ESP8266 Ping Test Demonstration

Version 1.0

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About This Guide

The document is structured as follows:

Chapter	Title	Content
Chapter 1	Overview	Introduction to the ping test demonstration.
Chapter 2	Architecture of the Demonstration	Introduction to the architecture of the ping test demonstration.
Chapter 3	Environment Setup	Introduction to the hardware and software environment of the ping test demonstration.
Chapter 4	Test Procedure	Introduction to the procedures of the ping test demonstration.
Chapter 5	Conclusion of the Demonstration	Conclusion of the ping test demonstration.
Appendix I	Installing UART Driver of the ESP-Launcher	Introduction to the installation of the UART driver on the PC, and how to use the UART debug tool.
Appendix II	Flash Download Tool Guide	Introduction to the Espressif flash download tool, and how to use it to download the firmware into the ESP-Launcher.

Release Notes

Date	Version	Release Notes
2016.09	V1.0	Initial release.

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1. Overview

This guide is intended to help users run ping test on the ESP8266 easily and quickly. It demonstrates the testing of network connectivity by running ping test in Station mode or SoftAP mode of ESP8266.

The ping test has been demonstrated and run on the ESP-Launcher. However, with appropriate build settings, the test can be made to run on any ESP8266-based system.

2. Architecture of the Demonstration

The architecture of the ping test demonstration is as follows:

- When the ESP8266 runs in SoftAP mode, the architecture of the ping test demonstration is as Figure 2-1 shows.

Figure 2-1. ESP8266 Running in SoftAP Mode

- When the ESP8266 runs in Station mode, the architecture of the ping test demonstration is as Figure 2-2 shows.

Figure 2-2. ESP8266 Running in Station Mode

3. Environment Setup

3.1. Environment Preparation

3.1.1. Hardware Preparation

Table 3-1. Hardware Preparation

Name	Figure	Quantity	Description
ESP-Launcher (ESP8266 demo board)		1	The development board with ESP8266. Whip antenna is needed.
Micro USB Cable		1	To connect the ESP-Launcher to the PC. • PC provides power supply. • User can trace the log outputted from ESP8266 on the PC UART tool.
PC		1	PC for running demo tools: Windows XP or Windows 7 OS is recommended.
Android Mobile Phone		1	To run the Espressif phone APP: Version Android4.0 or later is recommended.
Router		1	To provide Wi-Fi network.

3.1.2. Software Preparation

Table 3-2. Software Preparation

Name	Location	Description
demo.bin	***./Bin-FW/***	The firmware running on the ESP-Launcher
SecureCRT.rar	***./Tools/***	PC UART terminal emulator tool (supports 74880 baud rate)
ft232r-usb-uart.zip	***./Tools/***	USB - UART converter driver
Flash Download Tool	***./Tools/***	To download the firmware into the ESP-Launcher

3.2. Hardware Connection

- ESP-Launcher connects to the PC via the Micro USB cable. For instructions on how to install the UART driver on your PC, please refer to ***Appendix I***.
- A router through which ESP8266 can access the internet is needed.

3.3. Software Installation

Flash Download Tool is for downloading the firmware into the ESP-Launcher.

> 📖 ***Notes:***
> - *The firmware to be downloaded is in **./Bin-FW/**.*
> - *For information how to use Flash Download Tool, please refer to **Appendix II**.*

3.4. The ESP-Launcher

Figure 3-1. The ESP-Launcher

The switch “1”: toggle to the lower side

- Lower side: power-off
- Upper side: power-on

The switch “2”: toggle to the lower side

- Lower side: downloading firmware mode
- Upper side: program execution mode

The switch “3” (CHIP_EN Pin.): toggle to the upper side

- Lower side: chip disable
- Upper side: chip enable

The pin “4”: putting a jumper cap on the above 2 pins

The pin “5”: putting a jumper cap on it

4. Test Procedure

4.1. Download Firmware

1. Download firmware into the ESP-Launcher. Use Flash Download Tool (ESP8266 DOWNLOAD TOOL) to download ***./Bin-FW/demo.bin*** into address ***0x0000***. For more details about using Flash Download Tool, please refer to ***Appendix II***.

Figure 4-1. Downloading Firmware

> 📖 ***Notes:***
>
> - *In general, the firmware needs to be downloaded only once.*
> - *A new version of the firmware with improved functionality or new feature may be downloaded into the ESP-Launcher again.*

2. Run the firmware to confirm that the download is successful.
   - Connect the ESP-Launcher to the PC using the Micro USB cable.
   - Open the UART tool on your PC, and configure the baud rate as 115200.
   - Toggle the switch “2” on the ESP-Launcher to the upper side to set it to be the program execution mode.
   - Next, toggle the switch “1” to the upper side to power up the ESP-Launcher.
   - If the UART outputs the logs below, it means that the firmware is successfully downloaded.

Figure 4-2. UART Output Logs

4.2. Set ESP8266 to AP Mode for Ping Test

1. Set UART baud rate to be 115200 for firmware installation. The illegible characters are printed at the baud rate of 74880 and this is normal during correct power-up. Reset ESP8266 upon power-on, when the “ready” message is printed, it means that the firmware is running properly.

