

## Outline for March 11, 2002

**Reading:** §15.1–15.4

1. Greetings and Felicitations
2. Puzzle of the day
3. Privilege in Languages
  - a. Nesting program units
  - b. Temporary upgrading of privileges
4. Access Control Lists
  - a. UNIX method
  - b. ACLs: describe, revocation issue
5. MULTICS ring mechanism
  - a. MULTICS rings: used for both data and procedures; rights are REWA
  - b.  $(b_1, b_2)$  access bracket - can access freely;  $(b_3, b_4)$  call bracket - can call segment through gate; so if  $a$ 's access bracket is  $(32,35)$  and its call bracket is  $(36,39)$ , then *assuming permission mode (REWA) allows access*, a procedure in:
    - rings 0-31: can access  $a$ , but ring-crossing fault occurs
    - rings 32-35: can access  $a$ , no ring-crossing fault
    - rings 36-39: can access  $a$ , provided a valid gate is used as an entry point
    - rings 40-63: cannot access  $a$
  - c. If the procedure is accessing a data segment  $d$ , no call bracket allowed; given the above, *assuming permission mode (REWA) allows access*, a procedure in:
    - rings 0-32: can access  $d$
    - rings 33-35: can access  $d$ , but cannot write to it (W or A)
    - rings 36-63: cannot access  $d$
6. Capabilities
  - a. Capability-based addressing: show picture of accessing object
  - b. Show process limiting access by not inheriting all parent's capabilities
  - c. Revocation: use of a global descriptor table
7. Lock and Key
  - a. Associate with each object a lock; associate with each process that has access to object a key (it's a cross between ACLs and C-Lists)
  - b. Example: use crypto (Gifford).  $X$  object enciphered with key  $K$ . Associate an opener  $R$  with  $X$ . Then:
    - OR-Access:  $K$  can be recovered with any  $D_i$  in a list of  $n$  deciphering transformations, so  
 $R = (E_1(K), E_2(K), \dots, E_n(K))$  and any process with access to any of the  $D_i$ 's can access the file
    - AND-Access: need all  $n$  deciphering functions to get  $K$ :  $R = E_1(E_2(\dots E_n(K)\dots))$
  - c. Types and locks