

TOE1G-IP Demo on SP605 Instruction

Rev1.1 8-May-19

This document describes the instruction to run TOE1G-IP for transferring data between SP605 development board and PC through Gigabit Ethernet. This demo can select to run with supported and not supported Jumbo frame PC.

1 Environment Setup

As shown in Figure 1-1, to run TOE1G-IP send demo, please prepare

- 1) SP605 Development board
- 2) Xilinx programmer software (iMPACT/Vivado)
- 3) Ethernet cable (Cat5e or Cat6) for network connection between SP605 Development board and PC
- 4) PC with Gigabit Ethernet support
- 5) mini USB cable for programming FPGA between SP605 Development board and PC
- 6) “send_tcp_client.exe” and “rcv_tcp_client.exe”, provided by Design Gateway, which are test application available on PC

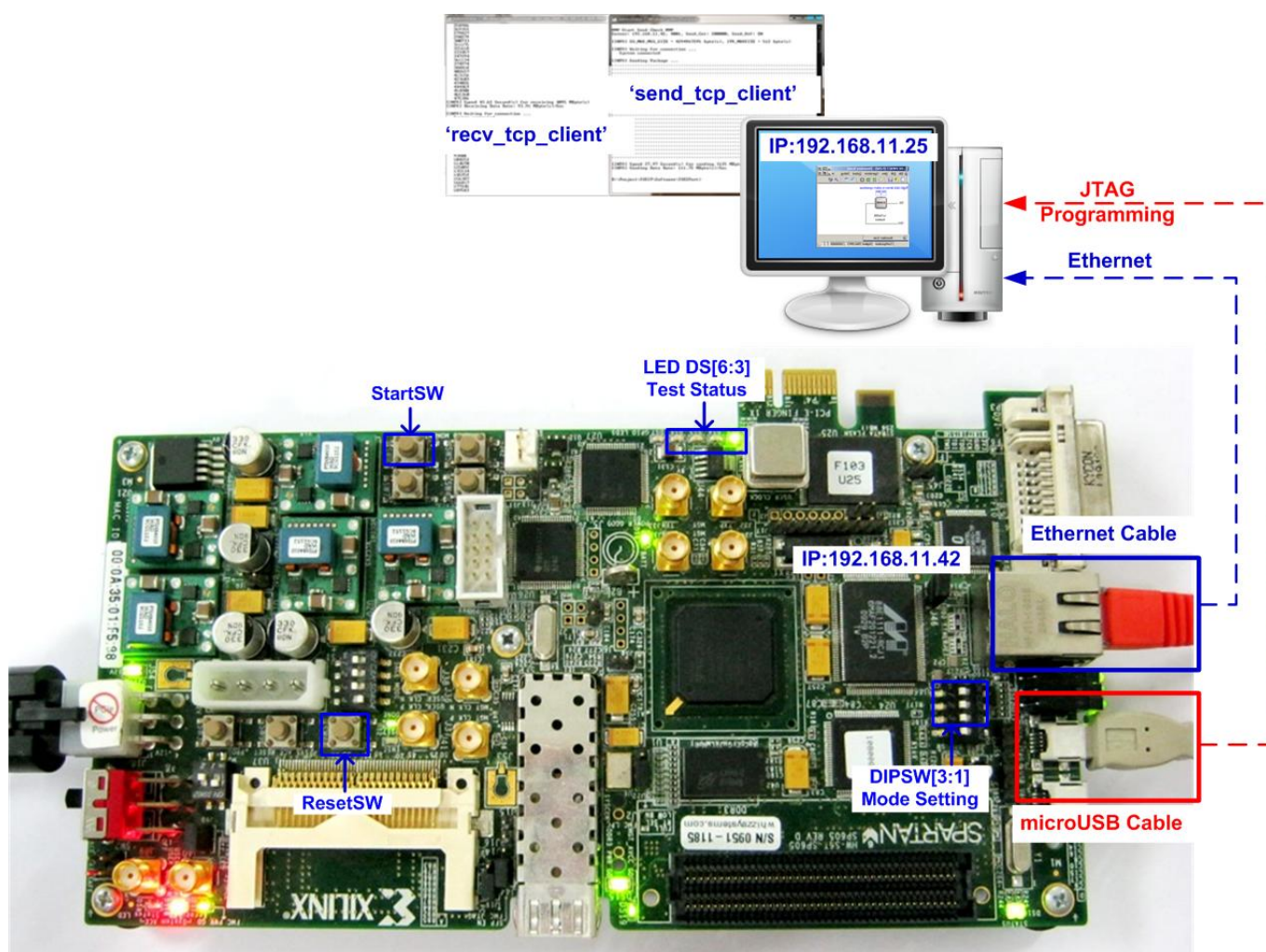


Figure 1-1 TOE1G-IP Demo Environment Setup

2 Demo description

There are two test modes, i.e. sending mode and receiving mode between SP605 development board (Server mode) and PC (Client mode). Each test mode uses the different test application on PC and the different DIPSW setting on SP605 development board. The definition of DIPSW and LED on SP605 development board are described in Table 2-1 and Table 2-2.

Note: DIPSW setting must not change during operation.



Figure 2-1 DIPSW Bit1-3 for user input

DIPSW	OFF	ON
Bit 1	Sending mode by using non-Jumbo frame (1460 bytes)	Sending mode by using Jumbo frame (8960 bytes)
Bit 2	Sending mode	Receiving mode
Bit 3	Receiving mode without data verification	Receiving mode with data verification

Table 2-1 DIPSW Setting Definition



Figure 2-2 LED bit0-3 for user output

LED	ON/BLINK	OFF
DS3	ON: IP initialize complete	Not complete. Please check that StartSW (SW8) has already been pressed. Also, confirm that IP address setting on PC is correct.
DS4	BLINK: Operation timeout or cable lost	Normal operation
DS5	Sending mode in Jumbo frame.	Sending mode in non-jumbo frame.
DS6	BLINK: data verification is failed in receiving mode ON: Port is established.	No operation

Table 2-2 LED Definition

The step to run sending and receiving test are described as follows.

