OPL1000

ULTRA-LOW POWER 2.4GHZ WI-FI + BLUETOOTH SMART SOC

Iperf Network Performance Measurement Tool

OPULINKS

OPL1000-Power-Consumption-Measurement-Guide-R01 ｜ Draft Version V01

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2019/07/12	0.1	● Initial Release

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1. INTRODUCTION

1.1. Application Scope

Iperf network performance measurement tool is a performance measurement tool for TCP and UDP. It can measure various statistical information including the maximum bandwidth performance for TCP and UDP, the network throughput, the delayed jitter, loss tolerance and size of the maximum transmission unit. The information can help use measure network performance and identify the network bottleneck.

1.2. Abbreviations

Abbr.	Explanation
Wi-Fi	Wireless Fidelity
DTO	Dynamic Throughput Optimize

1.3. References

[1] OPL1000-DEVKIT-getting-start-guide.pdf

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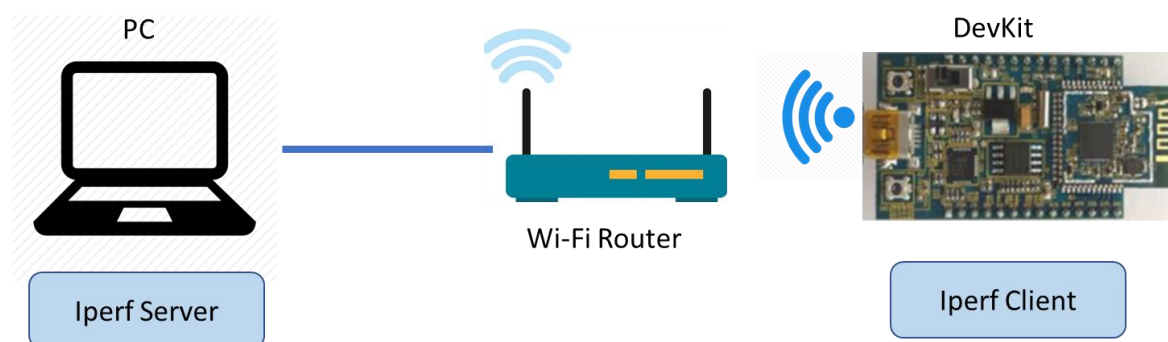## 2. IPERF NETWORK PERFORMANCE MEASUREMENT ENVIRONMENT

Figure 1 Schematic for Iperf network performance measurement environment

When Iperf is in use, one end is the server terminal while the other end is the customer terminal. The command for program initiation is the same but different parameters are used to differentiate the operation of different operation modes. Usually, the server terminal is first initiated for Iperf to monitor a fixed port. This is followed by executing the corresponding command at the customer terminal to begin measurement.

Figure 1 is shows the schematic for Iperf measurement environment, the PC can be connected through cable or wireless means to the Wi-Fi router and the DevKit can be connected to the Wi-Fi router through wireless means. The main purpose is to allow PC and DevKit to be on the same network segment, hence be able to ping each other. When both parties can ping each other successfully, the current measurement environment has been fully set up and the following Iperf network performance measurement test can be conducted.

Firstly, Iperf-2.0.10_exe can be used as the server terminal for the PC and commands like Iperf -s can be executed from PC. As a result, Iperf can be started through the server and monitor using the

5001 port from TCP. The port number for monitoring can also be changed using different commands. DevKit itself is used as the customer terminal and the detailed description for its command will be listed fully in the next chapter.

2.1. PC Environment Construction

Installation for Iperf Tools ：

a. Create a new iperf folder under C drive (C:\iperf) and copy the RAR file from the attachment to this folder. (please ensure that the name of the tool is iperf.exe after being uncompressed).

