MASTERs 2012
Lab Manual for RN-174 Evaluation Board

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Learn How Easy It Is to Add Wi-Fi to Your Embedded System

MICROCHIP
MASTERs 2012

ROVING networks

Hardware Architecture: Development Environment

RS-232 Interface (J3)

RX - input to evaluation board
TX - output from evaluation board

Pin	Description
1	No connect
2	RS-232 TX
3	RS-232 RX
4	No connect
5	GND
6	No connect
7	RS-232 RTS
8	RS-232 CTS
9	4 to 16 VDC input
10	No connect

Power Select Jumper (J4)

High-Voltage Mode (Default). The board is powered by a source up to 16 V DC.

Low-Voltage Mode. The board is powered by 2.0- to 3.3-V DC only.

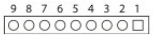
External Power Mode. Used when powering the board with regulated 3.3-V DC power.

GPIO Interface TTL Signals (J8)

RX - input to evaluation board
TX - output from evaluation board

Pin	Description
1	3.3 VDD
2	GND
3	UART RX
4	UART TX
5	GPIO4
6	GPIO5
7	GPIO6
8	GPIO7
9	GPIO8
10	GPIO9
11	UART CTS
12	UART RTS
13	RESET

Sensors (J1)



Pin	Description
1	Sensor PWR
2	Sensor 4 (3.3-V tolerant)
3	Sensor 5 (3.3-V tolerant)
4	Sensor 7 (1.2 V only)
5	Sensor 5 (1.2 V only)
6	Sensor 4 (1.2 V only)
7	Sensor 6 (1.2 V only)
8	Sensor 3 (1.2 V only)
9	GND

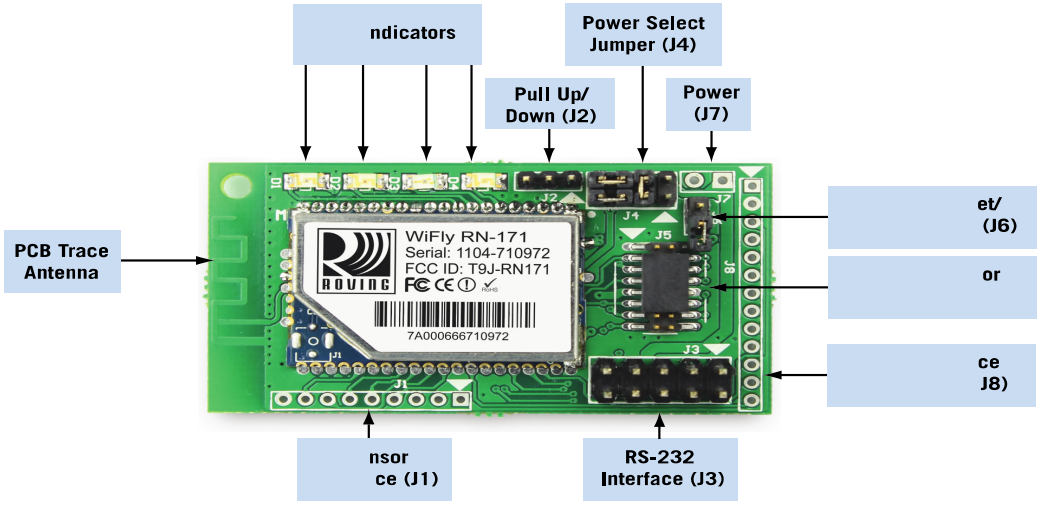
WARNING: Voltage on pins marked *1.2 V Only* should not exceed 1.2 V or permanent damage will occur.

Power (J7)

Pin	Description
1	5 to 12 VDC
2	GND

Pull Up/Down (J2)

Ad Hoc Mode/Factory Reset (J6)



Lab Equipment

For this lab, you need the following hardware and software.

Hardware

- RN-174 evaluation board, which contains the RN-171 WiFly module
- Personal computer with a USB port
- USB-to-serial cable
- Null modem
- 10-pin serial cable
- 9-V battery clip

Software

- Tera Term software (http://sourceforge.jp/projects/ttssh2/releases/)
- Portpeeker software (http://www.linklogger.com/portpeeker.htm)

Lab 1:
Association & UDP

Purpose:

This lab will teach you how to:

- Differentiate between infrastructure and ad hoc networks.
- Configure module parameters.
- Scan, join, and authenticate to wireless networks.
- Discover the WiFly module on your wireless network via UDP.

