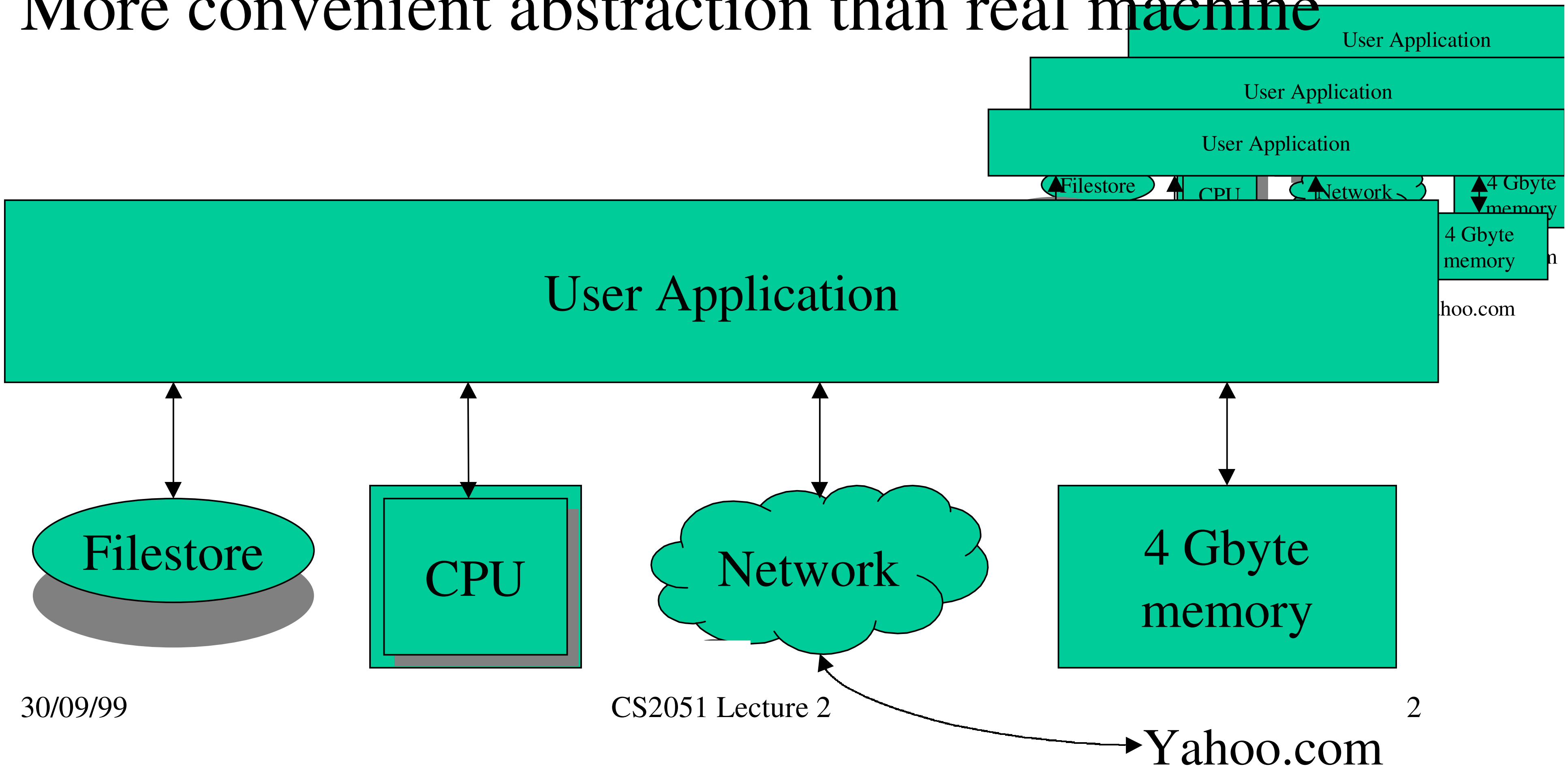
What does Operating System Do?

