



## **EE533 Spring 2026**

### **Lab 4 Report**

#### **NetFPGA Bitfile Generation and Using NetFPGA**

**Group: 14**

**Group member: Zixuan Gong 8529287764**

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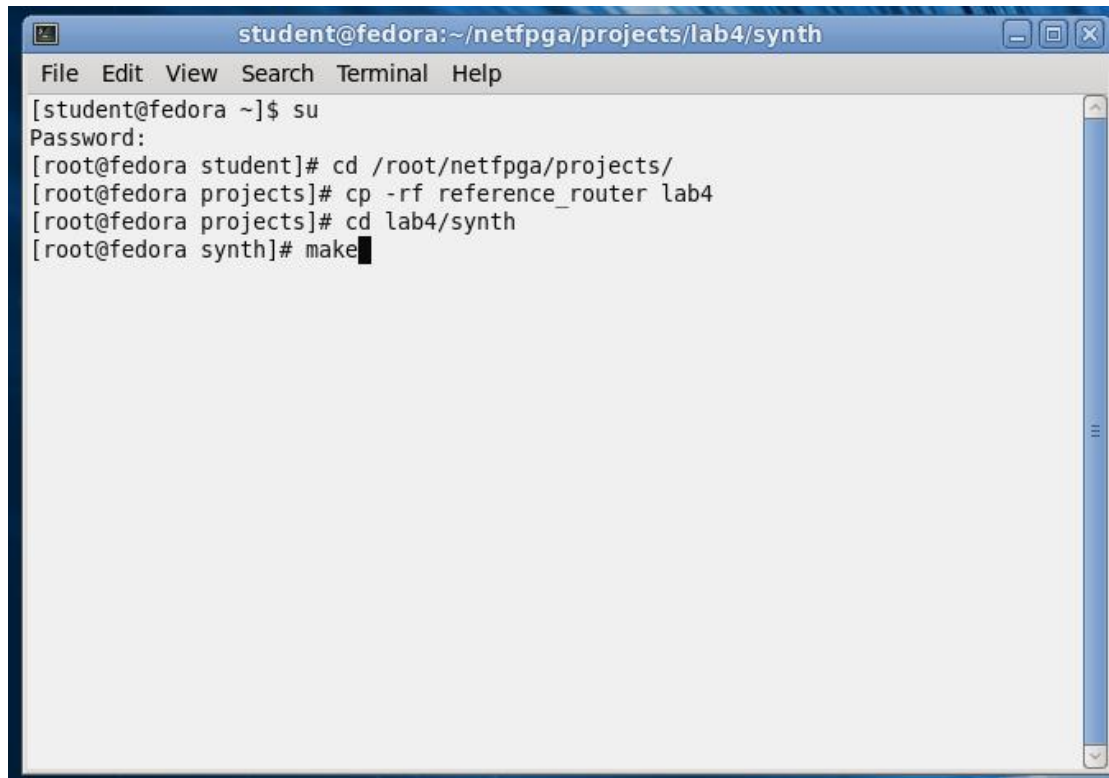
**Zhongqi Zhao 7864803206**

## Github Link:

<https://github.com/yuhanlia1/EE533-lab4-team13.git>

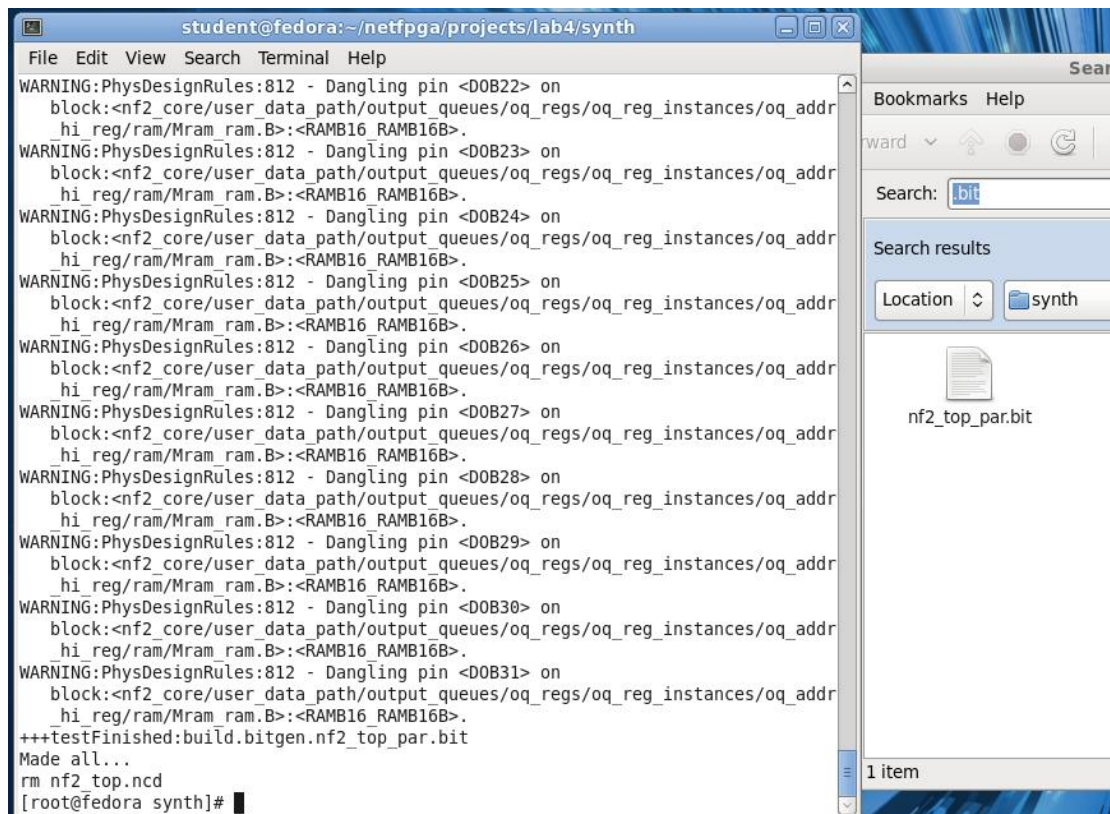
(All files from our group members were organized and uploaded by Yuhan. )