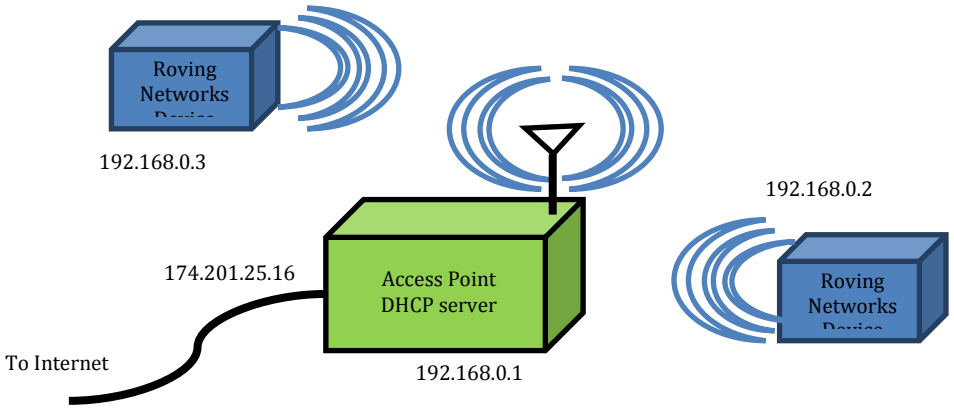
Overview:

In this procedure, you will set up hardware, configure the module on the evaluation board, associate with a network, and configure and capture UDP data.

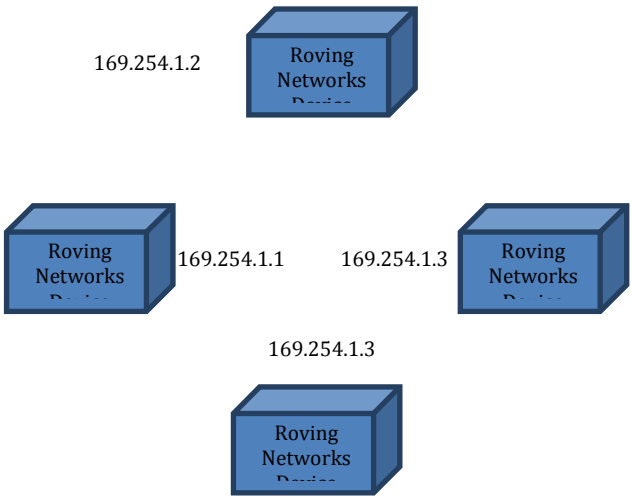
The WiFly module supports the following security modes:

- WEP 64, WEP 128 **OLD/NOT SECURE**
- WPA1 TKIP
- WPA2 AES has not been compromised
- Enterprise is not currently supported