Figure 4-3. UART Output Logs

> ⚠ ***Notice:***
> *The baud rate of using AT commands is 115200.*

2. After the “ready” message is displayed, users can send the AT command below to set the SSID and password of ESP8266 SoftAP.
   - AT command: `AT+CWSAP=“Smart1ap”,“espressif0-1”,5,3`
   - Result:

```
AT+CWSAP="Smart1ap","esressif0-1",5,3

OK
```

Figure 4-4. Setting ESP8266 to AP Mode

> ⚠ ***Notice:***
> - *AT commands always terminate with “\r\n”. ESP8266 will not recognize commands not terminating properly and will return “ERROR”.*
> - *For more information on AT commands, please refer to ESP8266 AT Instruction Set.*

3. Connect the PC to ESP8266 SoftAP of which SSID (Smart1ap) and password (espressif0-1) are set in the Step 2 above.

> ⚠ ***Notice:***
> *It is recommended to have a PC with an external wireless card to connect to ESP8266 SoftAP as a station. Using internal wireless card may cause poor Wi-Fi connectivity.*

4. Click the network icon (in the task bar at the lower right corner of the PC desktop screen). Connect the PC to the ESP8266 SoftAP (SSID: Smart1ap, password: espressif0-1).

Figure 4-5. PC Connecting to ESP8266 SoftAP

5. Run the command prompt on your PC. Type “cmd” in the “Run” dialogue to open a command window. Then input command as is shown below to ping the ESP8266 SoftAP with the default IP address 192.168.4.1.

```
C:\Users\Xu Tao>ping 192.168.4.1 -n 100
```

Figure 4-6. Ping ESP8266 SoftAP Using a PC

> 📖 ***Note:***
>
> *The "-n 100" in the ping command specifies that the ESP8266 SoftAP is to be pinged 100 times.*

6. The result of ping test is as shown below:

```
来自 192.168.4.1 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=32ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=3ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=7ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=9ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=8ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=4ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=7ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=7ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=3ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=2ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=7ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=3ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=9ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=25ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=227ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=217ms TTL=128
来自 192.168.4.1 的回复: 字节=32 时间=125ms TTL=128

192.168.4.1 的 Ping 统计信息:
    数据包: 已发送 = 100, 已接收 = 100, 丢失 = 0 (0% 丢失),
往返行程的估计时间(以毫秒为单位):
    最短 = 1ms, 最长 = 468ms, 平均 = 24ms
```

Figure 4-7. Ping Test Result

4.3. Set ESP8266 to Station Mode for Ping Test

> ⚠️ ***Notice:***
>
> - *AT commands terminate with “/r/n”, and the baud rate is 115200 by default.*
> - *For more information on AT commands, please refer to ESP8266 AT Instruction Set.*

1. Set ESP8266 into Station mode.
   - AT command: `AT+CWMODE=1`

- Result:

```
AT+CWMODE=1

OK
```

Figure 4-8. Setting ESP8266 into Station Mode

2. Connect PC to a router. Suppose the SSID of the target router is “Smart1ap”, and the password is “espressif0-1”.
3. Power up the ESP-Launcher, and connect ESP8266 to the same router by using the following AT command.
   - AT command: `AT+CWJAP_DEF=“Smart1ap”,“espressif0-1”`
   - Result:

```
AT+CWJAP_DEF="Smart1ap","espressif0-1"
busy p...
WIFI CONNECTED
WIFI GOT IP
```

Figure 4-9. Connecting ESP8266 to the Router

> 📖 ***Note:***
>
> *Printed message “WIFI GOT IP” means that ESP8266 has established connection with the router successfully and has been allocated an IP address.*

4. Query the IP address of ESP8266.
   - AT command: `AT+CIFSR`
   - Result:

```
AT+CIFSR

busy p...
+CIFSR:APIP,"192.168.4.1"
+CIFSR:APMAC,"5e:cf:7f:14:c7:45"
+CIFSR:STAIP,"192.168.31.181"
+CIFSR:STAMAC,"5c:cf:7f:14:c7:45"

OK
```

Figure 4-10. Querying the IP Address of ESP8266

5. Running command prompt on the PC again, and input the command shown below to ping ESP8266 Station (IP address is 192.168.31.181 in this case) as Step 4 shows above.

```
C:\Users\Xu Tao>ping 192.168.31.181 -n 100
```

Figure 4-11. PC Pinging the ESP8266 Station

> 📖 ***Note:***
>
> *The "-n 100" in the ping command specifies that the ESP8266 Station should be pinged 100 times.*

6. The result of ping test is as shown below:

```
来自 192.168.31.181 的回复: 字节=32 时间=50ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=55ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=59ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=40ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=18ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=29ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=43ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=26ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=30ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=215ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=88ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=164ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=18ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=69ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=12ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=6ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=44ms TTL=128
来自 192.168.31.181 的回复: 字节=32 时间=22ms TTL=128

192.168.31.181 的 Ping 统计信息:
    数据包: 已发送 = 100, 已接收 = 100, 丢失 = 0 (0% 丢失),
往返行程的估计时间(以毫秒为单位):
    最短 = 2ms, 最长 = 277ms, 平均 = 39ms
```

Figure 4-12. Ping Test Result

5. Conclusion of the Demonstration

ESP8266 has two Wi-Fi operation modes, Station and SoftAP modes. PC can connect to the ESP8266 in each Wi-Fi mode and test the connectivity by ping test. Both the SoftAP ping test and the Station ping test can be used when the ESP8266 is configured to be in Station + SoftAP mode.