## Part 1: Download and Set up NetFPGA Tool Virtual Machine

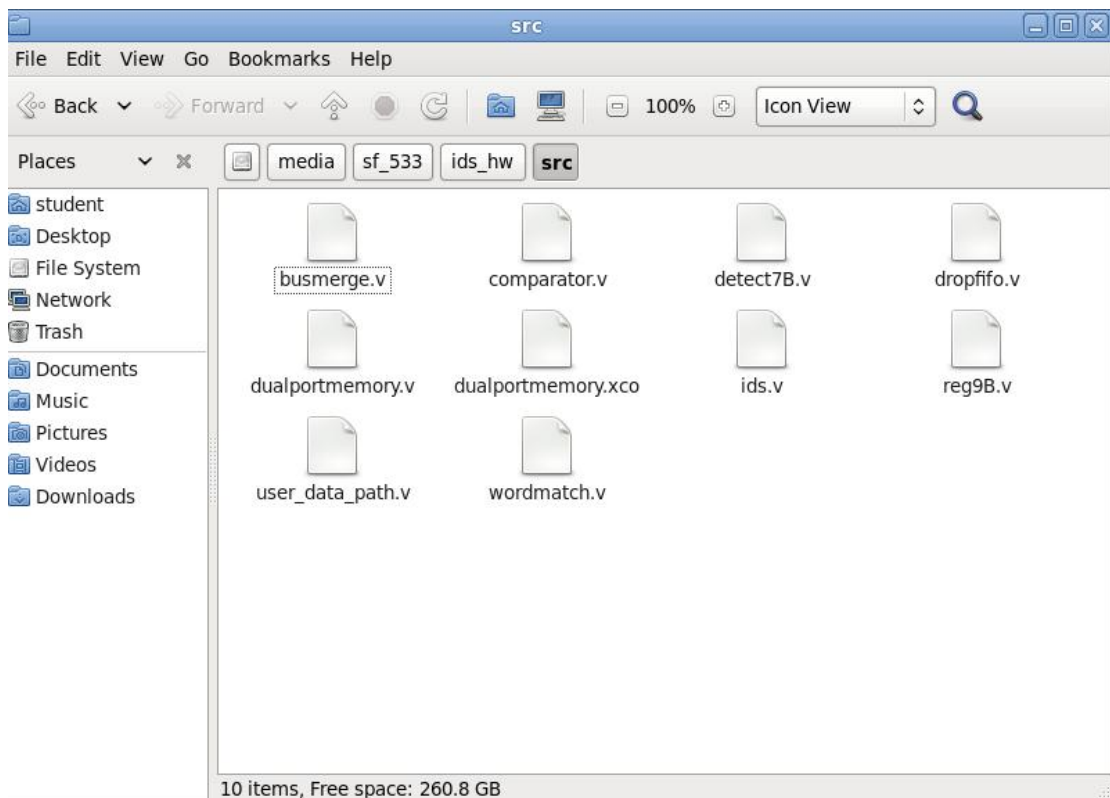
A screenshot of a terminal window titled 'student@fedora:~/netfpga/projects/lab4/synth'. The window has a menu bar with 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The terminal shows the following commands and output:

```
[student@fedora ~]$ su
Password:
[root@fedora student]# cd /root/netfpga/projects/
[root@fedora projects]# cp -rf reference_router lab4
[root@fedora projects]# cd lab4/synth
[root@fedora synth]# make
```

After 'make', we got the bitfile of refence\_router.