2.1 Sending mode

In this mode, 4 GB data is transferred from SP605 development board to PC. Also, "recv_tcp_client.exe" application is run on PC for data verification. If received data is not correct, the test application will show error message on console.

User can set two packet sizes by DIPSW[1], i.e. 1460 data byte for non-Jumbo frame mode, and 8960 data byte for Jumbo frame mode. User confirms the setting by monitoring from LED DS5 status.

The operation sequence for sending mode is as follows.

- 1) TOE1G-IP within SP605 development board loads the system parameters such as Packet size, transfer size, MAC and IP address. After that, IP waits open connection from PC.
- 2) Test application on PC opens connection to connect with SP605 development board, and then waits data sending from SP605 board.
- 3) TOE1G-IP starts to send 4 GB data to PC. At the same time, PC verifies that the received data is correct.
- 4) After all data are completely transferred, TOE1G-IP sends packet to close connection.
- 5) PC sends the acknowledge packet to close connection.
- 6) The operation goes back to Step2) to rerun the test as forever loop until the user cancels the operation.

2.2 Receiving mode

In this demo, data is transferred from PC to SP605 development board. By using "send_tcp_client.exe" operating on PC, data is sent out from PC until total data count is equal to the set value. The application can be set as two modes, i.e. dummy mode and increment mode. The test mode of application is the input parameter when calling the application.

The dummy mode is run to check the best performance. All zero data are sent out from PC. At the same time, the verification module within SP605 development board is OFF to read data without verification.

The increment mode is run to verify the data. 32-bit increment data is generated from PC and verification module within SP605 is ON. If data verification is error, DS6 LED will blink. DIPSW[3] is applied to enable verification module.

The operation sequence for receiving mode is as follows.

- 1) Similar to Step 1) in Sending mode.
- 2) Test application on PC opens connection to connect with SP605 development board. Next, the application sends the dummy data or increment data depending on the input mode until total data are completely transferred.
- 3) TOE1G-IP receives data with or without verification, depending on DIPSW[3].
- 4) After all data are completely transferred, Test application closes the connection.
- 5) TOE1G-IP sends acknowledgment to close connection. The operation is completed and not run in forever loop like Sending mode.

3 PC Setup

Before running demo, user needs to setup network setting on PC as follows.

3.1 IP Setting

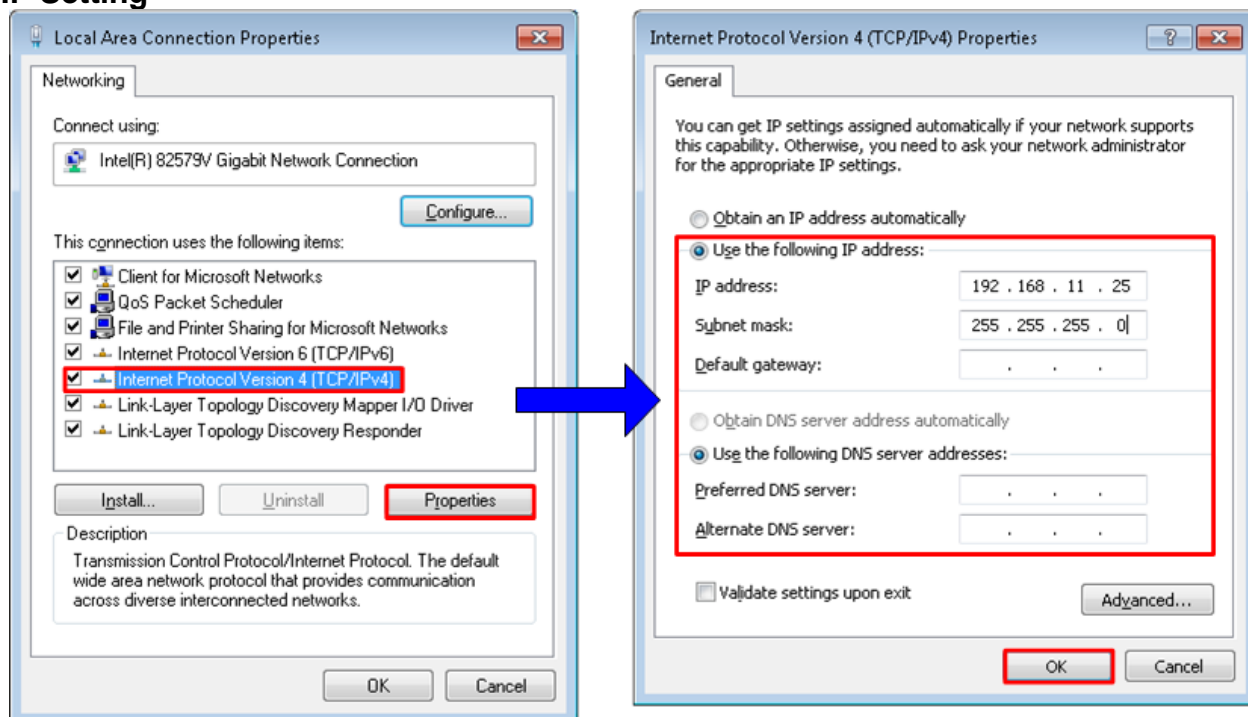


Figure 3-1 IPv4 Setting

- Open Local Area Connection Properties of test connection, as shown in the left window of Figure 3-1.
- Select “TCP/IPv4” and then click Properties.
- Set IP address = 192.168.11.25 and Subnet mask = 255.255.255.0, as shown in the right window of Figure 3-1.

