



# Distributed Information Processing

About Midterm

Eom, Hyeonsang (엄현상)  
Department of Computer Science  
& Engineering  
Seoul National University

# Possible Topics for Midterm

- Distributed Systems
- Lamport's "Happened Before" Relation
- Logical Clocks vs Vector Clocks
- Properties of Vector Clocks
- Chandy's "Snapshot" Algorithm
- Ordering Events with Vector Clocks
- Balance and Tradeoff among Communication, Processing, and Storage
- Speedup



# Possible Topics for Midterm

- Layered vs Middleware Communication Approaches
- Communication Types
- RMI Components
- RPC Steps
- Asynchronous RPC
- Passing Value Parameters in RPC
- Connection-Oriented Socket Communication
- Using a Buffer to Reduce Jitter
- Interleaved Communication

# Possible Topics (Cont'd)

- Memory Consistency Models
- Memory Coherence
- DSM vs Message Passing
- False Sharing
- Choosing the DSM Page Size
- Page Synchron Methods (Update Options)
- Copy Set (in Memory Coherence)
- Dynamic Page Ownership Approaches
- Lazy Diff Creation in TreadMarks
- Lazy vs Eager Release Consistency



# Possible Topics (Cont'd)

- Location Transparency vs Independence
- Sharing Semantics
- Choosing the Cache Unit Size
- Cached File Modification Policies
- Stateful vs Stateless Service
- AFS Scalability
- AFS Callback
- Large Cluster vs SM Machines

# Logical Clocks [Lamport78]

## ■ Ways of Assigning Numbers to Events

$LC_i(e)$ , where  $e$  is an event in process  $p_i$

## ■ Clock (Correctness) Condition

$$e \rightarrow e^* \Rightarrow LC(e) < LC(e^*)$$

□ Satisfied if the following two conditions hold:

$$(1) k < l \Rightarrow LC(e_i^k) < LC(e_i^l) \quad (i=1, \dots, N)$$

$$(2) e_i = \text{send}(m), e_j = \text{receive}(m) \text{ for Message } m$$

$$\Rightarrow LC(e_i) < LC(e_j)$$

# Vector Clocks (Cont' d)

## ■ Vector-Timestamp Comparisons

$$VC = VC^* \text{ iff } VC[j] = VC^*[j] \ (j = 1, \dots, N)$$

$$VC \leq VC^* \text{ iff } VC[j] \leq VC^*[j] \ (j = 1, \dots, N)$$

$$VC < VC^* \text{ iff } VC \leq VC^* \wedge VC \neq VC^*$$

## ■ Properties

$$e \rightarrow e^* \text{ iff } VC(e) < VC(e^*)$$

Strong  
Clock  
Condition

### □ Hints for the Proof

$$e \parallel e^* \Rightarrow \neg \{VC(e) \leq VC(e^*) \vee VC(e) \geq VC(e^*)\}$$

(Note That  $VC_i[j] \leq VC_j[j]$ )