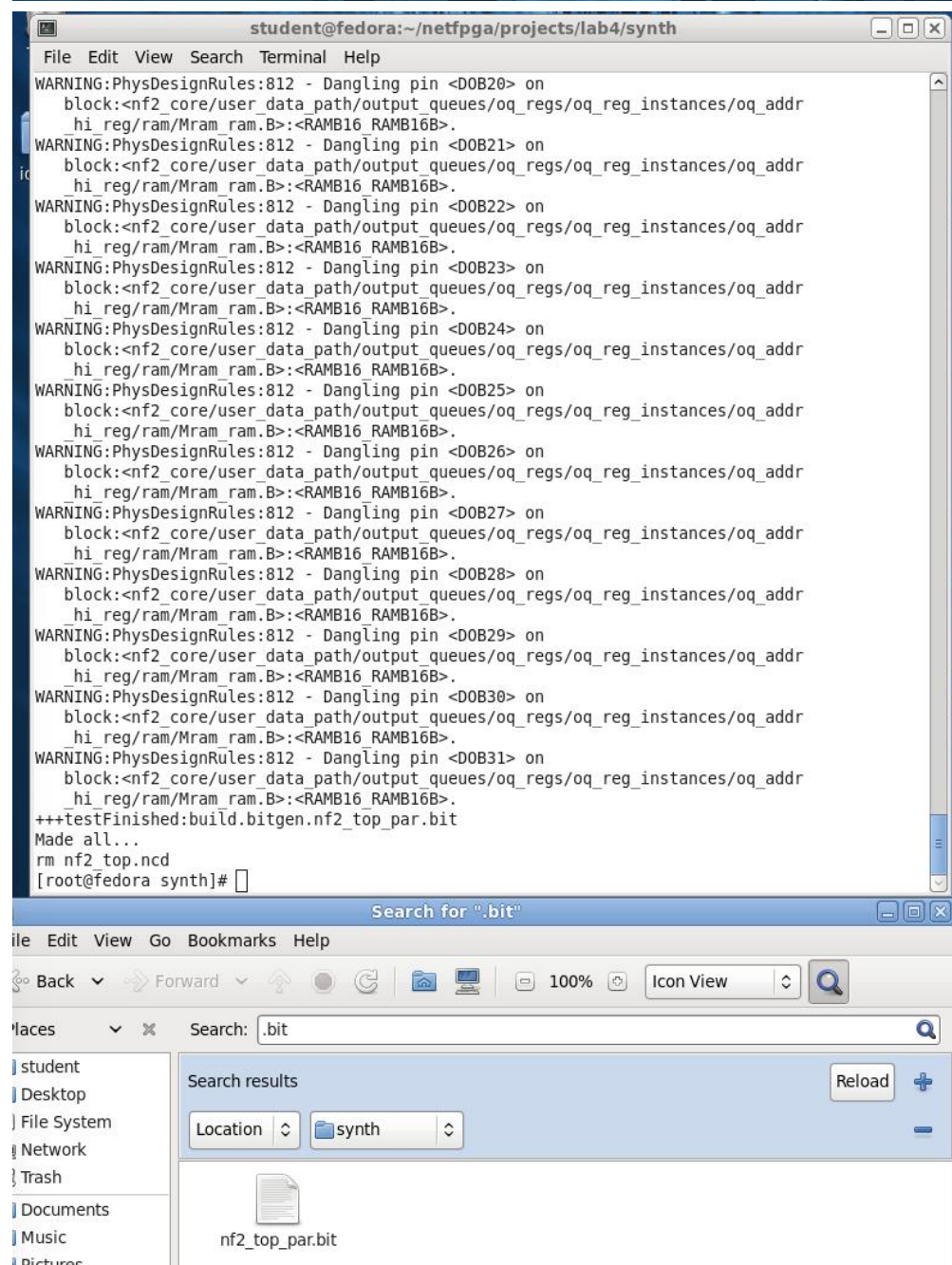
## Part 2: Compile and generate a design bitfile for NetFPGA



We solved errors by editing 'project.xml & ids.xml' and copying netlist 'dualmemory.ngc' to synth. Finally get the bitstream of Router with IDS (show the

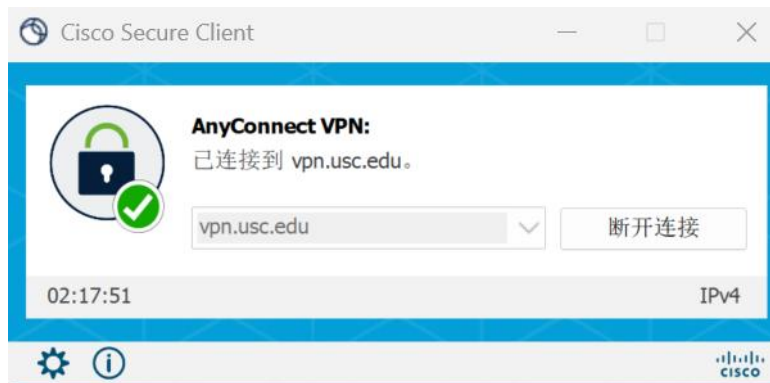
details code in the part 7)

```
Processing /root/netfpga/lib/verilog/core/io/mdu10/xml/mdu10.xml...
WARNING: No module specific XML found for module 'core/cpci_bus'
Processing /root/netfpga/lib/verilog/core/dma/xml/dma.xml...
WARNING: No module specific XML found for module 'core/user_data_path/udp_reg_ma
ster'
WARNING: No module specific XML found for module 'core/io_queues/add_rm_hdr'
Processing /root/netfpga/lib/verilog/core/strip_headers/keep_length/xml/strip_he
aders.xml...
Processing /root/netfpga/lib/verilog/core/utils/xml/device_id_reg.xml...
WARNING: No module specific XML found for module 'core/utils/generic_regs'
Processing /root/netfpga/projects/lab4/include/ids.xml...
Definition for module 'nf2_mac_grp' not loaded at /root/netfpga/bin/nf_register_
gen.pl line 59
make: *** [registers] Error 255
[root@fedora synth]#
```