3.2 Speed and Frame Setting

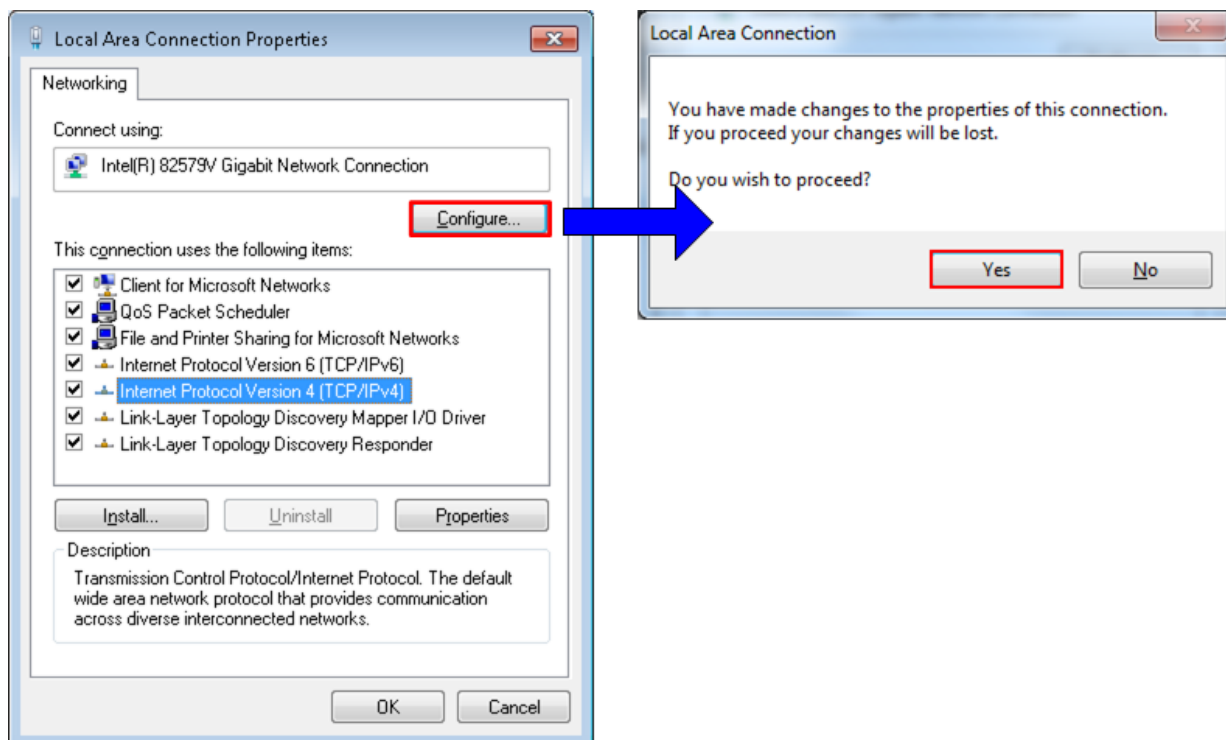


Figure 3-2 Network Configure

- On Local Area Connection Properties window, click “Configure”, as shown in Figure 3-2.
- On Advance tab, Jumbo Packet = 9014 Bytes to enable jumbo frame, as shown in Figure 3-3.

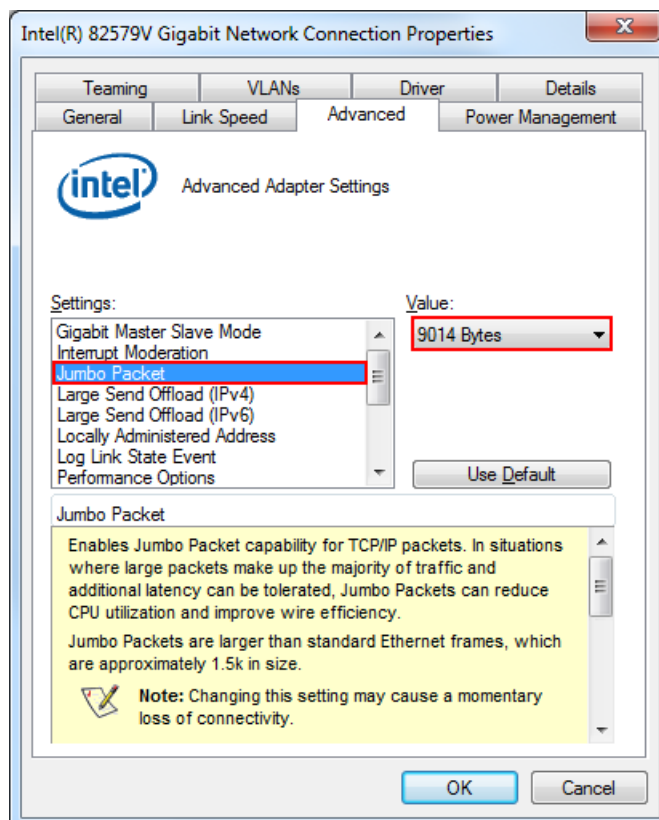


Figure 3-3 Jumbo Frame Setting

- On Link Speed tab, select “1.0 Gbps Full Duplex” for running Gigabit transfer test, as shown in the left window of Figure 3-4.
- On Advance tab, Settings=Interrupt Moderation and Value= “Enabled”, as shown in the right window of Figure 3-4.

