

Test Plan

1. Cache Read Hit

- **Scenario:** A cache line already loaded into the cache is accessed with a read operation.
- **Action:** Load a specific cache line into the cache & Perform a read operation.
- **Expected Result:** Cache hit is recorded, No eviction reports are updated correctly.

2. Cache Write Miss

- **Scenario:** A cache line not present for a cache
- **Action:** Ensure the line is not present in the cache & Perform a write operation.
- **Expected Result:** Cache miss is recorded, a new line is allocated, and reports are updated.

3. Pseudo-LRU Eviction

- **Scenario:** The cache is full, and a new line is accessed, requiring eviction of the least recently used line.
- **Action:** Fill the cache to capacity & Access a new line to trigger eviction
- **Expected Result:** The least recently used line is evicted, and the new line is added to the cache.

4. MESI State Transition

- **Scenario:** A cache line in the **Exclusive** state is accessed with a **Read-With-Intent-to-Modify** (RWIM) operation.
- **Action:** Perform a RWIM operation.
- **Expected Result:** The cache line transitions to the **Modified** state, and the snoop reflects **HITM**.

5. Invalidate Command

- **Scenario:** A cache line in the **Shared** state receives an **INVALIDATE** command from another processor.
- **Action:** Send an **INVALIDATE** command.
- **Expected Result:** The cache line is invalidated, and the logs reflect the operation.

6. L1 Line Eviction

- **Scenario:** A line in the **Modified** state in both L1 and L2 caches is evicted from L2.
- **Action:** Evict the line from L2.
- **Expected Result:** **GETLINE** and **INVALIDATELINE** messages are sent to L1.

7. Trace File Parsing

- **Scenario:** A trace file containing varied instruction types, including reads, writes, resets, and print commands, is processed.
- **Action:** Parse and execute the trace file.
- **Expected Result:** All instructions in the trace file are executed correctly.

8. Silent Mode

- **Scenario:** The simulation is run in silent mode where only summary reports are displayed.
- **Action:** Execute the simulator in silent mode.
- **Expected Result:** Displays only summary reports for cache operations.

9. Normal Mode

- **Scenario:** The simulation is run in normal mode, displaying detailed logs for bus operations, snoop results, and cache interactions.
- **Action:** Execute the simulator in normal mode.
- **Expected Result:** Detailed logs are displayed along with summary reports.

10. Cache Reset

- **Scenario:** A reset command is issued via the trace file to clear all cache lines and reset the state.
- **Action:** Execute the reset command (trace code **8**).
- **Expected Result:** The cache is cleared, and all state information is reset.

11. Print Cache State

- **Scenario:** A print command is issued via the trace file to display the valid cache lines and their states.
- **Action:** Execute the print command (trace code **9**).
- **Expected Result:** The valid cache lines and their states are displayed in a concise, readable format.