## Part3: Set Up VPN to USC



## Part 4: NetFPGA Environment

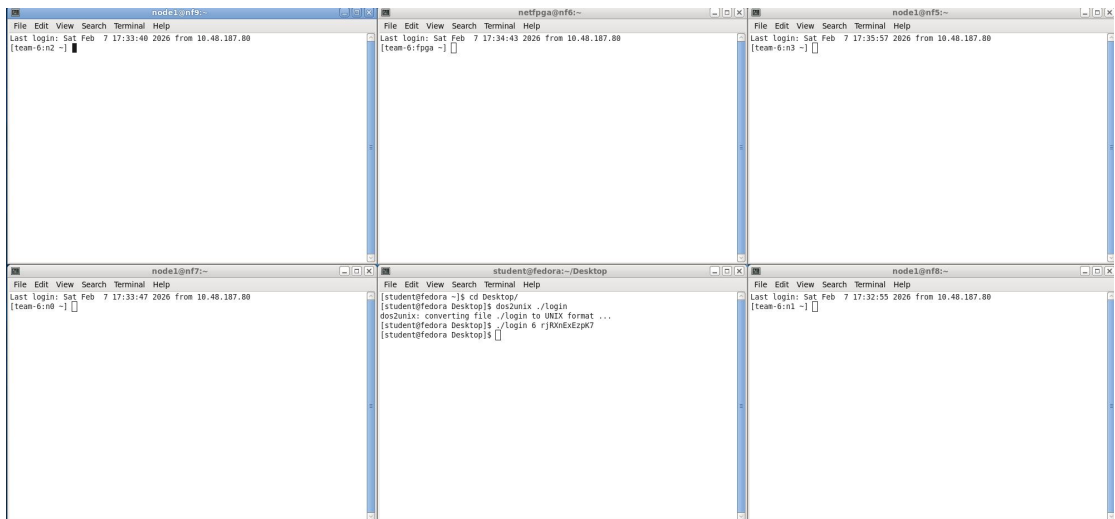
Connect by manual:

```
netfpga@nf6:~  
File Edit View Search Terminal Help  
[student@fedora ~]$ ssh netfpga@nf6.usc.edu  
Warning: Permanently added 'nf6.usc.edu,10.136.201.3' (RSA) to the list of known  
hosts.  
netfpga@nf6.usc.edu's password:  
Last login: Sat Feb 7 16:35:44 2026 from 10.48.187.65  
[team-6:fpga ~]  
  
[team-6:fpga ~] echo $n0  
10.0.4.3  
[team-6:fpga ~] ping $n0  
PING 10.0.4.3 (10.0.4.3) 56(84) bytes of data.  
64 bytes from 10.0.4.3: icmp_seq=1 ttl=64 time=2.02 ms  
64 bytes from 10.0.4.3: icmp_seq=2 ttl=64 time=0.416 ms  
64 bytes from 10.0.4.3: icmp_seq=3 ttl=64 time=0.622 ms  
64 bytes from 10.0.4.3: icmp_seq=4 ttl=64 time=0.571 ms  
64 bytes from 10.0.4.3: icmp_seq=5 ttl=64 time=0.429 ms  
  
--- 10.0.4.3 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4001ms  
rtt min/avg/max/mdev = 0.416/0.812/2.025/0.612 ms  
[team-6:fpga ~]
```

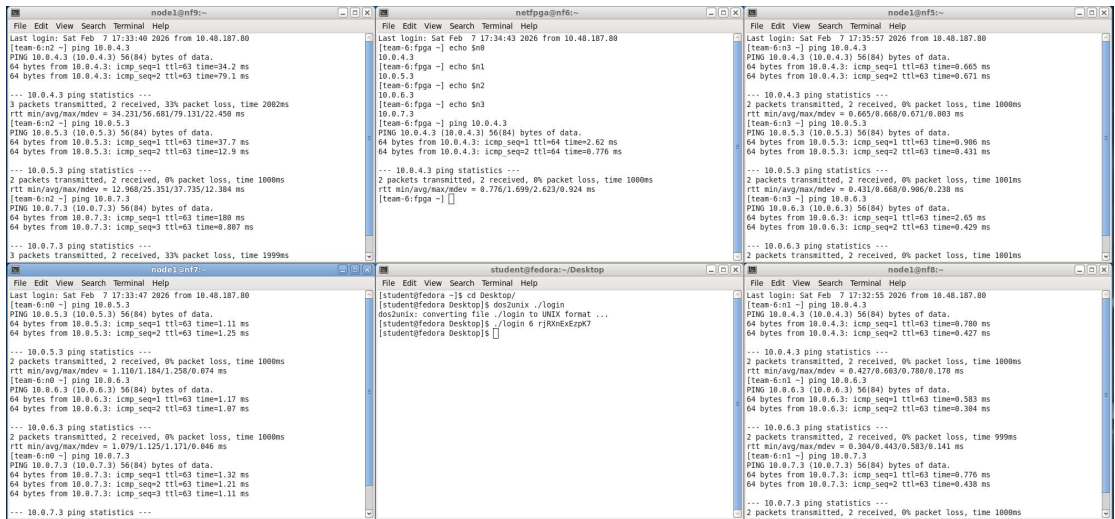
Then we use a script to open all the nodes.

```
login (~/.Desktop) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
login x
#!/bin/bash
if [ "$#" -le 1 ];then
    echo "$0 <TEAM #> <PASSWD>"
    exit 0
fi
ND=$(( $1 % 5))
LL=$(( $1 + 1))
CM=$LL"q;d"
PW=$2
CL=$(( (($1 / 5)) * 5))
M0=$(( $ND + $CL))
M1=$(( (($ND + 1) % 5) + $CL))
M2=$(( (($ND + 2) % 5) + $CL))
M3=$(( (($ND + 3) % 5) + $CL))
M4=$(( (($ND + 4) % 5) + $CL))

gnome-terminal -- bash -c "sshpass -p $PW ssh -o StrictHostKeyChecking=no
netfpga@nf$M0.usc.edu" &
gnome-terminal -- bash -c "sshpass -p $PW ssh -o StrictHostKeyChecking=no node
$ND@nf$M1.usc.edu" &
gnome-terminal -- bash -c "sshpass -p $PW ssh -o StrictHostKeyChecking=no node
$ND@nf$M2.usc.edu" &
gnome-terminal -- bash -c "sshpass -p $PW ssh -o StrictHostKeyChecking=no node
$ND@nf$M3.usc.edu" &
gnome-terminal -- bash -c "sshpass -p $PW ssh -o StrictHostKeyChecking=no node
$ND@nf$M4.usc.edu" &
```