- Manages Resources
  - processes compete for CPU, memory
  - can't leave sharing to individual programs (why?)
  - protection
- Provides services
  - Abstraction (hiding detail) e.g.:
    - filestore, not disk drive (geometry, capacity, etc)
    - variable size stack (hide memory shuffling, etc)
    - reliable network connection (not sumchecks, retries)

OS provides “Virtual Machine”

More convenient abstraction than real machine



Virtual Machine enforces Protection

- System against Program
  - Buggy (or malicious?) program cannot prejudice OS

- Program against Program
  - Buggy program cannot interfere with other program

OS Services Provided

E.g. User types “run myprog”

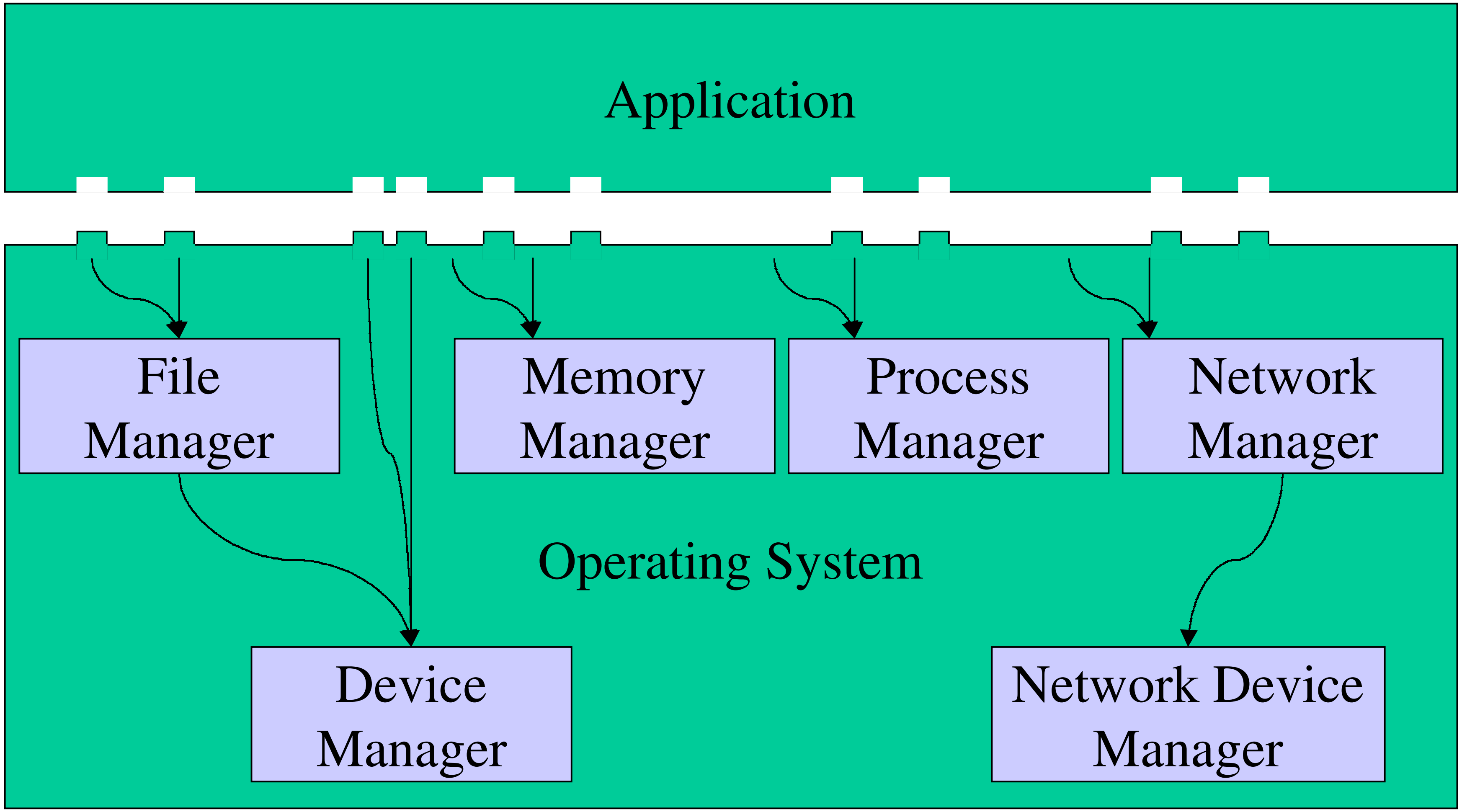
- Read command
- Find program file (how big?)
- Allocate memory
- Read file into memory
- Find libraries
- Start myprog running

