

TLM 2 Examples Mini Review



Electronic System Level Services

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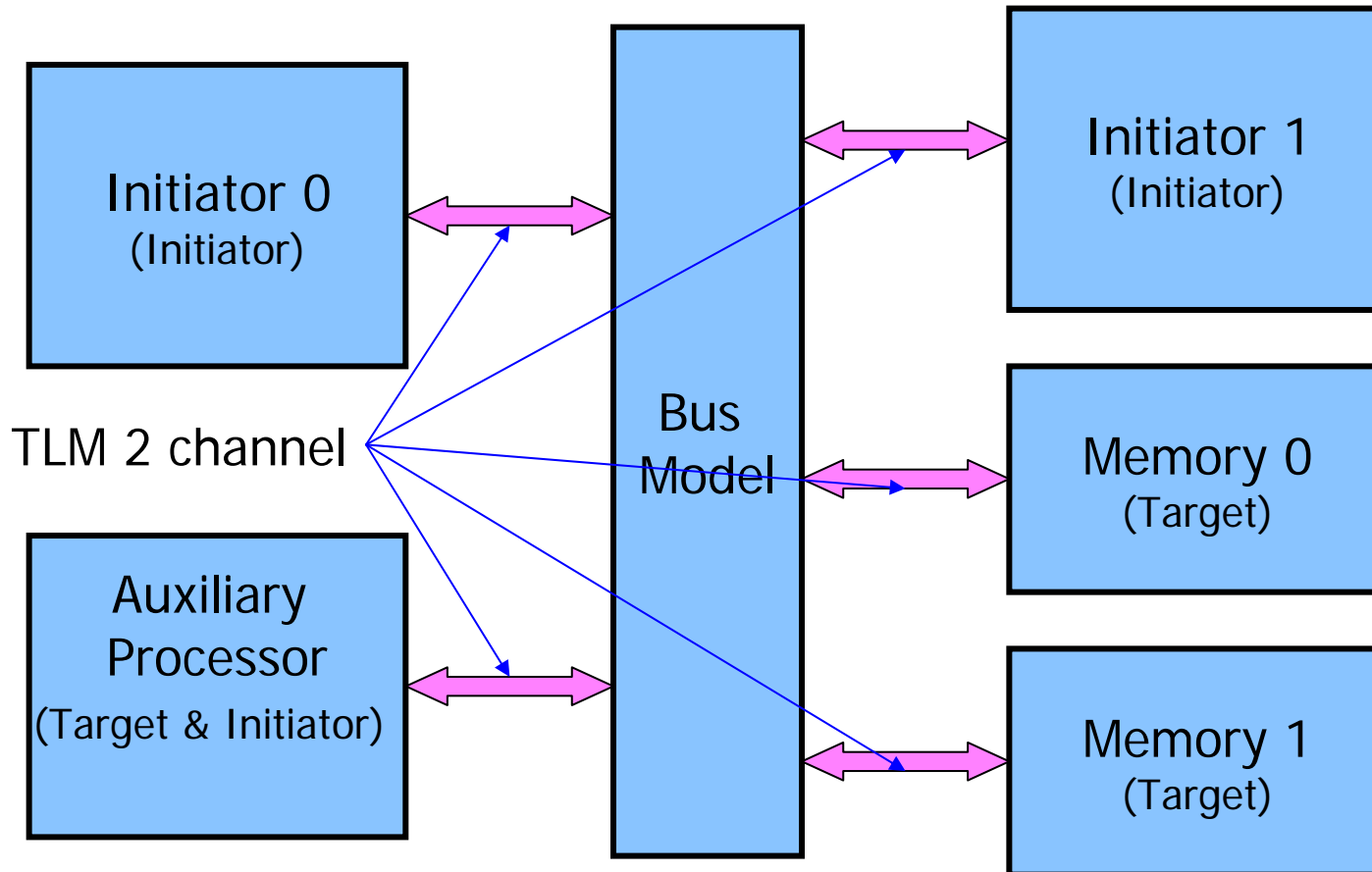
Objectives