## For Connectivity Test:



## Part5: (All scripts and logs are submitted on Github)

### NiC TCP

Server: n0	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n1	16.3	12.3	0%
n2	8.52	6.80	0%
n3	24.2	22.0	0%

Server: n1	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	13.0	9.13	0%
n2	29.2	25.5	0%
n3	14.5	13.3	0%

Server: n2	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
------------	-------------------------	-------------------------	------------------

n0	11.0	4.88	0%
n1	10.5	6.22	0%
n3	7.72	7.32	0%

Server: n3	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	18.9	14.1	0%
n1	6.88	5.44	0%
n2	11.1	9.83	0%

## NIC UDP

Server: n0	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n1	259	31.7	66%
n2	137000	23.5	32%
n3	239	22.6	89%

Server: n1	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	247	8.9	96%
n2	246	14.6	94%
n3	238	10.3	95%

Server: n2	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	247	6.48	97%
n1	259	7.32	97%
n3	257	6.71	98%

Server: n3	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	247	11.2	95%
n1	191	18.0	91%
n2	248	13.6	95%

## Part 6:

(All scripts and logs are submitted on Github)

### rkd

```
[team-6:fpga ~] rkd &
[2] 29815
[team-6:fpga ~] killall rkd
[1]- Terminated          rkd
[2]+ Terminated          rkd
```



## Router TCP

Server: n0	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n1	255	183	0%
n2	357	352	0%
n3	166	165	0%

Server: n1	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	474	474	0%
n2	334	332	0%
n3	264	259	0%

Server: n2	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	307	307	0%
n1	78.5	78.3	0%
n3	290	135	0%

Server: n3	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	37.7	37.7	0%
n1	319	318	0%
n2	122	122	0%

## Router UDP

Server: n0	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n1	254	1.91	65%
n2	244	16.1	89%
n3	17400	28.1	90%

Server: n1	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	246	97.4	60%
n2	243	42.7	82%
n3	245	124	49%

Server: n2	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	247	15	94%
n1	259	19.9	92%
n3	247	9.69	96%

Server: n3	Client bandwidth (Mb/s)	Server bandwidth (Mb/s)	Packet loss rate
n0	247	15.5	94%
n1	259	19.0	93%

## Experiment Configuration (UDP)

In this experiment, iperf is used in UDP mode to evaluate the forwarding performance of the NetFPGA. An iperf server running in UDP mode is launched on each node to receive traffic from other nodes. According to the experiment requirements, the packet size used by the iperf clients is fixed at 512 bytes. Using small packets significantly increases the packet processing rate, which places greater stress on the NetFPGA data path and forwarding logic.

For traffic generation, each NetFPGA port is configured to carry approximately 1 Gbps of traffic, with simultaneous traffic in both directions. Each iperf test runs for at least 30 seconds to ensure stable and reliable measurements. The same test is repeated multiple times, and the final performance results are obtained by averaging the measurements across all runs.

