NetSpeed Gemini

Release Notes

Version: GEMINI-17.10

Revision A.0

January 22, 2018

NetSpeed Gemini 17.10 Release Notes

About This Document

This document lists the release notes for NetSpeed Gemini. Using NetSpeed NocStudio, users can define NoC architectures, describe specifications and requirements, optimize the NoC design and finally generate the NoC IP files such as RTL, testbench, synthesis scripts, NoC IP documentation etc.

Audience

This document is intended for users of NocStudio:

- NoC Designers
- NoC Architects
- SoC Architects

Prerequisite

Before proceeding, you should generally understand:

- Basics of NetSpeed Gemini IP Technology

Related Documents

The following documents can be used as a reference to this document.

- NetSpeed NocStudio User Manual

Customer Support

For technical support about this product, please contact support@netspeedsystems.com

For general information about NetSpeed products refer to: www.netspeedsystems.com

Revision History

Revision	Date	Updates
0.0	Oct 24, 2017	Initial
0.1	Nov 7, 2017	Release candidate
A.0	Jan 22, 2018	1. Added property support “axi4_input_register” for regbus master bridge 2. Corrected an issue regarding split size calculation 3. Revised LLC replacement policy to match 1704 release performance 4. Revised latency calculation in NocStudio to better model split transactions

Contents

1 Deliverables

- NetSpeed NocStudio Package and one of the license options:
  - N7 version supporting 16 layers and 256 bridges
  - N6 version supporting 4 layers and 128 bridges
  - N5 version supporting 4 layers and 60 bridges
  - N4 version supporting 2 layers and 32 bridges
  - N3 version supporting 1 layers and 12 bridges
- NocStudio executable with interactive GUI.
- Verification checkers to be used in the DV environment.
- Sanity Test Bench.
- Documentation
  a. NocStudio User Manual: The User Guide describes how to set up a system using NocStudio and how to use it to generate NetSpeed IP.
  b. IP Integration Spec: The Integration Manual describes how to integrate a configured network into a larger subsystem.
  c. Technical Reference Manual: The Technical Reference Manual describes how the functionality of the various NoC elements, the features and functions available, and how to dynamically change the functions using the programmer's mode.

2 Installation

- NocStudio uses FlexLM based licensing.
  - Linux CentOS 5.5 or higher
  - For node-locked license file, copy over the license file under NocStudio installation directory and renamed it as “license.dat”. If the license file resides in a separated folder, please set environment variable LM_LICENSE_FILE with the proper path.
  - For floating licensing scheme, please download and extract netspeed.flexlmpkg.tar.gz for 32- or 64-bit license daemon and follow FlexLM documentation.

  NOTE: Please use a linux machine to unpack release tarball set. Unpack linux tarball set on Windows machines may cause problems with symbolic links.

- The release makes use of Qt libraries covered under LGPL:
  - http://qt-project.org/downloads

3 Feature Update: Design Methodology

3.1 New look of NocStudio GUI

Fresh new look of NocStudio GUI. Key features include (1) dock / float support of individual sub-windows (2) added support for new_soc with fine grained physical specification of Host IPs (3) Re-designed toolbar icons (4) Merging of selective GUI icons to minimize window real estate (5) new command "highlight" is supported with significantly increased color choices. (6) tune_sibs, tune_router_conn, tune_max_outstanding and build_low_area added for automatic area optimization.

Please note that "Selection", "Default", "Mesh" and "Sim" tabs are moved to lower right corner of the screen by default.

3.2 Creating design with unified domain mode

New release allows user to define a unified domain with a common clock, voltage and power domain. All modules within the domain will be part of a RTL group. GUI visualization has been enhanced with outline in the floorplan view.

3.3 GUI visualization enhancements during performance analysis

GUI tooltip window displays complete detailed information of all links of a router, including lists of flows and traffic activities. The pop-up window can be disabled by setting "prop_default tooltip_on no".

3.4 GUI support for individual font size control

Each of the Icon size, Console Font, Main Tabs font and Side panel font can now be controlled by the user by clicking "view → Resize Icon and Size".

3.5 New Heat Map support and power modeling with GUI visualization during simulation – preliminary

New default property "heatmap_enabled" can be set to yes for user to visualize the NOC heatmap / activities during simulation. Please refer to NocStudio help manual and search for keyword "heatmap".