b. Environment variable construction: right-click on Computer Property -> click on Advanced System Setting -> click Environment Variable -> search for Path Variable under System Variable and click Edit -> Click New and enter the iperf tool directory (based on the directory installed by the user) -> click OK
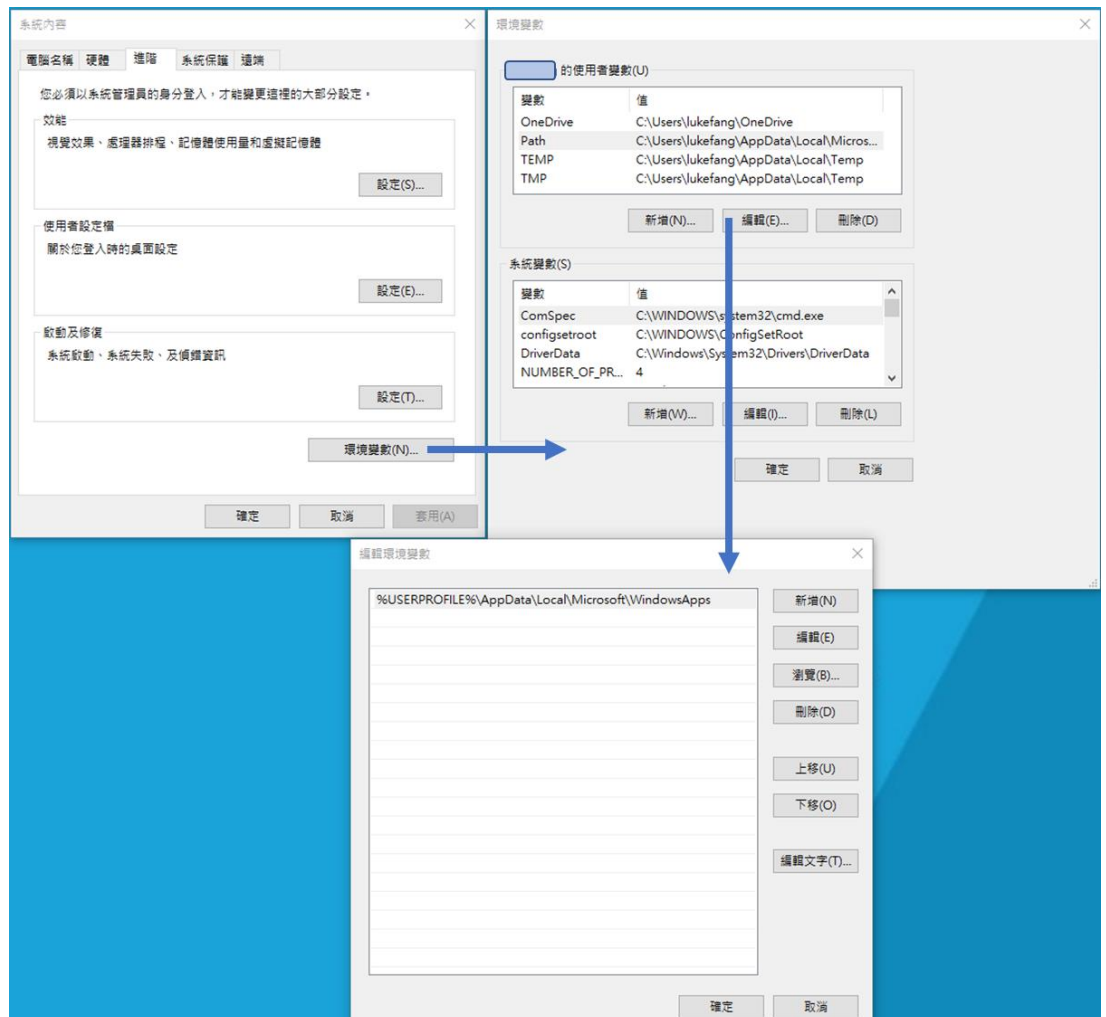
c. Environment variable inspection: Open cmd window and enter iperf -v. If a non-system command is shown, the environment variable is constructed wrongly. If the version number is shown, please ensure that the version for the tools used is 2.0.10.

