ECS 235B Module 39
Policy Composition I
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• Assumed: Output function of input
  • Means deterministic (else not function)
  • Means uninterruptability (differences in timings can cause differences in states, hence in outputs)

• This result for deterministic, noninterference-secure systems
Compose Systems

• Louie, Dewey LOW
• Hughie HIGH
• $b_L$ output buffer
  • Anyone can read it
• $b_H$ input buffer
  • From HIGH source
• Hughie reads from:
  • $b_{ LH}$ (Louie writes)
  • $b_{ LDH}$ (Louie, Dewey write)
  • $b_{ DH}$ (Dewey writes)
Systems Secure

- All noninterference-secure
  - Hughie has no output
    - So inputs don’t interfere with it
  - Louie, Dewey have no input
    - So (nonexistent) inputs don’t interfere with outputs
Security of Composition

• Buffers finite, sends/receives blocking: composition not secure!
  • Example: assume $b_{DH}, b_{LH}$ have capacity 1

• Algorithm:
  1. Louie (Dewey) sends message to $b_{LH} (b_{DH})$
    – Fills buffer
  2. Louie (Dewey) sends second message to $b_{LH} (b_{DH})$
  3. Louie (Dewey) sends a 0 (1) to $b_{L}$
  4. Louie (Dewey) sends message to $b_{LDH}$
    – Signals Hughie that Louie (Dewey) completed a cycle
Hughie

• Reads bit from $b_H$
  • If 0, receive message from $b_{LH}$
  • If 1, receive message from $b_{DH}$

• Receive on $b_{LDH}$
  • To wait for buffer to be filled
Example

• Hughie reads 0 from $b_H$
  • Reads message from $b_{LH}$
• Now Louie’s second message goes into $b_{LH}$
  • Louie completes setp 2 and writes 0 into $b_L$
• Dewey blocked at step 1
  • Dewey cannot write to $b_L$
• Symmetric argument shows that Hughie reading 1 produces a 1 in $b_L$
• So, input from $b_H$ copied to output $b_L$