3.6 New display_node_as_x_y property to switch between node ID and [x,y]

This added property allows user to switch GUI node ID display to [x, y] coordinate. The feature improves usability for user to extensively specify [x, y] in the design script file and eases host/bridge relocation and mesh resizing. Please refer to command "resize_mesh" for details.

3.7 New command "resize_mesh"

This newly added command allows user to increase / decrease rows and columns in the mesh. Setting "prop_default display_node_as_x_y yes" should be used to create highly scalable design flow.

3.8 Next Gen SOC Physical Floorplan View – preliminary

User specified fine grained definition of the Host IP dimension. Instead of grid/mesh based Host IP size specification with new_mesh, user can draw the actual size (with um granularity) using new_soc command. The "chip_view" in prior releases has been replaced with command "generate_chip_view".

3.9 Design Config Rule check (lint) support

New command "lint" is now supported to check the integrity of the design configuration. Similar to logic linting flow, user can define their own waiver rule file based on the design criteria on per project basis or a corporate wide defined rule.

3.10 A set of automatic area optimization commands and options

New commands "tune_sibs" and "tune_router_conn" have been added in this release to explore usage of shared interface bridges and optimize router connections. These commands would display a list of applicable property changes in the console window for user review. Invoke the command the 2nd time with -apply option to actually apply to a design.

For customers with machine learning licenses, these optimizations are part of the ml_build -low_area option.

Thirdly, new command "tune_max_outstanding" has been incorporated in this release to automatically optimize max_outstanding setting based on performance simulations.

3.11 SystemC Modeling support for Non-coherent Orion and Pegasus design

New default property “sysc_enable” is now supported for Orion and Pegasus product families to generate all files needed for FT (Fast-timed) address-aware systemC modeling environment.

Coming soon: Gemini systemC modeling environment. Please contact NetSpeed support for availability.

4 Feature Updates: System Interconnect

4.1 NEW DEFAULT PROPERTY GEN_PASSTHROUGHS HAS BEEN ADDED

A new default property “gen_passthroughs” has been added for design with multiple RTL grouping which allows wires between group A and C to pass through group B. Group B is physically located between A and C.

5 Feature Updates: Non-Coherent Components

5.1 New Interface property low_latency_enable for bridge latency optimization

A new interface property has been added in this release for both master and slave bridges running at lower frequency to bypass the internal pipeline stages. Each of the AR, AWW, R and B channel can be set individually for user to be make best design tradeoffs between latency and frequency.

5.2 AHB Master Bridge Area Reduction

The AHB master bridge has been redesigned to reduce flop cost. Default 32-bits AHB master bridge has shown more than 50% area reduction.

5.3 SRAM wrapper enhancement

Enhancement has been made to RTL generator to define RAM wrapper with generate statement based on the parameters of the RAM configuration.

5.4 New bridge property axi4m_trusted_master

When set, transaction through this mater bridge will use the setting in address lookup table for all outgoing transactions (injected) to the NOC.

5.5 Programmable Hash function support in LLC pre-loader

The LLC pre-loader has been enhanced to support programmable hash function through regbus.

5.6 Added support of axi4_input_register for RBM

When set, input register flops are added at its inputs. Please note that the property can be set globally using prop_default or individually using bridge_prop.

6 Feature Updates: Coherent Components

6.1 Added support for Non-coherent traffic sharing the coherent path through Integrated CCC agent

New license controlled feature allows the mapping of non-coherent traffic flow shares with the coherent path – through CCC.

6.2 Regfile support for CCC prefetch buffer and IOCB read/write buffer and LLC read buffer

A new set of properties to support regfile implementation has been added. Please refer to NocStudio help manual and search for keyword "regfile".

6.3 Global Coherency Tracker (GCT) state reset support

The GCT state can now be cleared during RTL simulation when hardware reset signal is asserted.

7 EDA Tool Compatibility

- Cadence EDA tools were used for verification and synthesis of this product.
  - Incisive RTL Simulator 15.22-s012
  - Genus RTL Synthesis 16.22-s033_1
  - HAL Linting tool 15.20-s027
  - Conformal 16.20-s240
- Compatibility testing has been done with VCS vcs-mx/L-2016.06 and Synopsys Design Compiler L-2016.03-SP5.
- Please contact NetSpeed support team (support@netspeedsystems.com) for additional platform and tool compatibility details.

