ACE Slave Bridge

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# ACE Slave Bridge

Currently, *ns\_aceslvbrdg* is the superset slave bridge configuration. In Gemini NoCs, this bridge configuration is currently instantiated as CCC slave bridge. Some of channels have proprietary signaling.

The superset slave bridge needs to be enhanced to be a true ACE slave bridge, supporting standard requirements of an ACE master port. CCC slave bridge would now be a configuration of this superset bridge.

This document only describes the additions that have to be made to the existing superset bridge. All other features currently available in the slave bridge will be supported as is.

## Additional features

1. Snoop responses (CR, DC) have to be in the same order as snoop requests (AC)
2. RACK and WACK have to be in the same order as RRESP and BRESP respectively
3. AC channel needs address lookup to route the snoop requests to appropriate master agents.

## Changes to snoop (AC) channel

1. A new parameter needs to be defined to track the number of snoops that can be outstanding in the network. P\_MAX\_OUTSTD\_SNOOPS
2. An allocation ID needs to be generated and tagged with the snoop packet sent on to the NoC. This ID will be used for reordering snoop response and snoop data. Note that the exiting snoop NoC packet already has a field for this called *CRTID.*
3. NoC Destination of the snoop request will be determined using a simplified address lookup table. The table may be reused from the master bridge with similar parameters and semantics. Address table will be programmable and programmable address hashing will be supported. Additional flexibility that’s not required for this instance will be disabled.
   1. System address based lookup using ADDRESS\_BASE and ADDRESS\_MASK entries
   2. Function is ACADDRS -> Noc Layer, VC, routing information
   3. There is no external QoS level for a snoop request so this won’t factor in lookup. There will only be a single route to a given destination.
   4. Security check and address relocation are not required.
4. Snoop address lookup can hit an unknow address in the table. In this case a local snoop error response is returned without sending the snoop packet to the NoC.
5. Snoops destined for DVM will have to be identified and sent on the configured route to DVM.

## Changes to snoop response (CR CD) channel

1. Snoop response channel will need a tracking table sized to P\_MAX\_OUTSTD\_SNOOPS
2. There will also be P\_MAX\_OUTSTD\_SNOOPS x 64B buffer to hold out-of-order snoop data.
3. When the tracking table is full, AC channel must be back pressured by de-asserting ACREADY
4. First free entry in the tracking table is provided as the allocation ID for tagging AC packets sent to NoC
5. For every AC packet sent to NoC, its ID is recorded in a snoop order FIFO
6. In coming snoop responses return with the ID originally tagged on their corresponding snoop request
7. If ID of an incoming snoop response matches ‘head’ of the order FIFO, then the storage structure is bypassed and snoop response and data are directly posted to the interface
8. If incoming snoop response ID doesn’t match ‘head’, then the snoop response and snoop data are stored in the buffer location corresponding to the ID.
9. Flush logic, drains a buffer if it is ready and its ID matches the head of the order FIFO.

## Changes to R and B response channels

1. In ACE mode, currently externally provided ID is used to lookup the destination of read and write responses. In true ACE slave bridge mode, master ID of original request is used for response routing. This is handled using the AIDTBL similar to an AXI slave bridge.
2. A new parameter is needed for maximum outstanding responses in the NoC.

P\_MAX\_OUTSTND\_RRESP, P\_MAX\_OUTSTND\_BRESP

1. Back pressure on response channel from full outstanding tables is required.
2. Read and write responses are tagged with ID from RACK and WACK ordering tables respectively.

## Changes to RACK/WACK channels

1. Individual RACK and WACK output pins are needed
2. Ordering table and logic similar to the CD channel is required. However no explicit data storage is needed in the structure.

## Clock gating

Clock gating logic will be updated to gate off additional data structures when idle.

## Low power

SYSCOREQ coherency connect request from master port of CCCs will be provided to this bridge. Bridge will forward any request on to the external interface. SYSCOACK response from the external interface will be broadcast back to the CCCs to indicate that the external port is connected for coherency.

## Block diagram



## Reordering logic



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