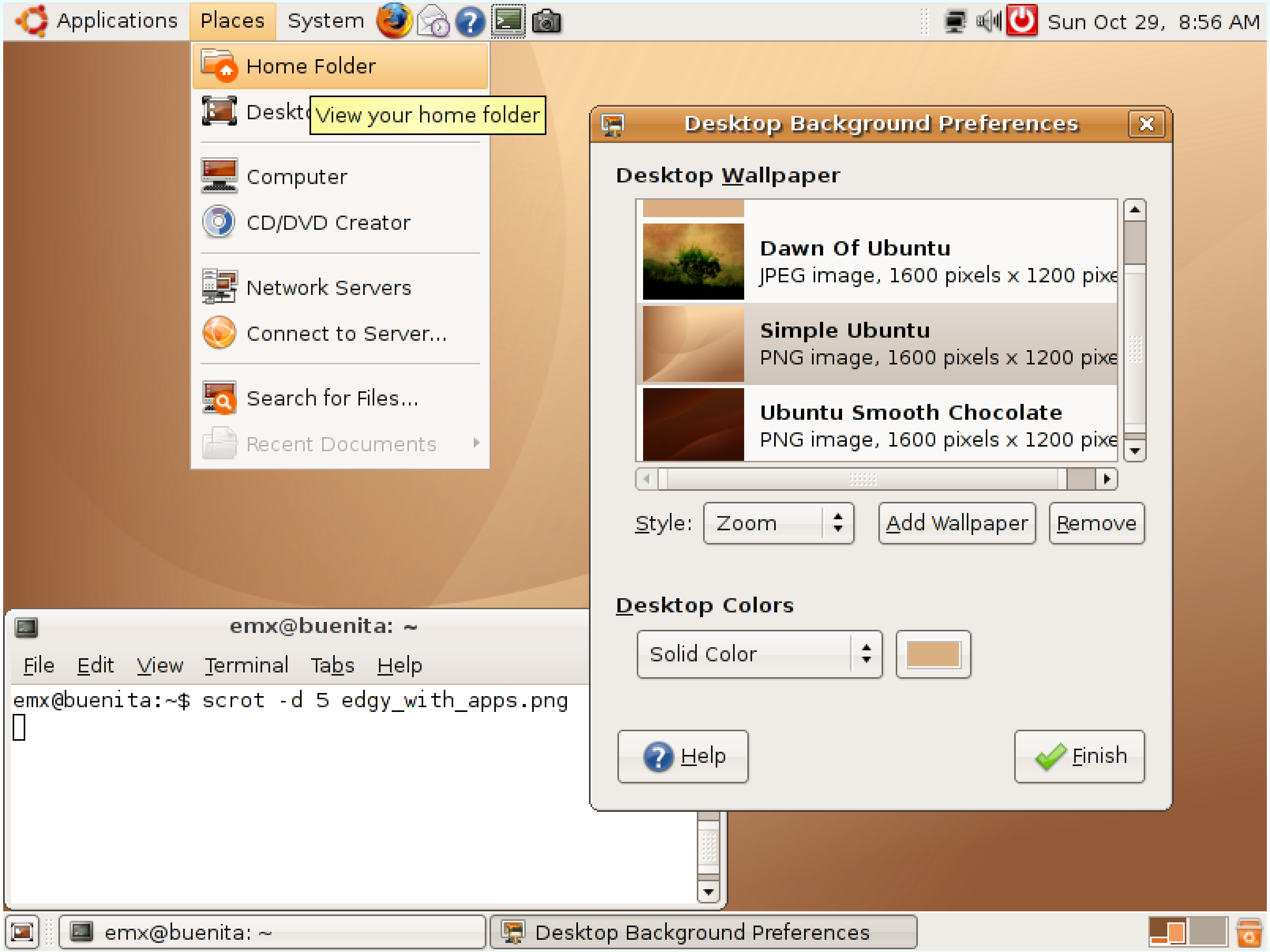
- Suppose the time slice was 50



History of Unix



Ubuntu



Applications
Places
System
Sun Oct 29, 8:56 AM
Home Folder
View your home folder
Computer
CD/DVD Creator
Network Servers
Connect to Server...
Search for Files...
Recent Documents
Desktop Background Preferences
Desktop Wallpaper
Dawn Of Ubuntu
JPEG image, 1600 pixels x 1200 pixe
Simple Ubuntu
PNG image, 1600 pixels x 1200 pixe
Ubuntu Smooth Chocolate
PNG image, 1600 pixels x 1200 pixe
Style:
Zoom
Add Wallpaper
Remove
Desktop Colors
