

CS701-High Performance Computing Lab
LAB Assignment 02

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RollNo: CS242CS008

8 * 8 MESH

Configuration File :

```
# Simple default config of a 4x4 mesh
# Each parameter is overwritten when corresponding command line value is set
#
# NOC & WIRED CONFIGURATION
#
# Topologies:
# MESH
# BUTTERFLY
# BASELINE
# OMEGA
#
# BUTTERFLY, BASELINE, and OMEGA are Delta Network topologies
#
topology: MESH
# X and Y mesh sizes
mesh_dim_x: 8
mesh_dim_y: 8
# number of flits for each router buffer
buffer_depth: 32
# size of flits, in bits
flit_size: 32
# length in mm of router to hub connection
r2h_link_length: 2.0
# length in mm of router to router connection
r2r_link_length: 1.0
n_virtual_channels: 1

# Routing algorithms:
# XY
# WEST_FIRST
# DELTA
# NORTH_LAST
# NEGATIVE_FIRST
# ODD_EVEN
# DYAD
# TABLE_BASED
# Each of the above labels should match a corresponding
# implementation in the routingAlgorithms source code directory
routing_algorithm: ODD_EVEN
routing_table_filename: ""
```

```

# Routing specific parameters
# dyad_threshold: double
dyad_threshold: 0.6

# Selection Strategies:
# RANDOM
# BUFFER_LEVEL
# NOP
# Each of the above labels should match a corresponding
# implementation in the selectionStrategies source code directory
selection_strategy: RANDOM

#
# WIRELESS CONFIGURATION
#
Hubs:
  defaults:
    # channels from which Hub can receive/transmit
    rx_radio_channels: [0]
    tx_radio_channels: [0]
    # list of node tiles attached to the hub
    attached_nodes: []
    # size of buffers connecting the hub to tiles
    to_tile_buffer_size: 4
    from_tile_buffer_size: 4
    # size of antenna tx/rx
    rx_buffer_size: 4
    tx_buffer_size: 4

# for each hub, the same parameters specified above can be customized
# If not specified, the above default values will be used
# What is usually needed to be customized specifically for each hub is
# the set of nodes that are connected to it. In this simple topology
# we have 4 hubs (0-3) connected to the four nodes of the 2x2
# sub-meshes

0:
  attached_nodes: [0,1,4,5]

1:
  attached_nodes: [2,3,6,7]

2:
  attached_nodes: [8,9,12,13]

3:
  attached_nodes: [10,11,14,15]

# Transmission channels configuration
# each channel modelizes the transmission over a given frequency that
# can be used by a set of communicating hubs

```

RadioChannels:

defaults:

data rate in Gb/s affect the number of cycles required for a
flit transmission

data_rate: 16

bit error rate (CURRENTLY UNSUPPORTED)

ber: [0, 0]

mac policies:

who has the token releas only when a complete packet has
been sent

#[TOKEN_PACKET]

who has the token, release only after a fixed number of
cycles, even no transmission is occurring

#[TOKEN_HOLD, num_hold_cycles]

who has the token, holds the packet until needed for
transmissions, until a max number of cycles is reached

#[TOKEN_MAX_HOLD, max_hold_cycles]

mac_policy: [TOKEN_PACKET]

SIMULATION PARAMETERS

#

clock_period_ps: 1000

duration of reset signal assertion, expressed in cycles

reset_time: 1000

overall simulation lenght, expressed in cycles

simulation_time: 10000

collect stats after a given number of cycles

stats_warm_up_time: 1000

power breakdown, nodes communication details

detailed: false

stop after a given amount of load has been processed

max_volume_to_be_drained: 0

show_buffer_stats: false

Winoc

enable wireless, when false, all wireless channel configuration is
ignored

use_winoc: false

experimental power saving strategy

use_wirxsleep: false

Verbosity level:

