USER MANUAL NIRGAM 3.0

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20-Jun-2011

3D-NoC

A 3D-NoC is nothing but the stack of 2D-NoC in such a way that each stack are again connected to its front and rear stack. Figure-1 shows the corresponding 4x4x4 3D-Mesh topology constituted of four 4x4 2D-Mesh NoCs stacked to the rear.

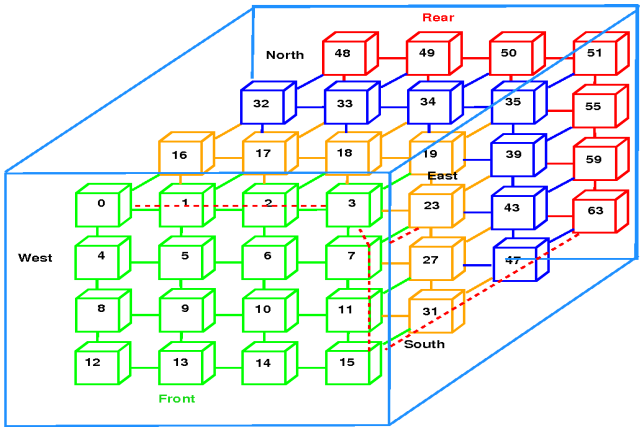

Figure 1. Showing 4x4x4 3D-Mesh NoC

Following is the structure of tiles used in 3D-NoC

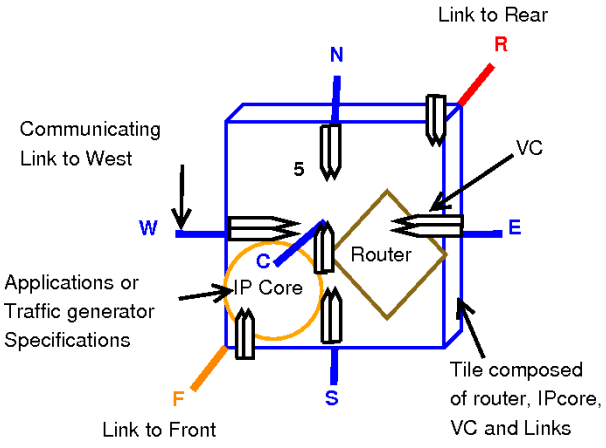

Figure-2 shows a general tile of 3D-Mesh with 7 links (North, South, East, West, Front, Rear and Core).

In the design of 3D-Mesh topology, a general tile (shown in Figure-2) is comprised of a IP core, router, 7 links towards North, South East West Front Rear and the IP core.

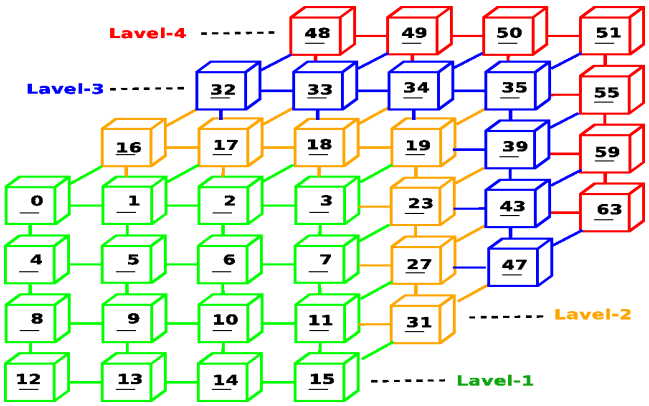

Figure-3 shows the level wise stacking arrangement of 3D-Mesh.

One 2D-Mesh is referred as a Slice, and each slice are arranged back to back in leveled stacking fashion to constitute a 3D-Mesh topology as shown in Fiure-3. A tile in 3D-Mesh for any intermediate slice is connected to its 4 neighbor tiles like in 2D-Mesh and 2 neighbor tiles one in front slice and another in rear slice, 1 link is communicating the IP core.

Next section of this manual will discuss the applications in 3D-Mesh NoC and parameters to run.

APPLICATIONS IN 3D-NoC

3D-Mesh NoC is equipped with following traffic patterns and routing techniques in nirgam-3.0.

Traffic patterns that can run with 3D-NoC are:

1. CBR
2. Bursty
3. Multimedia

Two basic Routing techniques implemented are:

1. XYZ routing
2. ZXY routing
3. XYZR Routing

The basic applications

1. App_send
2. App_concat

RUNNING 3D-Mesh NoC

Parameters for nirgam.conf

To run 3D-mesh the following parameters need to be set in nirgam.conf except which others are same as that of 2D-Mesh.

Parameters in nirgam.conf

```
TOPOLOGY  MESH3D
NUM_ROWS  4
NUM_COLS  4
NUM_SLICE 4
LOG  4
RT_ALGO  XYZ
WARMUP  5
DIRNAME  3D-XYZ-CBR
SIM_NUM  1000
TG_NUM  300
```

The TOPOLOGY name is MESH3D for 3D-Mesh NoC. And simply MESH for 2D-Mesh NoC.

A sample config folder given in examples.

The topology size for 3D can be specified as following example.

(NUM_ROWS, NUM_COLS and NUM_SLICE)

for 16 tiles (4, 2, and 2) respectively

for 64 tiles (4, 4, and 4) respectively

for 126 tiles (8, 8, and 4) respectively

Parameters for tile-n

Similar to the 2D-Mesh, Destination tiles can be specified FIXED n or RANDOM as per the requirement. Other parameters are also same as 2D-Mesh NoC.

RESULTS:

All the results like throughput, latency and power consumption are produced in respective sum_results and power_sim_results files.

A new graph is plotted in results/../graph folder showing Link usage in packet transmission.

Plotting of other graphs are under construction.

LIMITATIONS:

1. The maximum number of 256 tiles are tested for both 3D and 2D Mesh NoC in a system with 4GB RAM, a system with higher configuration may cope with more number of tiles.
2. TORUS topology is not implemented for 3D-NoC.
3. This design of 3D-Mesh is not compatible for NED traffic pattern, which we can extend further.
4. Other than XYZ and ZXY routing, other routing techniques (that are inherited from nirgam 2.1) are compatible only for 2D-Mesh NoC.

EXTENSION IN 2D

Several techniques are implemented for 2D Mesh are:

1. NED traffic pattern.
2. DyAD routing.
3. PROM routing.

Example of these routing are given example folder.

SPIDERGON TOPOLOGY IN 2D

Spidergon topology is a low cost, scalable, regular, high performance topology. Spidergon topology is implemented in Nirgam 2.1(last updated in Nov-2010).

Spidergon topology is compatible with SG-routing.