Solid Color
Help
Finish
emx@buenita: ~
File
Edit
View
Terminal
Tabs
Help
emx@buenita:~$ scrot -d 5 edgy_with_apps.png
emx@buenita: ~
Desktop Background Preferences

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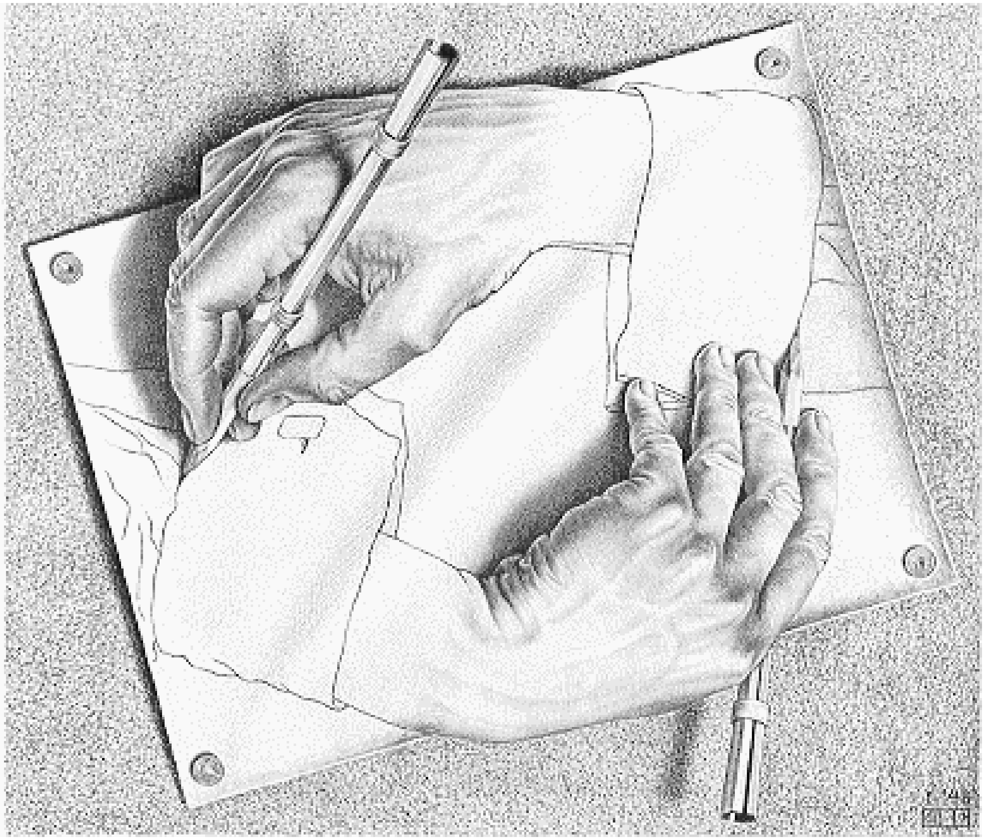
A Little Hands On



Links

- www.ubuntu.com - UBUNTU Official Site
- **http://video.google.com/videoplay?docid=-61044908113118982**

Homework

- **Read Chapter Ten, Sections 10.3 – 10.4**
- **Program Assignment #2 – Start working on it!!**
- **Play With Ubuntu**

Have A Great Weekend