Turn off PC Firewall:
a) Open the control panel on PC and click on Windows Defender Firewall under System and Security
b) Click on turn Windows Defender Firewall on or off
c) Select the turn off option and click OK.
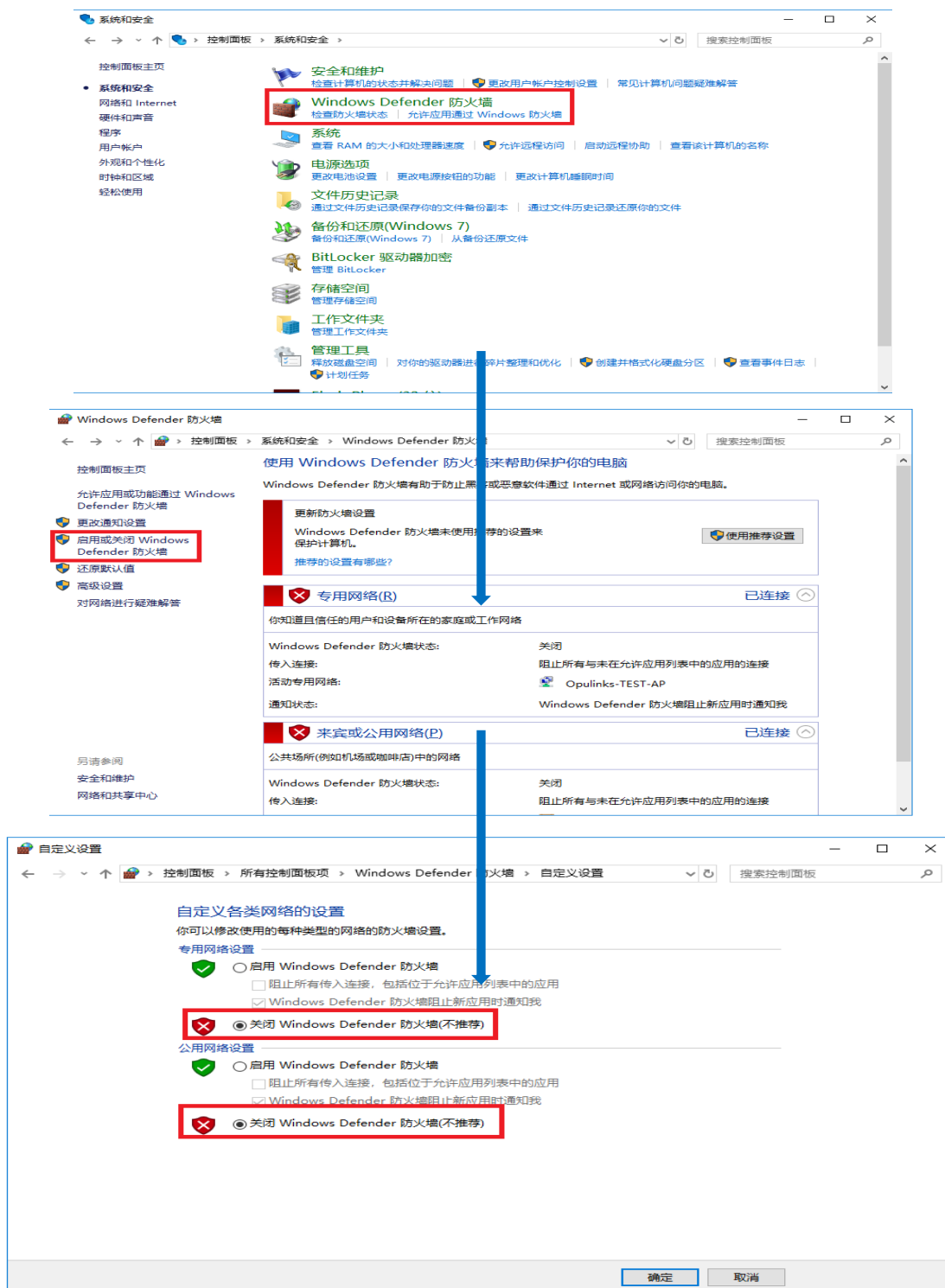
3. IPERF NETWORK PERFORMANCE MEASUREMENT COMMAND

3.1. DevKit Wi-Fi Command

After entering "help" in the AT COM Port of DevKit, the commands shown in Figure 2 will appear.

Please refer to Table 3-1 for the description of the commands.