8 Errata: System Interconnect

None

9 Errata: Non-Coherent Components

None

10 Errata: Coherent Components

None

11 Errata: Coherent Components

11.1 SYSCOREQ HANDSHAKING FOR ACE MASTER

If using a Netspeed provided voltage-domain crossing with an ACE master, and using a Q-channel to control power-management, then SYSCOREQ shall not be asserted until the Q-channel handshake has reached the Q_RUN state

12 Errata: Coherent Components

12.1 SYSCOREQ HANDSHAKING FOR ACE MASTER

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13 Changes to Commands and Properties

Please refer to NocStudio Help → User Manual Supplement for details.

13.1 COMMAND CHANGES

Command Name	Comment
add_column / del_column	Add / delete a column to the logical mesh at the position specified in the physical floorplan view
add_domain / del_domain / list_domains	Add / delete a single domain with a clock domain, power domains and an RTL group. List all domains
add_row / del_row	Add / delete a row to the logical mesh at the position specified in the physical floorplan view
add_to_region / del_from_region / list_regions / move_region	Add / delete a physical region and specify clock domains, power domains, RTL groups. List or move region(s)
add_unwaiver / del_unwaiver / list_unwaivers / reset_unwaivers	This command adds / deletes / resets or lists one or more IDs and/or one or more categories and/or one or more strings to the unwaiver list used for lint.
add_waiver / del_waiver / list_waivers / reset_waivers	This command adds / deletes / reset or lists one or more IDs and/or one or more categories and/or one or more strings to the waiver list used for lint.
analyze_interface_perf_ratios	Report on interface performance ratios of last sim run
build_low_area	Build a NoC with lowest possible area
expand_var	Expand variable and print the result
generate_chip_view	Draws a physical chip view of the NoC
highlight	Highlights the filtered NoC components in the specified color (default color is automatically chosen by NocStudio)
lint	This command runs a design verification check (or lint check) on the current NoC,

	and presents a report with the errors and warnings that might hinder rtl generation
list_rtl_groups	Lists RTL elements in each group
list_channel_tooltips	Renamed with list_tooltips
load_waiver_list	This command loads a list of waived/unwaived IDs and/or categories and/or strings for lint
new_soc	This command creates a new blank SoC on which hosts can be drawn using physical coordinates
permute_router_conn	Changes the router connections of all provided bridges
reset_node_physical_positions	Resets the physical position of all nodes in the logical grid
reset_upgraded_warning	Reset the given upgraded warning ID(s) to be warning(s) again
resize_mesh	This command is used to change the number of rows and columns in the mesh
save_lint_report	Save the lint report as a .csv file
set_node_physical_position	Set the physical position of a node in the logical grid
set_pmf	Set the Probability Mass function associated with a name
transform_soc	This command transforms the physical floorplan view into the logical mesh view
tune_max_outstanding	Tune the max_outstanding_requests attribute on TX interfaces
tune_router_conn	Tunes the bridges router connections to minimize the number of distinct routers that the bridges are connected to
tune_sibs	Automatically adds shared interface bridges wherever possible to reduce the bridge area
upgrade_warning	Upgrade the given warning ID to be an error

13.2 MESH PROPERTY CHANGES

Property Name	**Comment**
enable_address_aware_simulation	Enables address aware simulation.

flop_density	Indicates the flop density (number of flops per um2) for chip view display mode.
interrupt_mode	Controls the type of interrupt signals that are exposed in ns_soc_ip.v
link_wire_density	Indicates the wire density (number of wires per um).
link_wire_width_nm	deprecated
logical_transform_tolerance_cap	The maximum tolerance that can be used to transform the physical positions of objects into the logical positions
max_distance_from_sib	The maximum allowed Manhattan distance in mm between a bridge and an SIB.
register_area_nm2	deprecated
soc_view_reference_line	Choose type of lines to show in the SoC view.
soc_view_wire_width_scale	Scaling factor for width of wires in the SoC view.
tooltip_on	deprecated
virtual_ok	deprecated