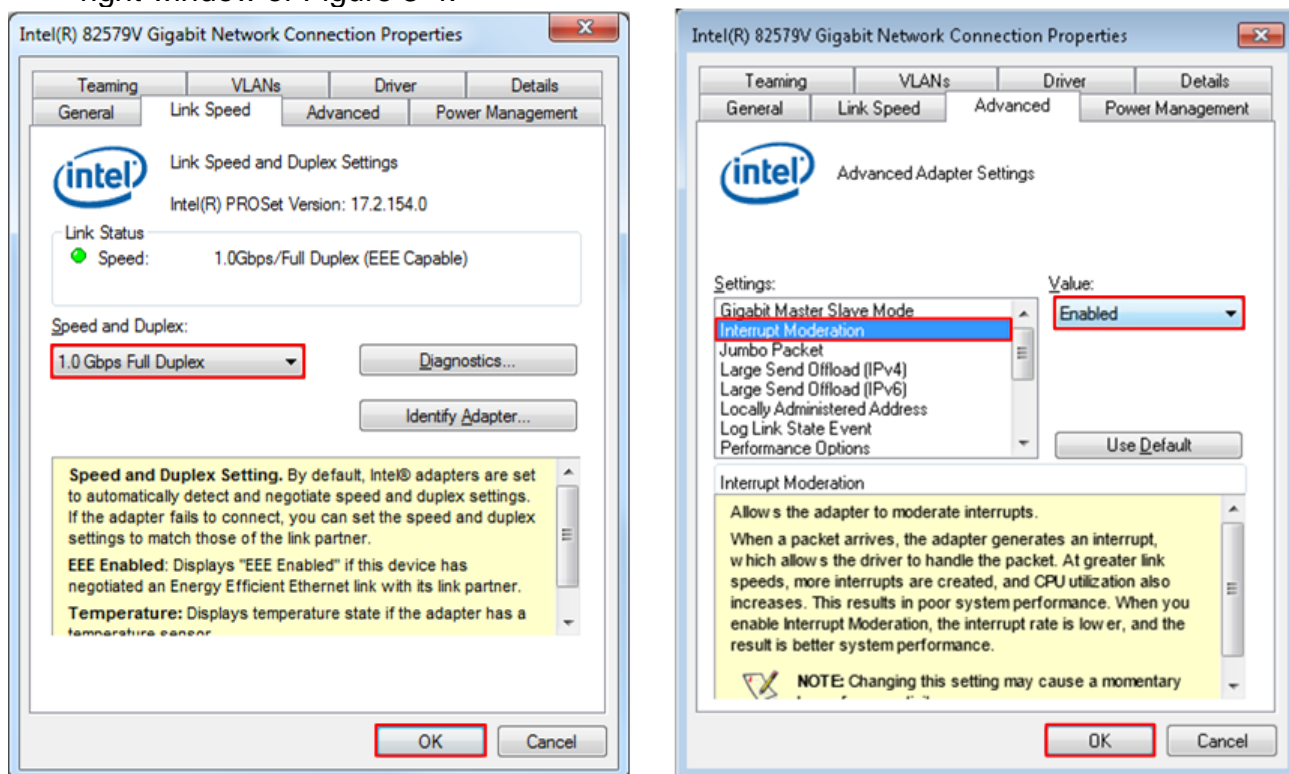


Figure 3-4 Link speed and Jumbo frame setup

- For Intel LAN controller, Performance Options in “Advanced” tab should be set to achieve the good performance as shown in Figure 3-5. “Interrupt Moderation Rate” in “Performance Options” windows is recommended to set as “Off”.

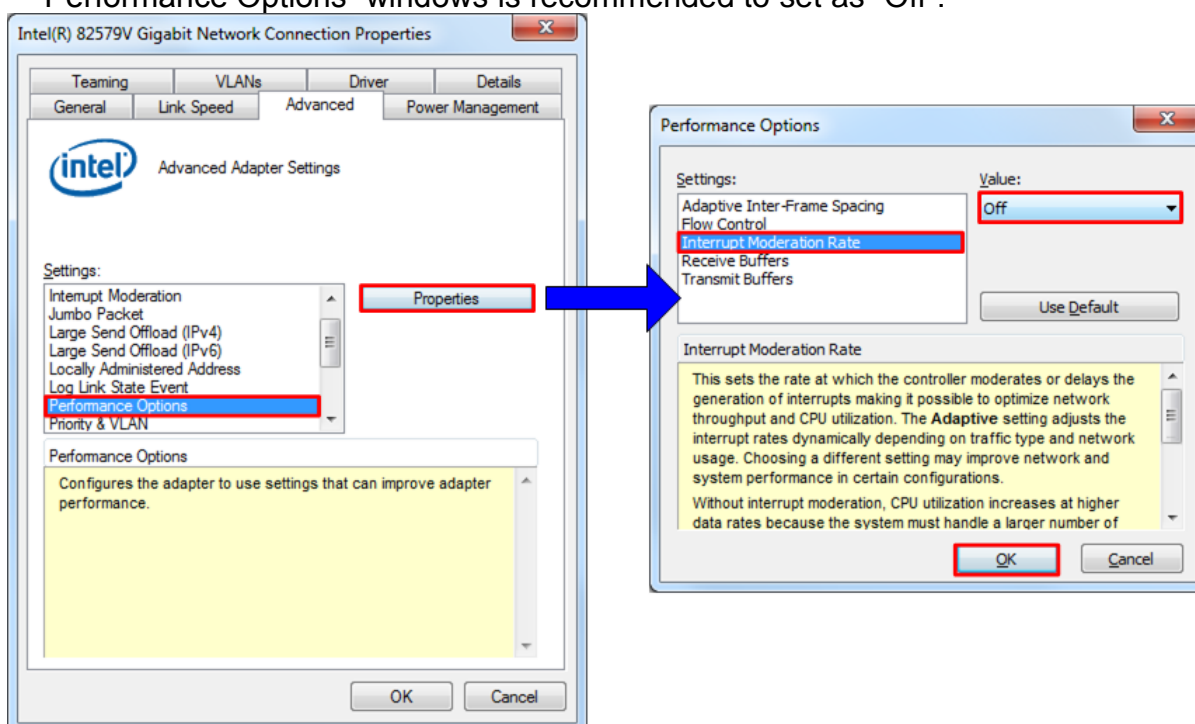


Figure 3-5 Enable Interrupt Moderation

4 How to run demo

The following sequence is recommended to setup the hardware before running the test.