Figure 2 The help command

Wi-Fi Part	
Scan AP	scan

Connect AP	connect [SSID] [Passphrase]
Disconnect the link with AP	disconnect
Query States (check the current Wi-Fi status)	query
Set Tx Data rate (Set the Wi-Fi Tx transmission rate，0:DTO, 1:1M, 2:2M, 3:5.5M, 4:11M)	wifi_data_rate <TYPE>
Get current setting of STA mac address	sta_mac
Set STA mac address. Format likes XX:XX:XX:XX:XX:XX.(Set station mac address, the device needs to be rebooted after setting)	sta_mac set [MAC_ADDR]
Iperf Part	
Help (command for instruction on use of Iperf)	iperf -h
Common Part	
Show current SDK version	version
Reboot device	reset
Stop ping command（停止 ping 命令）	ping s
Start ping command. Default send 3 ICMP packets to target HOST. Amongst the commands： [IP] - The target HOTS IP address [Pkt counts] - which total of packet numbers to be send. [Pkt len] - which packet size per packet. [Recv timeout] - which timeout per packet. [Ping period] - which ping interval time.	ping [IP] [Pkt counts] [Pkt len] [Recv timeout] [Ping period]

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Table 3-1 Description for the help command

Command for connection of DevKit and AP. Firstly, enter the scan command shown in Figure 3 and AP list will be displayed. The AP list shows the SSID for AP, the current channel used by the AP as well as the current AP signal strength relative to DevKit.

```
>scan
I cmd_wifi: sta scanning
        SSID                    BSSID           CHANNEL     RSSI      SECURITY
Opulinks-HUAWEI            3c:fa:43:11:4f:50      13         -47      NONE
                          1a:e8:29:e7:23:87       1         -55      RSN-PSK-CCMP
OPULINKS_UNIFI            18:e8:29:e7:23:87       1         -55      RSN-PSK-CCMP
Opulinks-Dlink           78:32:1b:3a:f5:b4        2         -50      RSN-PSK-CCMP
旺凌科技                  f0:0f:ec:c3:4b:64        3         -55        RSN-PSK-CCMP
Opulinks-DLINK-99A0      40:9b:cd:3b:99:a0        5         -47      NONE
Opulinks-cisco           84:3d:c6:0d:bb:d8        4         -50      NONE
Opulinks-guest           12:fc:68:90:a8:a1        5         -49      RSN-PSK-CCMP
Opulinks-Netgear         00:1f:33:b5:36:20        5         -52      RSN-PSK-CCMP
Opulinks_TPLINK_WAR308   78:44:fd:60:26:fa       13         -33      NONE
Opulinks-office          30:fc:68:90:a8:a1        5         -41      RSN-PSK-CCMP
Opulinks-Mercury         bc:5f:f6:ca:95:2e        7         -44      NONE
Opulinks_EDIMAX          80:1f:02:51:77:18        6         -58      WPA-PSK-TKIP
TP-LINK_578A             74:05:a5:86:57:8a       11         -30      RSN-PSK-CCMP
Opulinks-TEST-AP         48:7d:2e:07:11:1d       11         -40      RSN-PSK-CCMP
Opulinks_TP-LINK_WA701ND ec:08:6b:5e:89:a3       11         -58      RSN-PSK-CCMP

AP number = 16
```

Figure 3 The scan command

Action to begin connection with AP. Firstly, select one AP and enter the connect command shown in Figure 4. After connection, connect to SSID of AP and enter the password set for AP. After DevKit is connected with AP, the phrase "Wi-Fi connected" will appear on the AT COM port. After DevKit obtained IP address, the phrase "Wi-Fi Got IP" will appear on the AT COM port.

```
>connect Opulinks-TEST-AP 1234abcd
I cmd_wifi: connecting to Opulinks-TEST-AP
I iperf: Wi-Fi Connected
I iperf: Wi-Fi Got IP
```

Figure 4 The connect command

After DevKit received the WiFi connected message, "query" can be used to check the current DevKit Wi-Fi connection status. This will produce the message shown in Figure 5, and the IP address obtained is displayed on the AT COM port. In the case where DevKit did not receive the WiFi connected message, "Disconnected" will be displayed on the COM port when query is used to check the current DevKit Wi-Fi connection status.

```
>query
I cmd_wifi: query wifi states
I cmd_wifi: Wifi Connected.
I cmd_wifi: AP SSID:  Opulinks-TEST-AP
I cmd_wifi: IP:       192.168.1.110
I cmd_wifi: Netmask:  255.255.255.0
I cmd_wifi: Gateway:  192.168.1.1
```