13.3 Host Property Changes

Property Name	**Comment**
cc_directory_hash_mode	The type of hashing used in the directory for the CCC.
cc_interrupt_mask_value	This bit vector specifies which events should trigger interrupts in the CCC.
cc_pfb_memory_enable	Enable regfile implementation for pre-fetch buffer
cc_pfb_memory_in_width	Pre-fetch buffer input width
cc_pfb_memory_out_width	Pre-fetch buffer output width
iocb_master_port_rd_buffer_memory_enable	Enable regfile implementation for the IOCB read buffer
iocb_master_port_rd_buffer_memory_in_width	Read buffer input width
iocb_master_port_rd_buffer_memory_out_width	Read buffer output width
iocb_slave_port_wr_buffer_memory_enable	Enable regfile implementation for the IOCB write buffer
iocb_slave_port_wr_buffer_memory_in_width	Write buffer input width

iocb_slave_port_wr_buffer_memory_out_width	Write buffer output width
llc_interrupt_mask_value	This bit vector specifies which events should trigger interrupts in the LLC.
llc_master_port_wr_buffer_ram_enable	deprecated
llc_master_port_wr_buffer_ram_in_width	deprecated
llc_master_port_wr_buffer_ram_out_width	deprecated
llc_partialwrite_alloc	Specifies whether partial write will trigger read fetch first.
llc_poison_support	Specifies if the ICCC should store poison bits in the data array.
llc_read_max_outstanding	Specifies the number of outstanding read requests the LLC can support from all sources.
llc_slave_port_rd_buffer_memory_enable	Enable regfile implementation for LLC read buffer
llc_slave_port_rd_buffer_memory_in_width	Read buffer input width
llc_slave_port_rd_buffer_memory_out_width	Read buffer output width
llc_slave_port2_rd_buffer_memory_enable	Enable regfile implementation for LLC read buffer on 2nd port
llc_slave_port2_rd_buffer_memory_in_width	Read buffer input width
llc_slave_port2_rd_buffer_memory_out_width	Read buffer output width
llc_write_max_outstanding	Specifies the number of outstanding write requests the LLC can support from all sources

13.4 BRIDGE PROPERTY CHANGES

Property Name	**Comment**
allowed_positions	Sets the positions that this bridge is allowed to move to.
axi4_input_register	enables input registering at the bridge.
axi4m_ar_rob_memory_enable	renamed _ram_ with _memory_
axi4m_ar_rob_memory_in_width	renamed _ram_ with _memory_
axi4m_ar_rob_memory_out_width	renamed _ram_ with _memory_
axi4m_trusted_master	specify if a master should use the address table to determine secure status of a transaction.

chi_addr_width chi_cache_stash_en chi_cc_cache_capacity chi_data_check_en chi_data_width chi_direct_cache_transfer_en chi_direct_memory_transfer_en chi_enhanced_features_en chi_hnrn_req_max_outstanding chi_hnrn_snp_max_outstanding chi_node_id_width chi_poison_en chi_rnf_logical_processors chi_rx_dat_output_register chi_rx_req_output_register chi_rx_rsp_output_register chi_rx_snp_output_register chi_rxdat_rsvdc chi_rxreq_rsvdc chi_txdat_link_buffer_depth chi_txdat_rsvdc chi_txreq_link_buffer_depth chi_txreq_rsvdc chi_txrsp_link_buffer_depth chi_txsnp_link_buffer_depth chi_version	CHI support is available upon request. Please contact NetSpeed support for details.
color	choices of bridge colors are significantly enhanced
lock	lock/unlock the position of a bridge
run_sib_compatibility_checks	Allows masters that do not have matching traffic and address ranges to be connected to the same sib.
sync_input_register	deprecated

13.5 Interface Property Changes

Property Name	Comment
host_max_outstanding_requests	Maximum number of outstanding messages from the host's perspective on this interface if its response_id is set (by default, response_id for both tx and rx

	Amba request interfaces are set per Amba protocol but are not set for NSIP interfaces).
low_latency_enable	Enable pipeline stages internal to the interface channel to be bypassed.
stream_data_packet	If true, then the interface is will stream any data packets that arrive on it.

13.6 Link Property Changes

Property Name	Comment
domain_crosser_phy_pos	The physical position of the crosser for this link

13.7 Router Property Changes

None

13.8 VC Property Changes

None

13.9 Default Property Changes

Property Name	Comment
axi4_input_register	This property applies to AXI4M, AXI3M, ACELM, ACEM, ACELDM, AXI4S, ACELS bridges. If yes, input registering is enabled at the input to the bridge from the host.
axi4m_ar_rob_memory_enable axi4m_ar_rob_memory_in_width axi4m_ar_rob_memory_out_width	renamed _ram_ with _memory_
axi4m_trusted_master	This property applies to ACELM, ACELDM, AXI4M, AXI3M, AXI4LM, AHBLM bridges. When this property is set, address lookup table is used for filtering and marking security status of outgoing transactions.