VERBOSE_OFF

VERBOSE_LOW

VERBOSE_MEDIUM

VERBOSE_HIGH

verbose_mode: VERBOSE_OFF

```

# Trace
trace_mode: false
trace_filename: ""

min_packet_size: 4
max_packet_size: 4
packet_injection_rate: 0.02
probability_of_retransmission: 0.01

# Traffic distribution:
# TRAFFIC_RANDOM
# TRAFFIC_TRANSPOSE1
# TRAFFIC_TRANSPOSE2
# TRAFFIC_HOTSPOT
# TRAFFIC_TABLE_BASED
# TRAFFIC_BIT_REVERSAL
# TRAFFIC_SHUFFLE
# TRAFFIC_BUTTERFLY
traffic_distribution: TRAFFIC_RANDOM
# when traffic table based is specified, use the following
# configuration file
traffic_table_filename: "t.txt"

```

Output :

```

anandmk@csedept-HP: ~/Anand/NITK/noxim/bin
anandmk@csedept-HP:~/Anand/NITK/noxim/bin$ ./noxim -config ../config_examples/my_config.yaml

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-----
      Noxim - the NoC Simulator
      (C) University of Catania
-----

Catania V., Mineo A., Monteleone S., Palesi M., and Patti D. (2016) Cycle-Accurate Network on Chip Simulation with Noxim. ACM Trans. Model. Comput. Simul. 27, 1, Article 4 (August 2016), 25 pages. DOI: https://doi.org/10.1145/2953878

Loading configuration from file "../config_examples/my_config.yaml"... Done
Loading power configurations from file "power.yaml"... Done
Reset for 1000 cycles... done!
Now running for 10000 cycles...
Noxim simulation completed. (11000 cycles executed)

% Total received packets: 11741
% Total received flits: 46971
% Received/Ideal flits Ratio: 1.01934
% Average wireless utilization: 0
% Global average delay (cycles): 18.0252
% Max delay (cycles): 80
% Network throughput (flits/cycle): 5.219
% Average IP throughput (flits/cycle/IP): 0.0815469
% Total energy (J): 3.81997e-05
%   Dynamic energy (J): 2.67506e-06
%   Static energy (J): 3.55247e-05
anandmk@csedept-HP:~/Anand/NITK/noxim/bin$

```

Total received packets: 11308
% Total received flits: 45239
% Received/Ideal flits Ratio: 0.981749
% Average wireless utilization: 0
% Global average delay (cycles): 18.2963
% Max delay (cycles): 94
% Network throughput (flits/cycle): 5.02656
% Average IP throughput (flits/cycle/IP): 0.0785399
% Total energy (J): 3.8123e-05
% Dynamic energy (J): 2.59829e-06
% Static energy (J): 3.55247e-05

16 * 16 MESH

Configuration File :

```
# Simple default config of a 4x4 mesh
# Each parameter is overwritten when corresponding command line value is set
#
# NOC & WIRED CONFIGURATION
#
# Topologies:
# MESH
# BUTTERFLY
# BASELINE
# OMEGA
#
# BUTTERFLY, BASELINE, and OMEGA are Delta Network topologies
#
topology: MESH
# X and Y mesh sizes
mesh_dim_x: 16
mesh_dim_y: 16
# number of flits for each router buffer
buffer_depth: 32
# size of flits, in bits
flit_size: 64
# lenght in mm of router to hub connection
r2h_link_length: 2.0
# lenght in mm of router to router connection
r2r_link_length: 1.0
n_virtual_channels: 1

# Routing algorithms:
# XY
# WEST_FIRST
```

```

# DELTA
# NORTH_LAST
# NEGATIVE_FIRST
# ODD_EVEN
# DYAD
# TABLE_BASED
# Each of the above labels should match a corresponding
# implementation in the routingAlgorithms source code directory
routing_algorithm: XY
routing_table_filename: ""

# Routing specific parameters
# dyad_threshold: double
dyad_threshold: 0.6

# Selection Strategies:
# RANDOM
# BUFFER_LEVEL
# NOP
# Each of the above labels should match a corresponding
# implementation in the selectionStrategies source code directory
selection_strategy: RANDOM

#
# WIRELESS CONFIGURATION
#
Hubs:
  defaults:
    # channels from which Hub can receive/transmit
    rx_radio_channels: [0]
    tx_radio_channels: [0]
    # list of node tiles attached to the hub
    attached_nodes: [0]
    # size of buffers connecting the hub to tiles
    to_tile_buffer_size: 4
    from_tile_buffer_size: 4
    # size of antenna tx/rx
    rx_buffer_size: 4
    tx_buffer_size: 4

# for each hub, the same parameters specified above can be customized
# If not specified, the above default values will be used
# What is usually needed to be customized specifically for each hub is
# the set of nodes that are connected to it. In this simple topology
# we have 4 hubs (0-3) connected to the four nodes of the 2x2
# sub-meshes

0:
  attached_nodes: [0,1,4,5]

1:
  attached_nodes: [2,3,6,7]