Figure 5 The query command

The user can also set the Wi-Fi Tx data transmission rate, allowing DevKit to use a fixed data transmission rate to test the maximum TCP and UDP bandwidth performance for the network. Theoretically, higher data transmission rate employed by the user, the better bandwidth performance data

```
>wifi_data_rate 4
I cmd_wifi: set wifi Tx fix data rate
I cmd_wifi: current setting : 4
I cmd_wifi:   0:DTO, 1:1M, 2:2M, 3:5.5M, 4:11M
```

Figure 6 Wi-Fi Tx fixed data transmission rate

3.2. Iperf Commands

The instruction and the detailed list of commands for Iperf is shown in Figure 7. Please refer to Table 3-2 for their description.

```
>iperf -h
I iperf_cli:

Client/Server:
    -a, --abort           abort iperf program
    -i, --interval  #     seconds between periodic bandwidth reports (default 3 secs)
    -p, --port      #     server port to listen on/connect to (default port 5001)
    -u, --udp             use UDP rather than TCP
    -s, --server          run in server mode

Client specific:
    -c, --client    <host>  run in client mode, connecting to <host>
    -d, --dualtest          Do a bidirectional test simultaneously
    -n, --num       #[kmgKMG]  number of bytes to transmit (instead of -t)
    -t, --time      #       time in seconds to transmit for (default 30 secs)
```

Figure 7 The instruction for Iperf

Client / Server		
-a, --abort	Details about Iperf	
-i, --interval	<number>	Report the bandwidth interval (unit: second)
-p, --port	<number>	Specify the connection port
-u, --udp	Conduct udp test, the default is tcp	
-s, --server	Run in server mode	
Client-specific		
-c, --client	<host>	Run in client mode, connect to the host address <host>
-d, --dualtest	Conduct dual test simultaneously	
-n, --num	<number>[kmgKMG] 'k'=Kbits/sec 'm'=Mbits/sec 'g' = Gbits/sec 'K'=KBytes/sec	Transmit the fixed bytes, replace -t

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	'M'=MBytes/sec 'G'=GBytes/sec	
-t, --time	\<number\>	The time for transmission with the unit being second

Table 3-2 Instruction list for Iperf

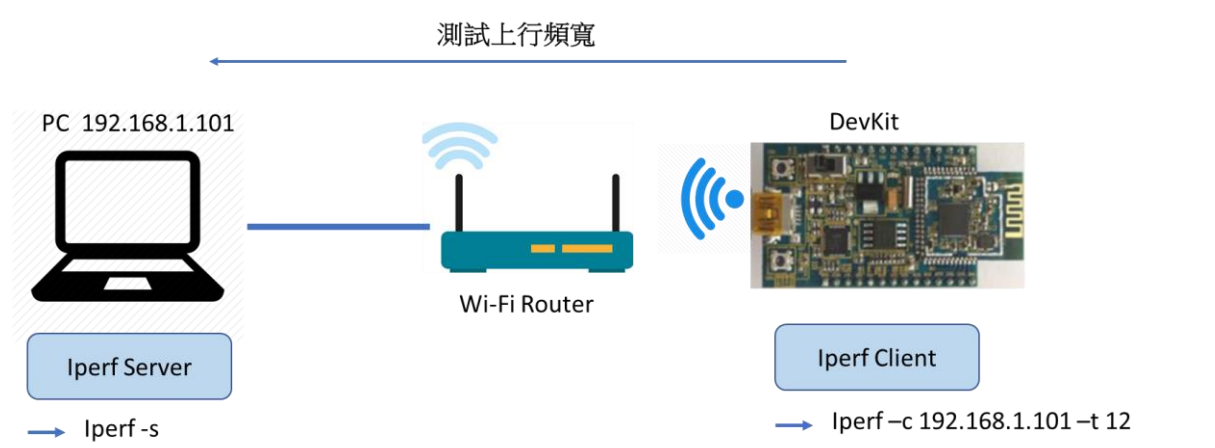## 3.3. Iperf command – Actual example for upload bandwidth measurement