cc_pfb_memory_enable cc_pfb_memory_in_width cc_pfb_memory_out_width	renamed _ram_ with _memory_
check_name_validity	When checking if a name is valid, by default NocStudio will scan many categories of names to see
chi_addr_width chi_cache_stash_en chi_cc_cache_capacity chi_data_check_en chi_data_width chi_direct_cache_transfer_en chi_direct_memory_transfer_en chi_enhanced_features_en chi_poison_en chi_rnf_logical_processors chi_rx_dat_output_register chi_rx_req_output_register chi_rx_rsp_output_register chi_rx_snp_output_register chi_rxdat_rsvdc chi_rxreq_rsvdc chi_txdat_link_buffer_depth chi_txdat_rsvdc chi_txreq_link_buffer_depth chi_txreq_rsvdc chi_txrsp_link_buffer_depth chi_txsnp_link_buffer_depth	A list of bridge property defaults for CHI support
display_node_as_x_y	This prop can be used to display Node ids as x,y values so the row and column of a node can be quickly identified.
domain_region_show	This property allows users to control how domain regions are shown in the SoC view
dynamic_power_equation	This property allows users to provide a formula for computing dynamic power of NoC logic.
gen_passthroughs	Enabling this flag changes RTL generation to automatically create passthroughs for internal wires whose logical path would pass through a node with rtl group that is

	neither the source nor destination of that wire.
heatmap_enabled	If yes, NocStudio will compute the power consumption during performance simulation runs, and in a separate tab display the heatmap of the NoC based on the power consumption at various routers and bridges and link
heatmap_include_static_power	If yes, the power computation for heatmap would include the static power consumption.
heatmap_pixels_mm	The pixel granularity of power sim heatmap.
host_max_outstanding_requests	This parameter limits the maximum number of outstanding command messages through this interface at a requester/master device for all responder/slave devices
iocb_master_port_rd_buffer_memory_enable iocb_master_port_rd_buffer_memory_in_width iocb_master_port_rd_buffer_memory_out_width	renamed _ram_ with _memory_
iocb_slave_port_wr_buffer_memory_enable iocb_slave_port_wr_buffer_memory_in_width iocb_slave_port_wr_buffer_memory_out_width	renamed _ram_ with _memory_
llc_master_port_wr_buffer_ram_enable llc_master_port_wr_buffer_ram_in_width llc_master_port_wr_buffer_ram_out_width	Deprecated
List_region_corners	This property allows the user to control the format in which regions are printed.
llc_slave_port_rd_buffer_memory_enable llc_slave_port_rd_buffer_memory_in_width llc_slave_port_rd_buffer_memory_out_width	renamed _ram_ with _memory_
llc_slave_port2_rd_buffer_memory_enable llc_slave_port2_rd_buffer_memory_in_width llc_slave_port2_rd_buffer_memory_out_width	Renamed _ram_ with _memory_
next_gen_bridge	This property is used to turn on certain area or performance optimizations in NocStudio that are not yet available in the bridge and router RTL
run_sib_compatibility_checks	This property can be set to yes to allow masters that have different address ranges

	and traffic to connect to the same shared interface bridge
shared_doc_enable	Indicates generation of redistributable documents is enabled when running gen_ip for this NoC.
show_flow_list_in_channel_tooltip	Whether to show the mapped/simulated flows list in VC/Ifce tooltip or not
static_power_equation	This property allows users to provide a formula for computing static power of NoC logic.
sync_input_register	deprecated
sysc_enable	Indicates whether SystemC model generation is enabled when running gen_ip for this NoC.
tooltip_on	Indicates whether to display tool-tip in NoC display.
wire_power_equation	This property allows users to provide a formula for computing dynamic power of NoC logic

14 Hot fixes

14.1 Corrected Split size calculation in NocStudio

An issue with split size calculation in NocStudio has been corrected where split size is set greater than the slave range granularity, based on slice bits or defined hash function.

14.2 LLC replacement policy change

In 1710 release, the LLC behavior has changed (from 1704) to improve LLC utilization with a better hit rate. However, in certain traffic profiles, the throughput has been degraded. In 1710a release, LLC replacement policy has been reverted back to 1704 like behavior. A property to define LLC replacement policy will be implemented in future release.

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