- Provide example system models that communicate TLM 2 capabilities to architects of all types who are new to the OSCI TLM
- Use cases include
 - Early software development
 - Software-hardware integration
 - Software performance analysis
 - System-level architecture analysis
 - Hardware functional verification
- Models should communicate clearly
 - Familiar components, timing and behaviors
 - Minimal documentation - brief, complete and clear

Unit Tests Currently in TLM 2 Kit

- Bus (using Point-to-Point and SimpleBus components)
- Point 2 Point
 - BaseSocketLT
 - RegisterSocketProcessLT
 - EndEventLT
 - SimpleAT
 - SimpleAT_TA
 - CoreDecoupling
 - GenericPayload
 - GenericPayloadExtension

Example System Model



Planned Components (1)

■ Target - Memory

- LT timing - unique read, write, and refresh timing
- Parameterized memory - small block of real storage (4K)
- Crude backdoor as parameter for second memory (NV-RAM)
- Direct Memory Interface (DMI) out-of-scope for now

■ Initiator - AT and LT (may also need blocking)

- Multiple sc_processes
- Configurable with one or more sc_processes
 - Block reads (i-cache fetch)
 - Block reads or writes (d-cache activity)
 - Reads and writes (peripheral control)
 - Direct execution

Planned Components (2)

- Hybrid (target and initiator)
 - AT target, LT and AT initiator (may also need blocking)
 - CSR in bus address space (target)
 - DMA to bus address space (initiator)
- Bus Model
 - Using SimpleBus from current kit
 - Minimum required for functionality
- Possible Bridge
 - Required-extension or other options

Initial Example Configuration Options

Option Set #1

- Attributes
 - Generic Payload (GP)
 - Non-blocking transport
 - Mixed LT/AT
- Cases
 - No extension (GP)
 - Ignorable Extension (GP+IE)
 - Non-ignorable Extension (GP+NE)

Option Set #2

- Untimed (UT)
 - Generic Payload
 - Blocking transport
- Loosely Timed (LT)
 - Generic Payload
 - Possible Ignorable extension
 - Non-blocking transport
 - Temporal Synchronization
- Approximately Timed (AT)
 - Extended/derived Generic Payload
 - Non-blocking transport
 - Mixed LT and AT components

Not Planned for Initial Examples

- Interrupts
- Multiple arbitration implementations
- Analysis ports
- Direct Memory Interface (DMI)
- Mode switching (LT -> AT)
- Mixed blocking and non-blocking transport
- Features not required for the example set
 - see previous slide

Generic Payload Extension Ideas

■ Ignorable Extension Options

- Atomic compare-and-swap (read linked – write conditional)
- Keep a copy of initiator-supplied address (used to process response)
- Other

■ Non-ignorable Extension Options

- 2D burst transfers
- Memory without byte read and write support (full cache line only)
- Other

Additional Example Configurations (1)

The following list is not exhaustive

- Software development platform
 - Simulation performance optimized
 - All components LT
 - Temporal Synchronization
 - Direct Memory Interface
- System-level architecture analysis model
 - Simulation performance is secondary
 - Switching from all LT to LT/AT
 - Direct Memory Interface for LT portion of simulation
 - Analysis port exercised

Additional Example Configurations (2)

■ Software-hardware integration

- Adapters converts GP to high-fidelity hardware interfaces
 - SystemC Pin-and-Cycle Accurate model
 - RTL model
- Switching most components from LT to AT
- DMI for LT operation

■ Hardware design verification

- System software replaced by verification tests
- Software development models can be used to validate verification tests
- Adapters convert GP to high-fidelity hardware interfaces
 - Cycle Approximate (CA)
 - Pin-and-Cycle Accurate (PCA)

Additional Example Configurations (3)

- Non-MMB interconnect models implemented using TLM 2
 - Demonstrates flexibility of TLM 2's transport
 - Payload is unique or derived from GP
 - Possibly non-MMB (switched network or network-on-a-chip)
- Exclusively blocking UT model (GP only)
- Mixed blocking and non-blocking LT model (GP only)
- Exclusively non-blocking LT model (GP only)
- Pure AT model (may require GP with extensions)