- 1) Power off system
- 2) Connect mini USB cable from SP605 development board to PC.
- 3) Connect power supply to SP605 board.
- 4) Connect Ethernet cable between SP605 development board and PC.
- 5) Set up network setting on PC following Topic 0.
- 6) Power on SP605 development board.
- 7) Open Xilinx programmer (iMPACT) and download “toe1giptest.bit” to SP605 development board, as shown in Figure 4-1.

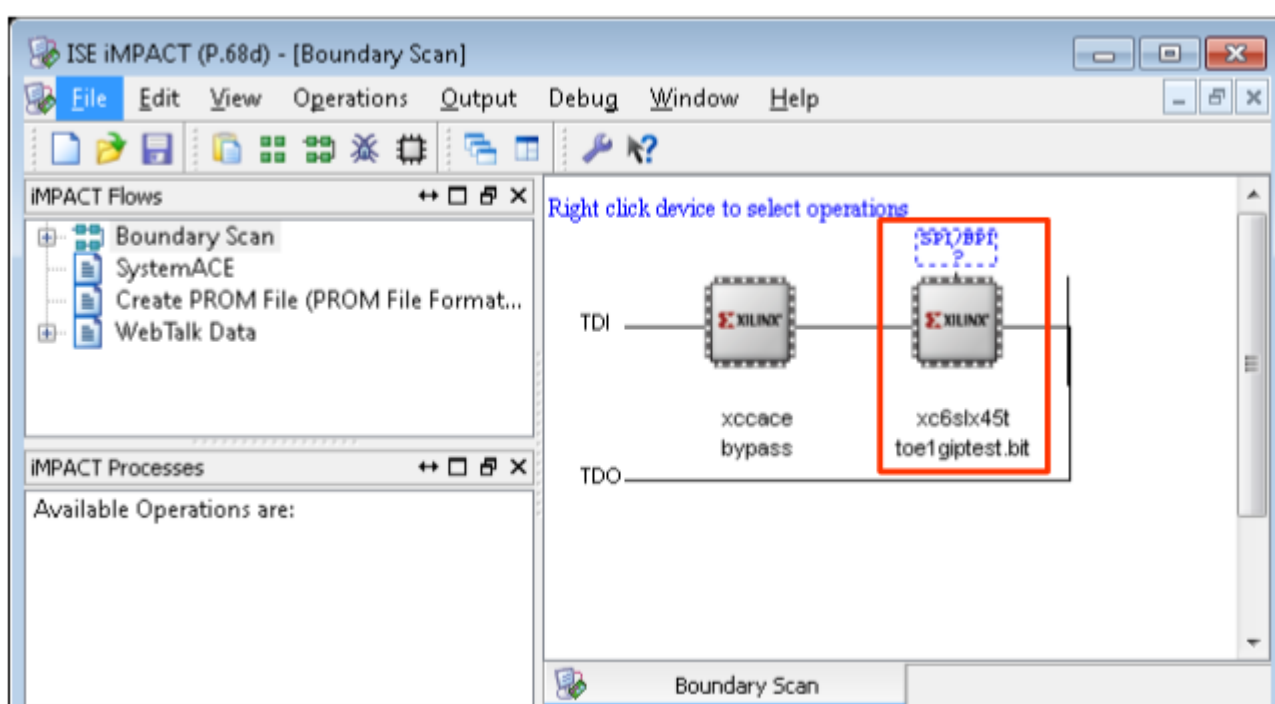


Figure 4-1 Programmer Environment

- 8) Check LED status on SP605 development board now and LED DS[6:3] are all OFF.
- 9) Check link status of PHY at LED 1000 (near RJ45). LED 1000 must be ON to show that 1Gb Ethernet link is ready, as shown in Figure 4-2.



Figure 4-2 Link Status LED from PHY chip

- 10) Press StartSW as shown in Figure 1-1 (SW8) to start the system initialization.
- 11) DS3 LED must turn on while DS5 LED status depends on DIPSW[1] setting.



Figure 4-3 LED Status after press StartSW when DIPSW[1]=OFF



Figure 4-4 LED Status after press StartSW when DIPSW[1]=ON

Now system is ready for the test. The step to test Sending and Receiving data is described in next topic.