## Part 7: Initial Attempt in Synthesizing and Testing Your Design

(All scripts are submitted on Github)

In Part 7, we completed both the passthrough version of the IDS and the normal version of the IDS. We also implemented an IDS with logic analysis. This figure shows the programming screenshot for the passthrough version of the IDS.

```
[team-6:fpga ~] cd bitfiles/
[team-6:fpga bitfiles] ls
ids.bit          IDS_Router.bit  nf2_top_par.bit  reference_router.bit
ids_passthru_yuhan.bit  ids_yuhan.bit  reference_nic.bit
[team-6:fpga bitfiles] nf_download ids_passthru_yuhan.bit
Found net device: nf2c0
Bit file built from: nf2_top_par.ncd;HW_TIMEOUT=FALSE
Part: 2vp50ff1152
Date: 2026/ 2/ 7
Time: 18:35:15
Error Registers: 0
Good, after resetting programming interface the FIFO is empty
Download completed - 2377668 bytes. (expected 2377668).
DONE went high - chip has been successfully programmed.
CPCI Information
-----
Version: 4 (rev 1)

Device (Virtex) Information
-----
Project directory: lab4
Project name: IDS
Project description: IDS Router

Device ID: 102
Version: 0.1.0
Built against CPCI version: 4 (rev 1)
```

This figure shows the programming screenshot for the normal version of the IDS.

```
[team-6:fpga ~] cd bitfiles/
[team-6:fpga ~] ls
bin bitfiles idsreg zhp_idsreg
[team-6:fpga ~] nf_download bitfiles/ids_yuhan.bit
Found net device: nf2c0
Bit file built from: nf2_top_par.ncd;HW_TIMEOUT=FALSE
Part: 2vp50ff1152
Date: 2026/ 2/ 7
Time: 21:29:58
Error Registers: 0
Good, after resetting programming interface the FIFO is empty
Download completed - 2377668 bytes. (expected 2377668).
DONE went high - chip has been successfully programmed.
CPCI Information
-----
Version: 4 (rev 1)

Device (Virtex) Information
-----
Project directory: lab4
Project name: IDS
Project description: IDS Router

Device ID: 102
Version: 0.1.0
Built against CPCI version: 4 (rev 1)

Virtex design compiled against active CPCI version
[team-6:fpga ~] cd bitfiles/
```

From this figure, we can see that the IDS software registers can correctly store the target pattern and the related data.

```
[team-6:fpga ~] idsreg reset
Found net device: nf2c0
Found net device: nf2c0
[team-6:fpga ~] idsreg pattern ABCDEFGH
Setting pattern hi=0x7f414243, lo=0x44454647
Found net device: nf2c0
Found net device: nf2c0
[team-6:fpga ~] idsreg allregs
Found net device: nf2c0
MATCHES:      0x00000000
Found net device: nf2c0
PATTERN_HI: 0x7f414243
Found net device: nf2c0
PATTERN_LO: 0x44454647
Found net device: nf2c0
COMMAND:      0x00000000
[team-6:fpga ~]
```

The passthrough IDS can successfully forward packets.

```
[team-6:fpga bitfiles] nf_download ids_passthr_yuhan.bit
Found net device: nf2c0
Bit file built from: nf2_top_par.ncd;HW_TIMEOUT=FALSE
Part: 2vp50ff1152
Date: 2026/ 2/ 7
Time: 18:35:15
Error Registers: 0
Good, after resetting programming interface the FIFO is empty
Download completed - 2377668 bytes. (expected 2377668).
DONE went high - chip has been successfully programmed.
CPCI Information
-----
Version: 4 (rev 1)

Device (Virtex) Information
-----
Project directory: lab4
Project name: IDS
Project description: IDS Router

Device ID: 102
Version: 0.1.0
Built against CPCI version: 4 (rev 1)

Virtex design compiled against active CPCI version
[team-6:fpga bitfiles] cd ..
[team-6:fpga ~] rkd &
[1] 1391
[team-6:fpga ~] █
```

```
node1@nf8:~
Last login: Sat Feb  7 22:32:53 2026 from 10.21.32.129
[team-6:n1 ~] 10.0.4.3
-bash: 10.0.4.3: command not found
[team-6:n1 ~] ping 10.0.4.3
PING 10.0.4.3 (10.0.4.3) 56(84) bytes of data.

--- 10.0.4.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 1999ms

[team-6:n1 ~] ping 10.0.4.3
PING 10.0.4.3 (10.0.4.3) 56(84) bytes of data.
64 bytes from 10.0.4.3: icmp_seq=1 ttl=63 time=3.00 ms
64 bytes from 10.0.4.3: icmp_seq=2 ttl=63 time=0.372 ms
64 bytes from 10.0.4.3: icmp_seq=3 ttl=63 time=0.341 ms
64 bytes from 10.0.4.3: icmp_seq=4 ttl=63 time=0.395 ms
64 bytes from 10.0.4.3: icmp_seq=5 ttl=63 time=0.372 ms

--- 10.0.4.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 3998ms
rtt min/avg/max/mdev = 0.341/0.897/3.009/1.056 ms
[team-6:n1 ~] █
```

