

# LECTURE - 25

# Topic for Today's Lecture

- Cache coherence protocols
- 
- *Scribe for today?*

# Cache Coherence

- In what kind of multi-processors do we need cache coherence?
- What are the kinds of data which are cached?
  - Shared (read) data - replication
  - Private data - migration

# Notions of Coherence and Consistency

- Coherence:
  - Program order preservation within a processor
  - Write by P1, Read by P2, if “sufficiently separated”, should get the value of write
  - Write serialization: same order of writes seen by all processors
- Specifying when a read should get the value of a write: *memory consistency model*

# Styles of Coherence Protocols

- **Directory-based:** central directory maintains the “status” of each block
- **Snooping-based:**
  - In a centralized shared memory machine
  - Each processor snoops on the common bus
  - Also maintains the “status” of a block locally (no central directory)
  - Snooping helps maintain coherence

# Styles of Snooping Protocols

- **Write-invalidate:** processor makes sure that it has the only copy of a block before writing
  - Invalidates other copies by sending an invalidate command on the bus
- **Write-update or write-broadcast:** processor updates all copies of a block when it writes
  - Send the written data on the common bus

# Write-invalidate vs. Write-update

## **Write-invalidate**

Consecutive writes to a location does not cause repeated traffic on bus

Writes to consecutive locations does not cause extra traffic on bus

## **Write-update**

Writes appear for readers with lesser latency