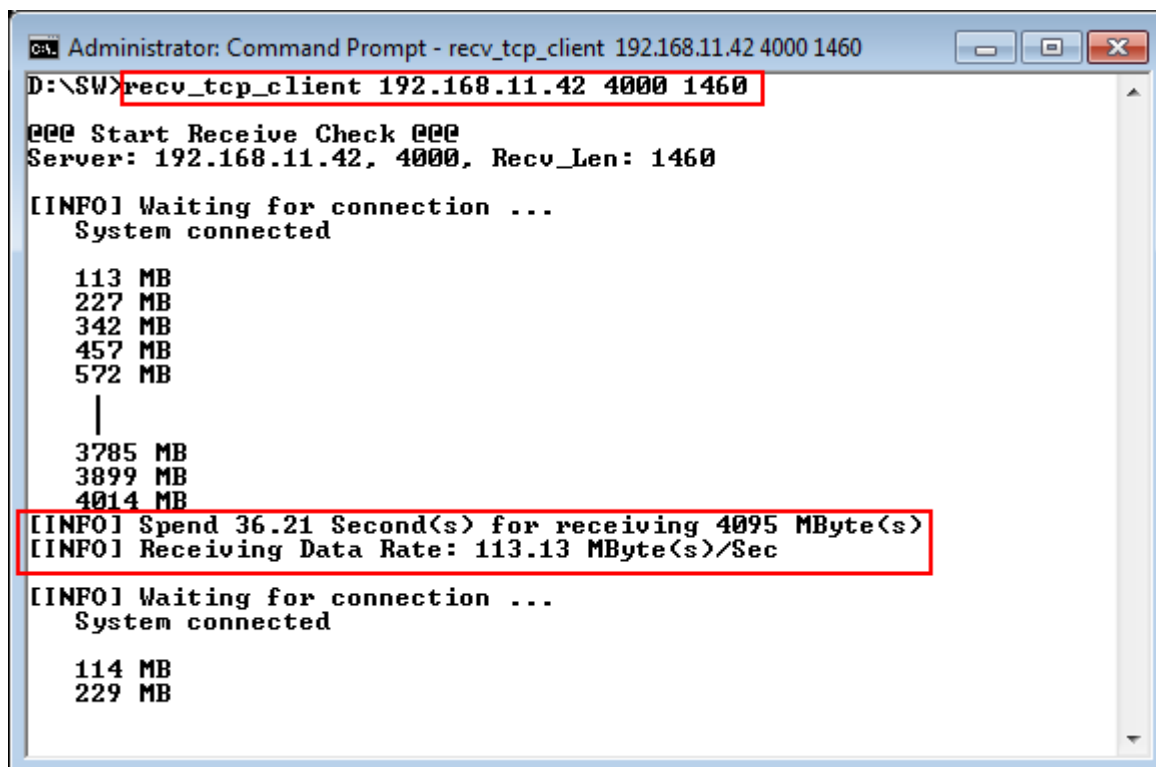
Note: Transfer performance on the demo depends on Test PC performance to send and receive data through Gigabit Ethernet

4.1 Run Sending Demo

Sending demo is operated as forever loop. The user needs to cancel the application to stop the test.

4.1.1 Non-Jumbo frame mode

- Set DIPSW[2] = OFF to run Sending demo.
- Set DIPSW[1] = OFF and confirm that DS5 LED is OFF.
- Open "command prompt" on PC, and run "recv_tcp_client" application by following command
 >> recv_tcp_client <FPGA IP address> <FPGA port number> <number of data in packet>
 For example,
 >> recv_tcp_client 192.168.11.42 4000 1460
Note: The parameters in the demo are fixed. So, IP address, port number, and the numbers of data could not be changed. To update some parameters, it needs to modify HDL code in the reference design.
- During running, Test application displays total received data every second. After finishing each loop, time usage and the performance are displayed, as shown in Figure 4-5.
- User can cancel operation by pressing "Ctrl+C".



```

Administrator: Command Prompt - recv_tcp_client 192.168.11.42 4000 1460
D:\SW>recv_tcp_client 192.168.11.42 4000 1460

### Start Receive Check ###
Server: 192.168.11.42, 4000, Recv_Len: 1460

[INFO] Waiting for connection ...
System connected

113 MB
227 MB
342 MB
457 MB
572 MB
|
3785 MB
3899 MB
4014 MB
[INFO] Spend 36.21 Second(s) for receiving 4095 MByte(s)
[INFO] Receiving Data Rate: 113.13 MByte(s)/Sec

[INFO] Waiting for connection ...
System connected

114 MB
229 MB
  
```

Figure 4-5 Non-Jumbo frame Sending Demo

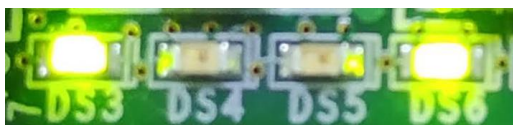
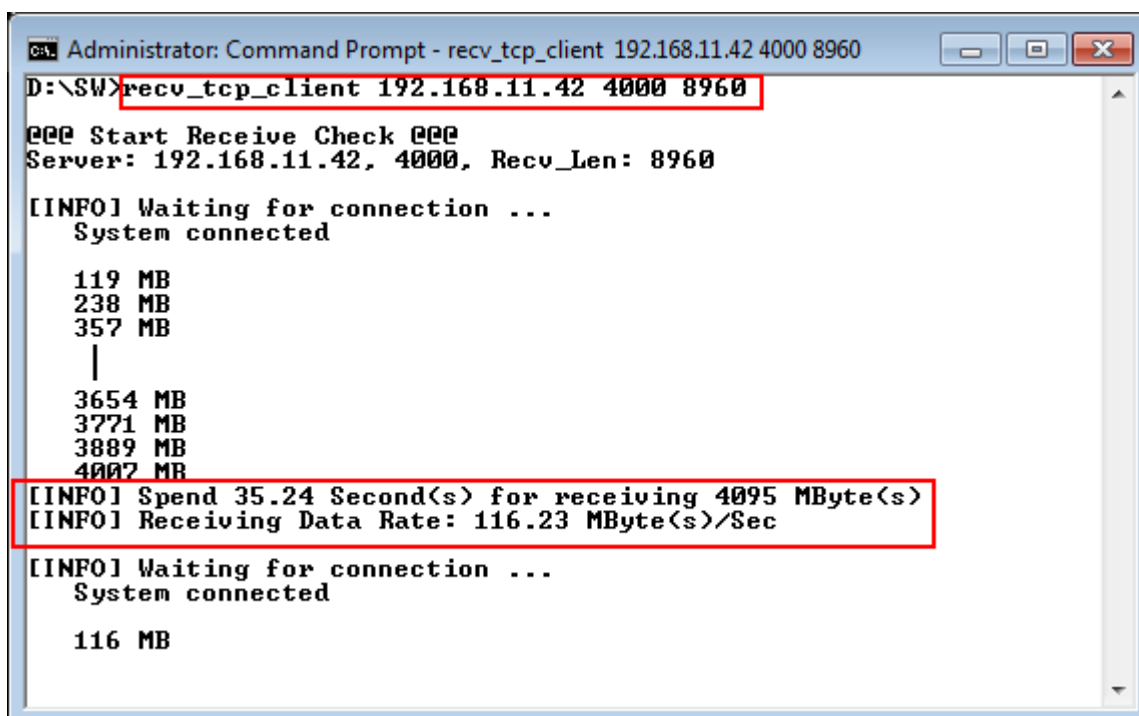