The same normal IDS module can also perform forwarding functions.

```
node1@nf7:~$ PING 10.0.5.3 (10.0.5.3) 56(84) bytes of data.
--- 10.0.5.3 ping statistics ---
6 packets transmitted, 0 received, 100% packet loss, time 5002ms

[team-6:n0 ~] iperf -s -p 6100
Server listening on TCP port 6100
TCP window size: 128 KByte (default)

[team-6:n0 ~] ping 10.0.5.3
PING 10.0.5.3 (10.0.5.3) 56(84) bytes of data.
64 bytes from 10.0.5.3: icmp_seq=1 ttl=63 time=3.02 ms
64 bytes from 10.0.5.3: icmp_seq=2 ttl=63 time=0.981 ms
64 bytes from 10.0.5.3: icmp_seq=3 ttl=63 time=0.858 ms
64 bytes from 10.0.5.3: icmp_seq=4 ttl=63 time=0.534 ms
64 bytes from 10.0.5.3: icmp_seq=5 ttl=63 time=1.19 ms
64 bytes from 10.0.5.3: icmp_seq=6 ttl=63 time=0.985 ms
64 bytes from 10.0.5.3: icmp_seq=7 ttl=63 time=1.03 ms

--- 10.0.5.3 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6008ms
rtt min/avg/max/ndev = 0.534/1.231/3.029/0.758 ms
[team-6:n0 ~]

Last login: Sat Feb 7 23:26:25 2026 from 10.48.187.41
[team-6:n2 ~]

node1@nf8:~$ Last login: Sat Feb 7 23:25:41 2026 from 10.48.187.41
[team-6:n1 ~]

netfpga@nf6:~$ [team-6:fpga bitfiles] nf_download nf2_top_par.bit
Found net device: nf2c0
Bit file built from: nf2_top_par.ncd;HW_TIMEOUT=FALSE
Part: 2vp50ff1152
Date: 2026/ 2/ 7
Time: 21:16:37
Error Registers: 0
Good, after resetting programming interface the FIFO is empty
Download completed - 2377668 bytes. (expected 2377668).
DONE went high - chip has been successfully programmed.
CPCI Information
-----
Version: 4 (rev 1)

Device (Virtex) Information
-----
Project directory: lab4
Project name: IDS
Project description: IDS Router

Device ID: 102
Version: 0.1.0
Built against CPCI version: 4 (rev 1)
```

Similarly, we observed an increase in the matches register, indicating that TCP format forwarding is also possible, even with a corrupted packet.

```
node1@nf7:~$ PING 10.0.5.3 (10.0.5.3) 56(84) bytes of data.
64 bytes from 10.0.5.3: icmp_seq=1 ttl=63 time=3.02 ms
64 bytes from 10.0.5.3: icmp_seq=2 ttl=63 time=0.981 ms
64 bytes from 10.0.5.3: icmp_seq=3 ttl=63 time=0.858 ms
64 bytes from 10.0.5.3: icmp_seq=4 ttl=63 time=0.534 ms
64 bytes from 10.0.5.3: icmp_seq=5 ttl=63 time=1.19 ms
64 bytes from 10.0.5.3: icmp_seq=6 ttl=63 time=0.985 ms
64 bytes from 10.0.5.3: icmp_seq=7 ttl=63 time=1.03 ms

--- 10.0.5.3 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6008ms
rtt min/avg/max/ndev = 0.534/1.231/3.029/0.758 ms
[team-6:n0 ~] iperf -s -p 5100
Server listening on TCP port 5100
TCP window size: 128 KByte (default)

[ 4] local 10.0.4.3 port 5100 connected with 10.0.5.3 port 53706
[ ID] Interval      Transfer      Bandwidth
[ 4] 0.0- 0.0 sec    128 KBytes    82.0 Mbits/sec
[ 5] local 10.0.4.3 port 5100 connected with 10.0.6.3 port 52010
[ 5] 0.0- 0.0 sec    128 KBytes    104 Mbits/sec
[ 4] local 10.0.4.3 port 5100 connected with 10.0.7.3 port 57539

Last login: Sat Feb 7 23:26:25 2026 from 10.48.187.41
[team-6:n2 ~] iperf -c 10.0.4.3 -p 5100 -F good_packet.txt
Client connecting to 10.0.4.3, TCP port 5100
TCP window size: 16.0 KByte (default)

[ 4] local 10.0.6.3 port 52010 connected with 10.0.4.3 port 5100
[ ID] Interval      Transfer      Bandwidth
[ 4] 0.0- 0.0 sec    128 KBytes    153 Mbits/sec
[team-6:n2 ~]

node1@nf8:~$ Last login: Sat Feb 7 23:25:41 2026 from 10.48.187.41
[team-6:n1 ~] iperf -c 10.0.4.3 -p 5100 -F good_packet.txt
Client connecting to 10.0.4.3, TCP port 5100
TCP window size: 16.0 KByte (default)

[ 4] local 10.0.5.3 port 53706 connected with 10.0.4.3 port 5100
[ ID] Interval      Transfer      Bandwidth
[ 4] 0.0- 0.0 sec    128 KBytes    74.9 Mbits/sec
[team-6:n1 ~]

netfpga@nf6:~$ [team-6:fpga ~] idsreg2 matches
Found net device: nf2c0
MATCHES = 0x0000000a
[team-6:fpga ~]

node1@nf5:~$ Last login: Sat Feb 7 23:28:44 2026 from 10.48.187.41
[team-6:n3 ~] iperf -c 10.0.4.3 -p 5100 -F bad_packet.txt
Client connecting to 10.0.4.3, TCP port 5100
TCP window size: 16.0 KByte (default)

[ 4] local 10.0.7.3 port 57539 connected with 10.0.4.3 port 5100
```