The result of ping test depends on the network environment. The demo results of the ping test in this document are results of open tests in a noisy environment, so the test results are for reference only. More accurate results can be acquired by carrying out the tests in a clean Wi-Fi environment.

I. Appendix - Installing UART Driver for ESP-Launcher

1. Use a Micro USB cable to connect the ESP-Launcher to the PC. The UART driver needs to be installed on the PC.

Figure I-1. Installing UART Driver on PC

Finish installing the UART driver on the PC:

Figure I-2. UART Driver Installed

> ⚠️ ***Notice:***
>
> *If the PC does not install the UART driver automatically, user can install it manually. Espressif provides the UART driver in* ***./Tools/ft232r-usb-uart.zip.***

2. Unzip ***./Tools/SecureCRT.rar***, and open the ***SecureCRT*** to check if the UART driver is installed successfully.

> 📖 ***Notes:***
>
> *The UART configuration of the ESP-Launcher should be as follows:*
>
> - *Baud rate: 74880 (by default) or 115200 (for AT commands)*
> - *8N1 (Data bits: 8, Parity bit: None, Stop bit: 1)*
> - *Flow control: disabled*
> - *If AT commands are used, the SecureCRT should be set into "New Line Mode", because that AT commands are ended with a new-line (CR-LF).*

- If it is the first time you are using the SecureCRT, create a new serial port connection. Set the configuration by referring to the screenshot below. Choose “Serial” protocol and no flow control. Set the actual port number by finding out the assigned port from the “Device Manager” of PC.

Figure I-3. Creating a New Serial Port Connection

- If the serial port connection was created before, users can change its configuration by right-clicking on it, and selecting “properties”.

Figure I-4. Checking the “Properties” of the Serial Port

- Select the “Serial” page in the “Properties” window to check the configuration of the serial connection.

Figure I-5. Checking the “Serial” in “Properties” Window

- If AT commands are used, the baud rate should be 115200, and the “New Line Mode” should be set because the AT commands end with a new line (CR-LF).

Figure I-6. Setting the “New Line Mode” for AT Commands

> **Note:**
>
> *The default baud rate of ESP8266 is 74880. But to use AT commands, the baud rate should be 115200.*

3. Power up the ESP-Launcher by toggling the switch “1” to the upper side. Check if the startup logs (baud rate 74880) are displayed on the SecureCRT.

Figure I-7. Startup Logs

4. User can connect / disconnect the serial port by clicking these two buttons

at the upper left corner of the SecureCRT.

- The left button is to create a serial port connection.
- The right button is to abort the connection.

II. Appendix - Flash Download Tool User Guide

1. Double click the ***./Tools/FLASH_DOWNLOAD_TOOLS_v2.4_150924/ESPFlashDownloadTool_v2.3+.exe*** to run the Flash Download Tool.
2. Fill the ***Download Path Config*** area with the location of the firmware which is to be downloaded, and download it to ***ADDR*** 0x0000. ***SPI SPEED*** is 40 MHz, ***SPI MODE*** is QIO, ***FLASH SIZE*** is 8 Mbit. And select the corresponding ***COM*** port.

Figure II-1. Flash Download Tool

> 📖 ***Note:***
>
> *The selected firmware in the **Download Path Config** area will turn into green and be downloaded into the ESP-Launcher. If there is any other firmware which is not selected, it will be ignored.*

3. Click the “START” button on the ESP8266 Flash Download Tool to enter the “SYNC” state. Wait for the ESP-Launcher to power up.

Figure II-2. “SYNC” State of Flash Download Tool

4. Power up the ESP-Launcher, and start downloading firmware.

   - Toggle the switch “2” to the lower side to set ESP-Launcher to download mode. And toggle the switch “1” to the upper side to power up the ESP-Launcher. More details about the ESP-Launcher are in ***Section 3.4***.

Figure II-3. ESP-Launcher

   - The Flash Download Tool will start to download firmware into the ESP-Launcher. The ***DETECTED INFO*** area on the ESP8266 Flash Download Tool will display information about the flash chip on the ESP-Launcher.

Figure II-4. Starting Downloading Firmware

- Wait for the download to complete. “FINISH” state will be shown on the Flash Download Tool.

Figure II-5. Downloading Firmware Finished

After the download is finished, toggle the switch “1” to the lower side to power off the ESP-Launcher.

Set the ESP8266 to be in program execution mode by toggling the switch “2” to the upper side. Then toggle the switch “1” to the upper side again to power on the ESP-Launcher.

Espressif IOT Team

www.espressif.com

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