Figure 4-6 LED Status when running Sending Demo with Non-Jumbo frame

4.1.2 Jumbo frame mode

- Set DIPSW[2] = OFF to run Sending demo.
- Set DIPSW[1] = ON and confirm that DS5 LED is ON.
- Open “command prompt” on PC, and run “recv_tcp_client” application by following command
 >> recv_tcp_client 192.168.11.42 4000 8960
Note: The parameters in the demo are fixed. So, IP address, port number, and the numbers of data could not be changed. To update some parameters, it needs to modify HDL code in the reference design.
- The message on the console during running the test is same as non-jumbo frame mode.



```

Administrator: Command Prompt - recv_tcp_client 192.168.11.42 4000 8960
D:\SW>recv_tcp_client 192.168.11.42 4000 8960
Start Receive Check
Server: 192.168.11.42, 4000, Recv_Len: 8960

[INFO] Waiting for connection ...
System connected

119 MB
238 MB
357 MB
|
3654 MB
3771 MB
3889 MB
4007 MB
[INFO] Spend 35.24 Second(s) for receiving 4095 MByte(s)
[INFO] Receiving Data Rate: 116.23 MByte(s)/Sec

[INFO] Waiting for connection ...
System connected

116 MB
  
```

Figure 4-7 Jumbo frame Sending Demo



Figure 4-8 LED Status when running Sending Demo with Jumbo frame

4.2 Run Receiving Demo

4.2.1 Dummy data mode

- Set DIPSW[2] = ON to run Receiving demo.
- Set DIPSW[3] = OFF to disable data verification module in SP605.
- Open “command prompt” on PC, and run “send_tcp_client” application by following command
 - >> send_tcp_client <FPGA IP address> <FPGA port number> <transfer size in 16kbyte unit> <mode>
 - o Similar to Sending demo, IP address and port number cannot change without HDL code modification.
 - o User sets transfer size in 16kByte unit which is the buffer size in test application. For example, 100000 is equal to 1600 Mbyte size. The valid range of transfer size is 1 – 262143.
 - o Mode: ‘0’- All ‘0’ pattern is sent as dummy data.

For example,

```
>> send_tcp_client 192.168.11.42 4000 100000 0
```

- Test application displays “...” during sending the data. Time usage and test performance are displayed as a test result after finishing transferring all data, as shown in Figure 4-10.