The following are the results for UDP.

```
node1@nf7:~  
team-6:n0 ~] iperf -s -p 5100  
-----  
Server listening on TCP port 5100  
TCP window size: 128 KByte (default)  
-----  
[ 4] local 10.0.4.3 port 5100 connected with 10.0.5.3 port 53706  
[ ID] Interval      Transfer    Bandwidth  
[ 4] 0.0- 0.0 sec   128 KBytes  82.0 Mbits/sec  
[ 5] local 10.0.4.3 port 5100 connected with 10.0.6.3 port 52010  
[ 5] 0.0- 0.0 sec   128 KBytes  104 Mbits/sec  
[ 4] local 10.0.4.3 port 5100 connected with 10.0.7.3 port 57539  
Waiting for server threads to complete. Interrupt again to force quit.  
team-6:n0 ~] iperf -s -u -p 5100  
-----  
Server listening on UDP port 5100  
Receiving 1470 byte datagrams  
UDP buffer size: 2.00 MByte (default)  
-----  
[ 3] local 10.0.4.3 port 5100 connected with 10.0.5.3 port 35857  
[ ID] Interval      Transfer    Bandwidth      Jitter    Lost/Total Datagrams  
[ 3] 0.0- 0.0 sec   1.44 KBytes  1.21 Mbits/sec  0.000 ms  0/ 1 (0%)  
[ 4] local 10.0.4.3 port 5100 connected with 10.0.6.3 port 58906  
[ 4] 0.0- 0.0 sec   1.44 KBytes  1.08 Mbits/sec  0.000 ms  0/ 1 (0%)  
-----  
node1@nf8:~  
Last login: Sat Feb 7 23:25:41 2026 from 10.48.187.41  
[team-6:n1 ~] iperf -c 10.0.4.3 -p 5100 -F good_packet.txt  
-----  
Client connecting to 10.0.4.3, TCP port 5100  
TCP window size: 16.0 KByte (default)  
-----  
[ 4] local 10.0.5.3 port 53706 connected with 10.0.4.3 port 5100  
[ ID] Interval      Transfer    Bandwidth  
[ 4] 0.0- 0.0 sec   128 KBytes  74.9 Mbits/sec  
[team-6:n1 ~] iperf -u -c 10.0.4.3 -p 5100 -F good_packet.txt  
-----  
Client connecting to 10.0.4.3, UDP port 5100  
Sending 1470 byte datagrams  
UDP buffer size: 2.00 MByte (default)  
-----  
[ 4] local 10.0.5.3 port 35857 connected with 10.0.4.3 port 5100  
[ ID] Interval      Transfer    Bandwidth  
[ 4] 0.0- 0.0 sec   1.44 KBytes  973 Kbits/sec  
[ 4] Sent 1 datagrams  
[ 4] Server Report:  
[ 4] 0.0- 0.0 sec   1.44 KBytes  1.21 Mbits/sec  0.000 ms  0/ 1 (0%)  
[team-6:n1 ~]   
-----  
node1@nf9:~  
Last login: Sat Feb 7 23:26:25 2026 from 10.48.187.41  
team-6:n2 ~] iperf -c 10.0.4.3 -p 5100 -F good_packet.txt  
-----  
Client connecting to 10.0.4.3, TCP port 5100  
TCP window size: 16.0 KByte (default)  
-----  
[ 4] local 10.0.6.3 port 52010 connected with 10.0.4.3 port 5100  
[ ID] Interval      Transfer    Bandwidth  
[ 4] 0.0- 0.0 sec   128 KBytes  153 Mbits/sec  
team-6:n2 ~] iperf -u -c 10.0.4.3 -p 5100 -F good_packet.txt  
-----  
Client connecting to 10.0.4.3, UDP port 5100  
Sending 1470 byte datagrams  
UDP buffer size: 2.00 MByte (default)  
-----  
[ 4] local 10.0.6.3 port 58906 connected with 10.0.4.3 port 5100  
[ ID] Interval      Transfer    Bandwidth  
[ 4] 0.0- 0.0 sec   1.44 KBytes  917 Kbits/sec  
[ 4] Sent 1 datagrams  
[ 4] Server Report:  
[ 4] 0.0- 0.0 sec   1.44 KBytes  1.08 Mbits/sec  0.000 ms  0/ 1 (0%)  
-----  
net...  
[team-6:fpga ~] ldsreg2 matches 23:28:44 2026 from 10.48.187.41  
Found net device: nf2c0 10.0.4.3 -p 5100 -F bad_packet.txt  
MATCHES = 0x00000016  
[team-6:fpga ~]   
-----  
Client connecting to 10.0.4.3, TCP port 5100  
TCP window size: 16.0 KByte (default)  
-----  
[ 4] local 10.0.7.3 port 57539 connected with 10.0.4.3 port 5100  
[team-6:n3 ~] iperf -u -c 10.0.4.3 -p 5100 -F bad_packet.txt  
-----  
Client connecting to 10.0.4.3, UDP port 5100  
Sending 1470 byte datagrams  
UDP buffer size: 2.00 MByte (default)  
-----  
[ 4] local 10.0.7.3 port 42404 connected with 10.0.4.3 port 5100  
[ ID] Interval      Transfer    Bandwidth  
[ 4] 0.0- 0.0 sec   1.44 KBytes  969 Kbits/sec  
[ 4] Sent 1 datagrams  
[ 4] WARNING: dtd not receive ack of last datagram after 10 tries.  
[team-6:n3 ~]   
-----
```