```

2:

attached_nodes: [8,9,12,13]

3:

attached_nodes: [10,11,14,15]

Transmission channels configuration

each channel modelizes the transmission over a given frequency that

can be used by a set of communicating hubs

RadioChannels:

defaults:

data rate in Gb/s affect the number of cycles required for a

flit transmission

data_rate: 16

bit error rate (CURRENTLY UNSUPPORTED)

ber: [0, 0]

mac policies:

who has the token releas only when a complete packet has

been sent

#[TOKEN_PACKET]

who has the token, release only after a fixed number of

cycles, even no transmission is occurring

#[TOKEN_HOLD, num_hold_cycles]

who has the token, holds the packet until needed for

transmissions, until a max number of cycles is reached

#[TOKEN_MAX_HOLD, max_hold_cycles]

mac_policy: [TOKEN_PACKET]

SIMULATION PARAMETERS

#

clock_period_ps: 1000

duration of reset signal assertion, expressed in cycles

reset_time: 1000

overall simulation lenght, expressed in cycles

simulation_time: 10000

collect stats after a given number of cycles

stats_warm_up_time: 1000

power breakdown, nodes communication details

detailed: false

stop after a given amount of load has been processed

max_volume_to_be_drained: 0

show_buffer_stats: false

Winoc

enable wireless, when false, all wireless channel configuration is

ignored

use_winoc: true

```

# experimental power saving strategy
use_wirxsleep: false

# Verbosity level:
#  VERBOSE_OFF
#  VERBOSE_LOW
#  VERBOSE_MEDIUM
#  VERBOSE_HIGH
verbose_mode: VERBOSE_OFF

# Trace
trace_mode: false
trace_filename: ""

min_packet_size: 4
max_packet_size: 4
packet_injection_rate: 0.005
probability_of_retransmission: 0.01

# Traffic distribution:
#  TRAFFIC_RANDOM
#  TRAFFIC_TRANSPOSE1
#  TRAFFIC_TRANSPOSE2
#  TRAFFIC_HOTSPOT
#  TRAFFIC_TABLE_BASED
#  TRAFFIC_BIT_REVERSAL
#  TRAFFIC_SHUFFLE
#  TRAFFIC_BUTTERFLY
traffic_distribution: TRAFFIC_RANDOM
# when traffic table based is specified, use the following
# configuration file
traffic_table_filename: "t.txt"

```

Output :

```

anandmk@csedept-HP: ~/Anand/NITK/noxim/bin
anandmk@csedept-HP:~/Anand/NITK/noxim/bin$ ./noxin -config ../config_examples/my_config.yanl

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Loading configuration from file "../config_examples/my_config.yanl"... Done
Loading power configurations from file "power.yanl"... Done
Reset for 1000 cycles... done!
Now running for 10000 cycles...
Noxim simulation completed. (11000 cycles executed)

% Total received packets: 11527
% Total received flits: 46087
% Received/Ideal flits Ratio: 1.00015
% Average wireless utilization: 0.00425089
% Global average delay (cycles): 25.2455
% Max delay (cycles): 75
% Network throughput (flits/cycle): 5.12078
% Average IP throughput (flits/cycle/IP): 0.020003
% Total energy (J): 0.00049675
%   Dynamic energy (J): 9.56805e-06
%   Static energy (J): 0.000487182
anandmk@csedept-HP:~/Anand/NITK/noxim/bin$