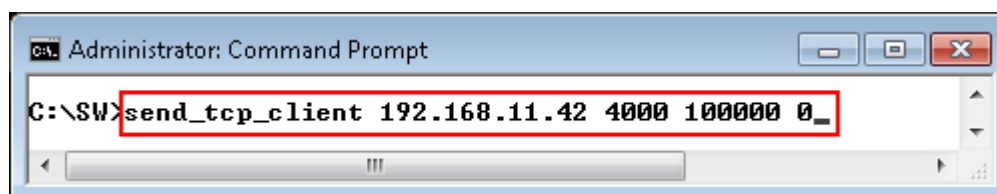


Figure 4-9 Command line for receiving demo on dummy data mode

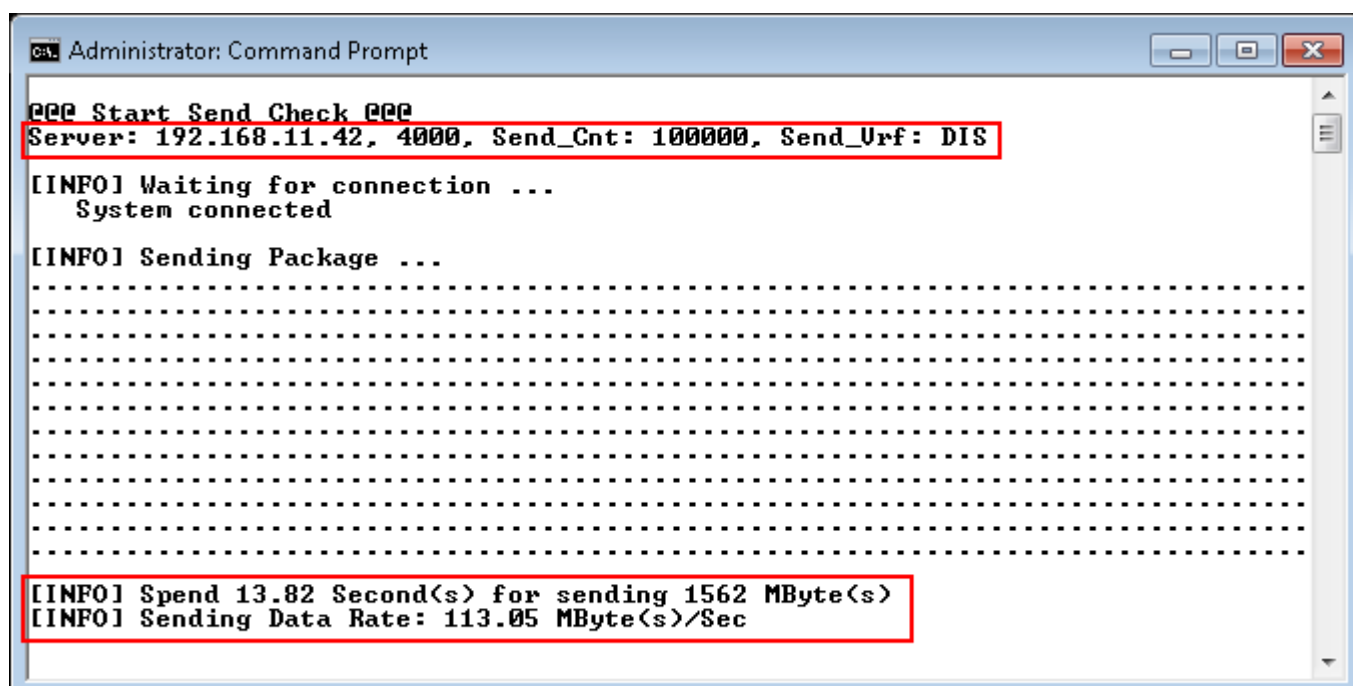


Figure 4-10 Receiving Demo on dummy data mode

4.2.2 Verification mode

- Set DIPSW[2] = ON to run Receiving demo.
- Set DIPSW[3] = ON to enable verification module in SP605.
- Open “command prompt” on PC, and run “send_tcp_client” application by following command
 - >> send_tcp_client <FPGA IP address> <FPGA port number> <transfer size in 16kbyte unit> <mode>
 - o Similar to Sending demo, IP address and port number cannot change without HDL code modification.
 - o User sets transfer size in 16kByte unit which is buffer size in test application. For example, 100000 is equal to 1600 Mbyte size. The valid range of transfer size is 1 – 262143.
 - o Mode: ‘1’- 32-bit increment data is sent to verify data by SP605.

For example,

```
>> send_tcp_client 192.168.11.42 4000 100000 1
```

- Test application displays “...” during sending the data. Time usage and test performance are displayed as a test result after finishing transferring all data, as shown in Figure 4-11.

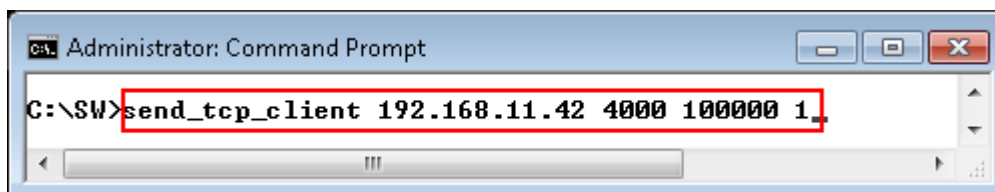


Figure 4-11 Command line for receiving demo on increment data mode

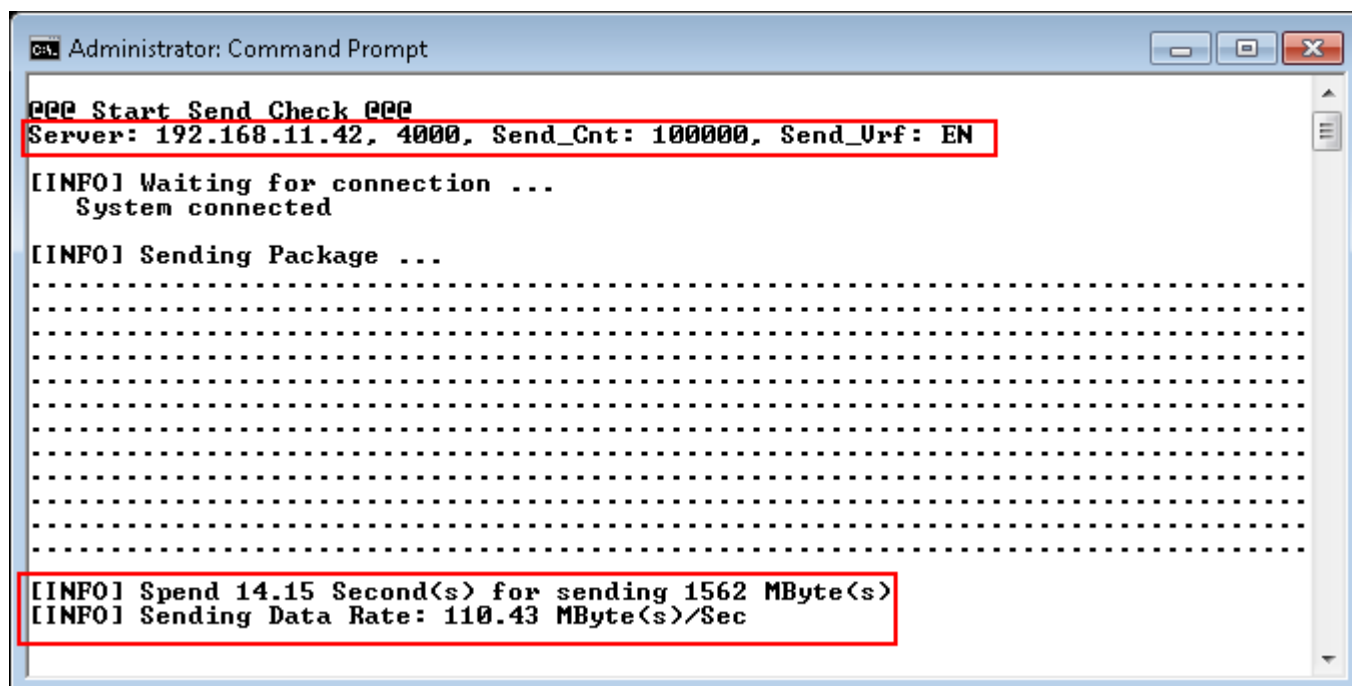


Figure 4-12 Receiving Demo on increment data mode

- DS6 LED will blink if some received data is error, detected by Verification module in SP605.

5 Revision History

Revision	Date	Description
1.0	11-Dec-12	Initial version release
1.1	8-May-19	Rename TOE2-IP to TOE1G-IP