Privileged Operations

OS/Hardware prevent unprivileged software from directly accessing facilities which may affect more than 1 program

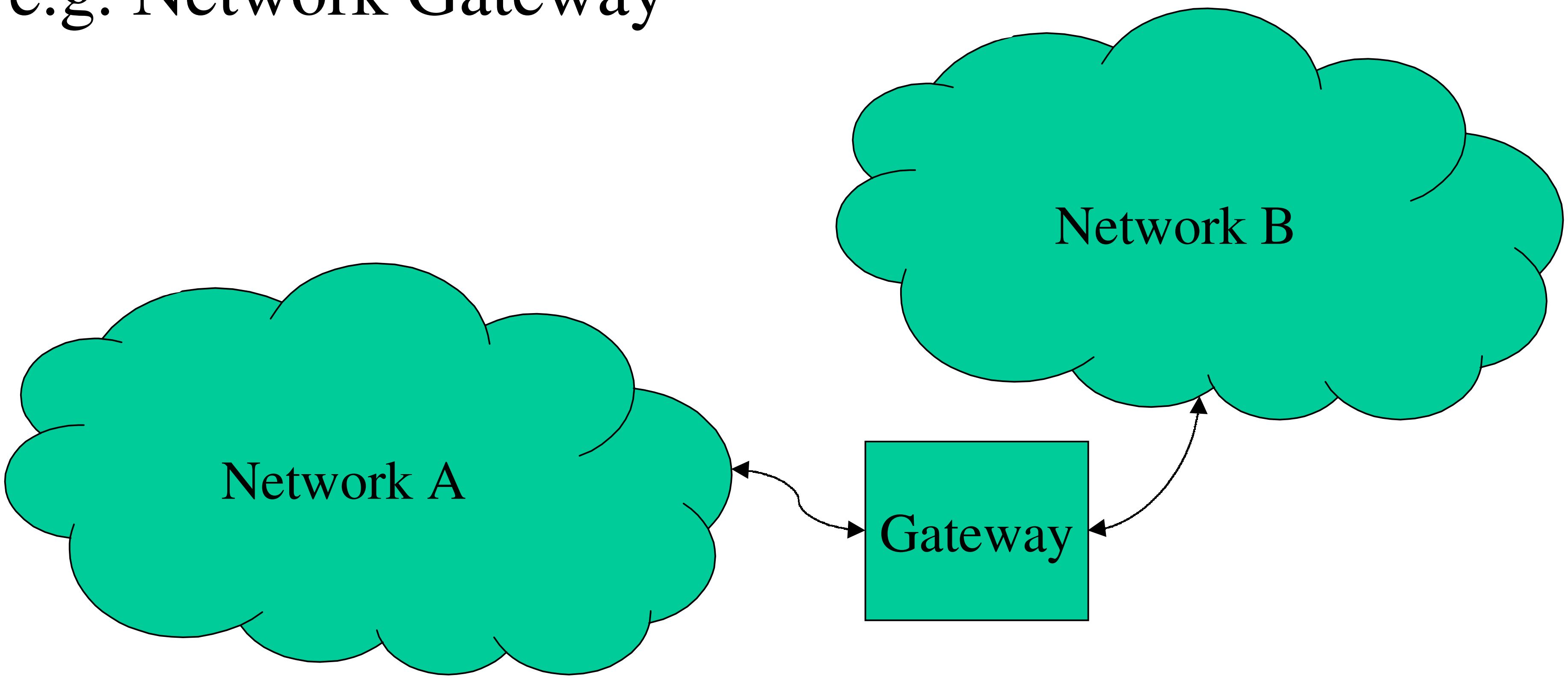
- file operations
- disk I/O
- memory allocation
- CPU allocation
- Network operations

OS Structure



Don't always need all modules...

- e.g. Network Gateway



But…

- Big OS Kernels have problems...
  - Size: (1.8Mb for Sun; 1.2Mb for Linux)
  - Internal Complexity
  - Debugging
- Microkernels
  - tailored for special-purpose applications
  - easier to maintain, tune, debug μK and services
  - real-time(?)