Figure 8 Measurement environment for upload bandwidth

When the user wishes to measure the upload bandwidth for DevKit, DevKit can be used as the client terminal. Firstly, enter commands like iperf -c 192.168.1.101 -t 12, shown in Figure 9 and the meaning can be found in Table 3-2. The brief explanation of the command is as follows. The -c means that it is running in the client terminal, 192.168.1.101 refers to the server connected and -t refers to the time for measurement with second being the unit. The measurement command mentioned above lasted for 12 seconds. The default interval for bandwidth feedback is 3 seconds and the measured data will be displayed on the COM port.

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Figure 9 Iperf client

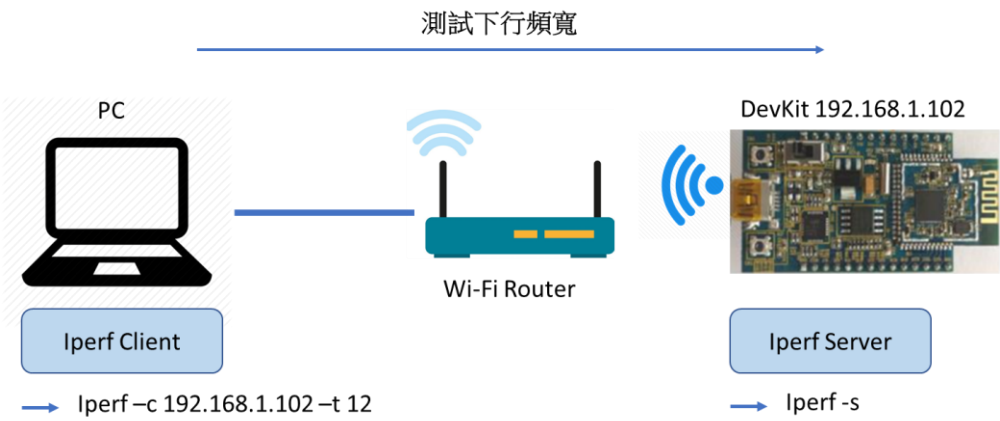## 3.4. Iperf Command – Actual example for download bandwidth measurement

Figure 10 Measurement environment for download bandwidth

When the user wishes to measure the download bandwidth for DevKit, DevKit can be used as the server terminal. Firstly, enter commands like iperf -s, shown in Figure 10 and the meaning can be found in Table 3-2. The -s means that it is running in the server terminal. Please refer to Figure 10 for commands from PC. For more measurement combination, please refer to the combination(s) of Iperf measurement commands provided by Table 3-3 and Table 3-4 in Chapter 错误!未找到引用源。.

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3.5. Combination(s) of Iperf Command

There are many different combinations of commands for Iperf measurement. Table 3‑3 and Table 3‑4 provide different combinations of Iperf measurement commands. Based on the description in the table, the user can clearly and rapidly set DevKit as UDP or TCP for Iperf measurement. In order to reduce interferences during measurement and allow measured data to be closer to the measurement environment of the user, it is suggested to read through things to note before conducting the measurement.

Things to note：

1. It is necessary to ensure that interference from measurement environment is minimum for air interface measurement. The commonly used AP channels are Channel 1, Channel 6 and Channel 11. The user can try to avoid these channels. Hence, it is suggested to set AP channel as Channel 2 for measurement.

2. In the case where the PC has multiple network interface cards, it is suggested to turn off the cards that are not in use.

	DevKit be UDP Server	DevKit be UDP Client
DevKit	iperf -s -u -t 180	iperf -c <PC IP Address> -u -p 6007 -t 180
PC	iperf -c <DevKit IP Address> -u -p 5001 -t 180 -i 5 -b 10M	iperf -s -u -p 6007 -i 3

Table 3‑3 Iperf UDP Test

	DevKit be TCP Server	DevKit be TCP Client
DevKit	iperf -s -t 180	iperf -c <PC IP Address> -t 180

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PC	iperf -c <DevKit IP Address> -p 5001 -t 180 -i 5	iperf -s -i 3

Table 3-4 Iperf TCP Test

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