```


% Total received packets: 11527
% Total received flits: 46087
% Received/Ideal flits Ratio: 1.00015
% Average wireless utilization: 0.00425089
% Global average delay (cycles): 25.2455
% Max delay (cycles): 75
% Network throughput (flits/cycle): 5.12078
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32 * 32 MESH

Configuration File :

```
# Simple default config of a 4x4 mesh
# Each parameter is overwritten when corresponding command line value is set
#
# NOC & WIRED CONFIGURATION
#
# Topologies:
# MESH
# BUTTERFLY
# BASELINE
# OMEGA
#
# BUTTERFLY, BASELINE, and OMEGA are Delta Network topologies
#
topology: MESH
# X and Y mesh sizes
mesh_dim_x: 32
mesh_dim_y: 32
# number of flits for each router buffer
buffer_depth: 32
# size of flits, in bits
flit_size: 64
# lenght in mm of router to hub connection
r2h_link_length: 2.0
# lenght in mm of router to router connection
r2r_link_length: 1.0
n_virtual_channels: 1

# Routing algorithms:
# XY
# WEST_FIRST
# DELTA
# NORTH_LAST
# NEGATIVE_FIRST
# ODD_EVEN
# DYAD
```

```

# TABLE_BASED
# Each of the above labels should match a corresponding
# implementation in the routingAlgorithms source code directory
routing_algorithm: XY
routing_table_filename: ""

# Routing specific parameters
# dyad_threshold: double
dyad_threshold: 0.6

# Selection Strategies:
# RANDOM
# BUFFER_LEVEL
# NOP
# Each of the above labels should match a corresponding
# implementation in the selectionStrategies source code directory
selection_strategy: RANDOM

#
# WIRELESS CONFIGURATION
#
Hubs:
  defaults:
    # channels from which Hub can receive/transmit
    rx_radio_channels: [0]
    tx_radio_channels: [0]
    # list of node tiles attached to the hub
    attached_nodes: [0]
    # size of buffers connecting the hub to tiles
    to_tile_buffer_size: 4
    from_tile_buffer_size: 4
    # size of antenna tx/rx
    rx_buffer_size: 4
    tx_buffer_size: 4

# for each hub, the same parameters specified above can be customized
# If not specified, the above default values will be used
# What is usually needed to be customized specifically for each hub is
# the set of nodes that are connected to it. In this simple topology
# we have 4 hubs (0-3) connected to the four nodes of the 2x2
# sub-meshes

0:
  attached_nodes: [0,1,4,5]

1:
  attached_nodes: [2,3,6,7]

2:
  attached_nodes: [8,9,12,13]

3:

```

attached_nodes: [10,11,14,15]

Transmission channels configuration
each channel models the transmission over a given frequency that
can be used by a set of communicating hubs

RadioChannels:

defaults:

data rate in Gb/s affects the number of cycles required for a
flit transmission

data_rate: 32

bit error rate (CURRENTLY UNSUPPORTED)

ber: [0, 0]

mac policies:

who has the token releases only when a complete packet has
been sent

#[TOKEN_PACKET]

who has the token, releases only after a fixed number of
cycles, even no transmission is occurring

#[TOKEN_HOLD, num_hold_cycles]

who has the token, holds the packet until needed for
transmissions, until a max number of cycles is reached

#[TOKEN_MAX_HOLD, max_hold_cycles]

mac_policy: [TOKEN_PACKET]

SIMULATION PARAMETERS

#

clock_period_ps: 1000

duration of reset signal assertion, expressed in cycles

reset_time: 1000

overall simulation length, expressed in cycles

simulation_time: 10000

collect stats after a given number of cycles

stats_warm_up_time: 1000

power breakdown, nodes communication details

detailed: false

stop after a given amount of load has been processed

max_volume_to_be_drained: 0

show_buffer_stats: false

Winoc

enable wireless, when false, all wireless channel configuration is

ignored

use_winoc: false

experimental power saving strategy

use_wirxsleep: false

Verbosity level:

VERBOSE_OFF

```

# VERBOSE_LOW
# VERBOSE_MEDIUM
# VERBOSE_HIGH
verbose_mode: VERBOSE_OFF

# Trace
trace_mode: false
trace_filename: ""

min_packet_size: 4
max_packet_size: 4
packet_injection_rate: 0.005
probability_of_retransmission: 0.01

# Traffic distribution:
# TRAFFIC_RANDOM
# TRAFFIC_TRANSPOSE1
# TRAFFIC_TRANSPOSE2
# TRAFFIC_HOTSPOT
# TRAFFIC_TABLE_BASED
# TRAFFIC_BIT_REVERSAL
# TRAFFIC_SHUFFLE
# TRAFFIC_BUTTERFLY
traffic_distribution: TRAFFIC_RANDOM
# when traffic table based is specified, use the following
# configuration file
traffic_table_filename: "t.txt"

```

Output :

```

anandmk@csdept-HP: ~/Anand/NITK/noxim/bin
anandmk@csdept-HP:~/Anand/NITK/noxim/bin$ ./noxim -config ../config_examples/my_config.yaml

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Loading configuration from file "../config_examples/my_config.yaml"... Done
Loading power configurations from file "power.yaml"... Done
Reset for 1000 cycles... done!
Now running for 10000 cycles...
Noxim simulation completed. (11000 cycles executed)

% Total received packets: 46368
% Total received flits: 185489
% Received/Ideal flits Ratio: 1.00634
% Average wireless utilization: 0
% Global average delay (cycles): 50.2076
% Max delay (cycles): 158
% Network throughput (flits/cycle): 20.6099
% Average IP throughput (flits/cycle/IP): 0.0201268
% Total energy (J): 0.00201123
%   Dynamic energy (J): 7.32849e-05
%   Static energy (J): 0.00193795
anandmk@csdept-HP:~/Anand/NITK/noxim/bin$

```

% Total received packets: 46368
% Total received flits: 185489
% Received/Ideal flits Ratio: 1.00634
% Average wireless utilization: 0
% Global average delay (cycles): 50.2076
% Max delay (cycles): 158
% Network throughput (flits/cycle): 20.6099
% Average IP throughput (flits/cycle/IP): 0.0201268
% Total energy (J): 0.00201123
% Dynamic energy (J): 7.32849e-05
% Static energy (J): 0.00193795

50 * 50 MESH

Configuration File :

```
# Simple default config of a 4x4 mesh
# Each parameter is overwritten when corresponding command line value is set
#
# NOC & WIRED CONFIGURATION
#
# Topologies:
# MESH
# BUTTERFLY
# BASELINE
# OMEGA
#
# BUTTERFLY, BASELINE, and OMEGA are Delta Network topologies
#
topology: MESH
# X and Y mesh sizes
mesh_dim_x: 50
mesh_dim_y: 50
# number of flits for each router buffer
buffer_depth: 64
# size of flits, in bits
flit_size: 64
# lenght in mm of router to hub connection
r2h_link_length: 2.0
# lenght in mm of router to router connection
r2r_link_length: 1.0
n_virtual_channels: 2

# Routing algorithms:
# XY
# WEST_FIRST
# DELTA
# NORTH_LAST
# NEGATIVE_FIRST
# ODD_EVEN
# DYAD
```

```

# TABLE_BASED
# Each of the above labels should match a corresponding
# implementation in the routingAlgorithms source code directory
routing_algorithm: XY
routing_table_filename: ""

# Routing specific parameters
# dyad_threshold: double
dyad_threshold: 0.6

# Selection Strategies:
# RANDOM
# BUFFER_LEVEL
# NOP
# Each of the above labels should match a corresponding
# implementation in the selectionStrategies source code directory
selection_strategy: RANDOM

#
# WIRELESS CONFIGURATION
#
Hubs:
  defaults:
    # channels from which Hub can receive/transmit
    rx_radio_channels: [0]
    tx_radio_channels: [0]
    # list of node tiles attached to the hub
    attached_nodes: [0]
    # size of buffers connecting the hub to tiles
    to_tile_buffer_size: 8
    from_tile_buffer_size: 8
    # size of antenna tx/rx
    rx_buffer_size: 8
    tx_buffer_size: 8

# for each hub, the same parameters specified above can be customized
# If not specified, the above default values will be used
# What is usually needed to be customized specifically for each hub is
# the set of nodes that are connected to it. In this simple topology
# we have 4 hubs (0-3) connected to the four nodes of the 2x2
# sub-meshes

0:
  attached_nodes: [0,1,4,5]

1:
  attached_nodes: [2,3,6,7]

2:
  attached_nodes: [8,9,12,13]

3:

```

attached_nodes: [10,11,14,15]

Transmission channels configuration
each channel modelizes the transmission over a given frequency that
can be used by a set of communicating hubs

RadioChannels:

defaults:

data rate in Gb/s affect the number of cycles required for a
flit transmission

data_rate: 64

bit error rate (CURRENTLY UNSUPPORTED)

ber: [0, 0]

mac policies:

who has the token releas only when a complete packet has
been sent

#[TOKEN_PACKET]

who has the token, release only after a fixed number of
cycles, even no transmission is occurring

#[TOKEN_HOLD, num_hold_cycles]

who has the token, holds the packet until needed for
transmissions, until a max number of cycles is reached

#[TOKEN_MAX_HOLD, max_hold_cycles]

mac_policy: [TOKEN_PACKET]

SIMULATION PARAMETERS

#

clock_period_ps: 1000

duration of reset signal assertion, expressed in cycles

reset_time: 1000

overall simulation lenght, expressed in cycles

simulation_time: 10000

collect stats after a given number of cycles

stats_warm_up_time: 1000

power breakdown, nodes communication details

detailed: false

stop after a given amount of load has been processed

max_volume_to_be_drained: 0

show_buffer_stats: false

Winoc

enable wireless, when false, all wireless channel configuration is

ignored

use_winoc: false

experimental power saving strategy

use_wirxsleep: false

Verbosity level:

VERBOSE_OFF

```

# VERBOSE_LOW
# VERBOSE_MEDIUM
# VERBOSE_HIGH
verbose_mode: VERBOSE_OFF

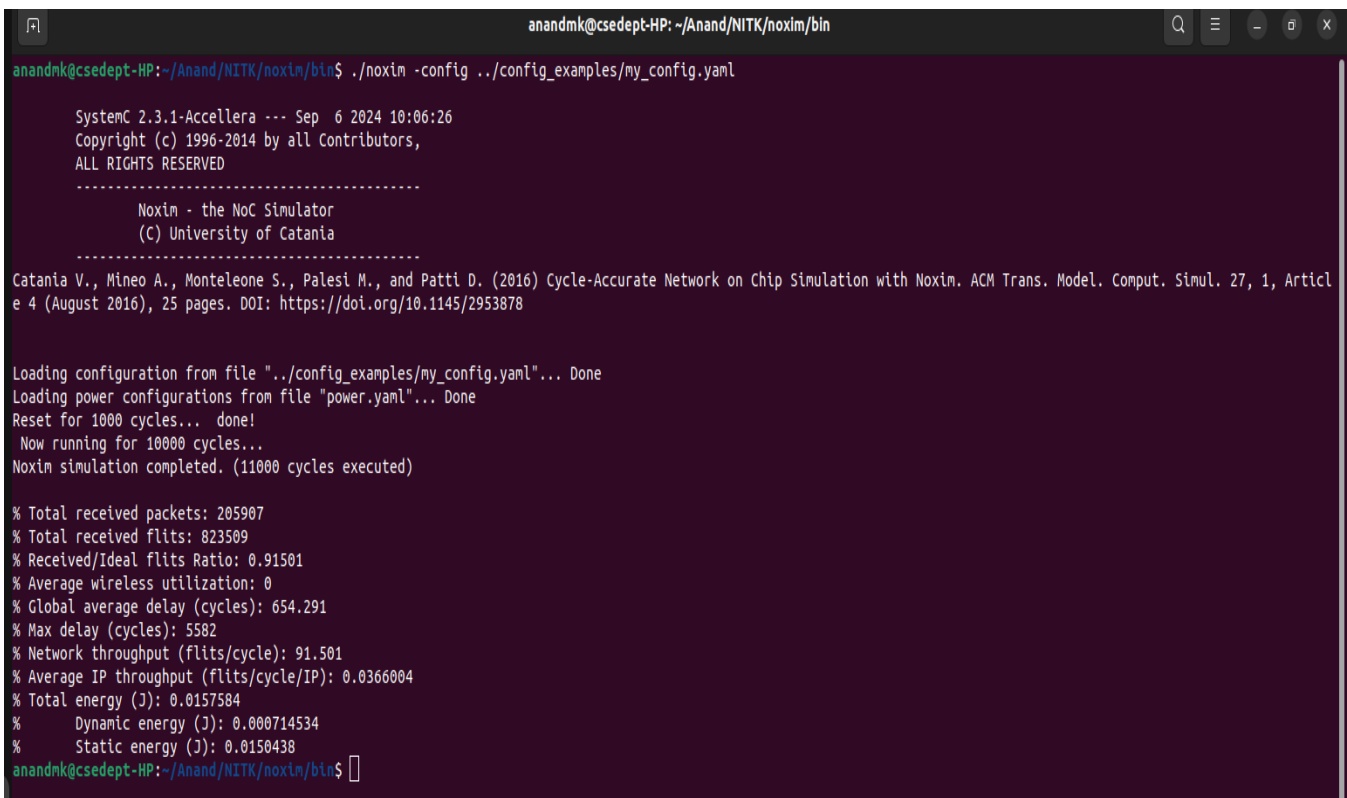
# Trace
trace_mode: false
trace_filename: ""

min_packet_size: 4
max_packet_size: 4
packet_injection_rate: 0.01
probability_of_retransmission: 0.01

# Traffic distribution:
# TRAFFIC_RANDOM
# TRAFFIC_TRANSPOSE1
# TRAFFIC_TRANSPOSE2
# TRAFFIC_HOTSPOT
# TRAFFIC_TABLE_BASED
# TRAFFIC_BIT_REVERSAL
# TRAFFIC_SHUFFLE
# TRAFFIC_BUTTERFLY
traffic_distribution: TRAFFIC_RANDOM
# when traffic table based is specified, use the following
# configuration file
traffic_table_filename: "t.txt"

```

Output :



```

anandmk@csedept-HP: ~/Anand/NITK/noxim/bin
anandmk@csedept-HP:~/Anand/NITK/noxim/bin$ ./noxim -config ../config_examples/my_config.yaml

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Loading configuration from file "../config_examples/my_config.yaml"... Done
Loading power configurations from file "power.yaml"... Done
Reset for 1000 cycles... done!
Now running for 10000 cycles...
Noxim simulation completed. (11000 cycles executed)

% Total received packets: 205907
% Total received flits: 823509
% Received/Ideal flits Ratio: 0.91501
% Average wireless utilization: 0
% Global average delay (cycles): 654.291
% Max delay (cycles): 5582
% Network throughput (flits/cycle): 91.501
% Average IP throughput (flits/cycle/IP): 0.0366004
% Total energy (J): 0.0157584
%   Dynamic energy (J): 0.000714534
%   Static energy (J): 0.0150438
anandmk@csedept-HP:~/Anand/NITK/noxim/bin$

```


% Total received packets: 205907
% Total received flits: 823509
% Received/Ideal flits Ratio: 0.91501
% Average wireless utilization: 0
% Global average delay (cycles): 654.291
% Max delay (cycles): 5582
% Network throughput (flits/cycle): 91.501
% Average IP throughput (flits/cycle/IP): 0.0366004
% Total energy (J): 0.0157584
% Dynamic energy (J): 0.000714534
% Static energy (J): 0.0150438