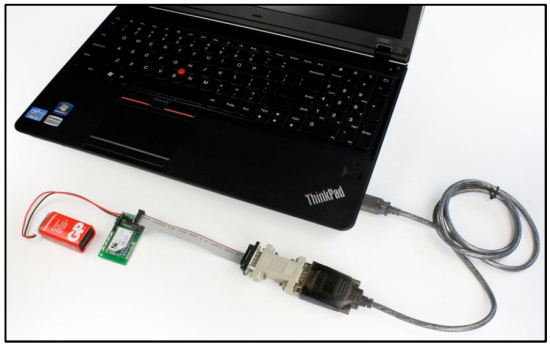
Infrastructure Networking

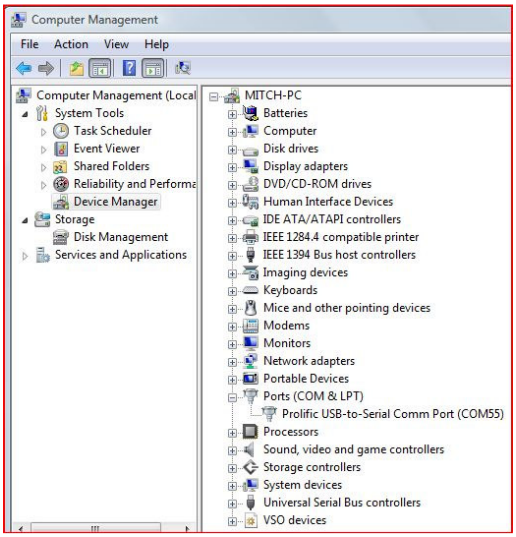


Ad Hoc Networking

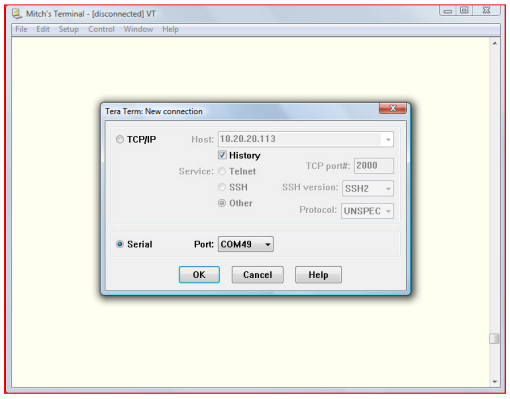


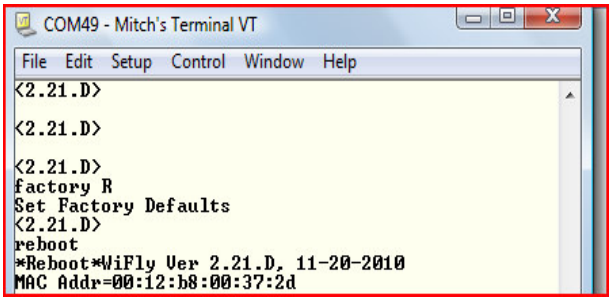
Procedure (Part 1):



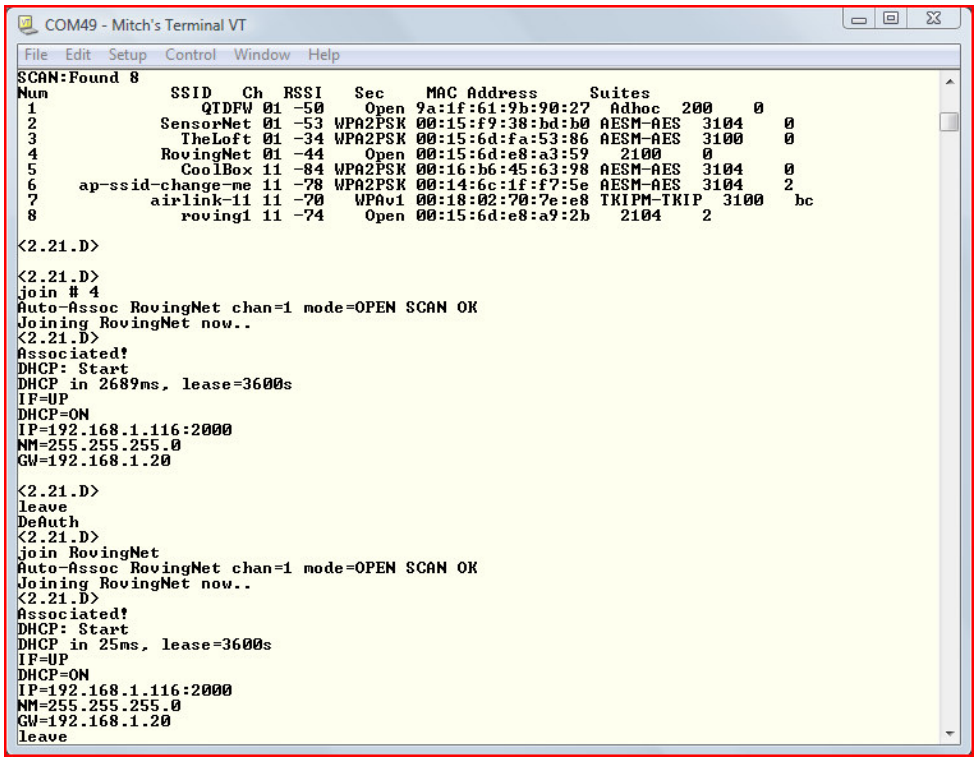


1. Connect the evaluation board.
    a. Connect the board to your computer.
    b. Connect the battery (the green LED blinks slowly).
    c. Use the device manager to find the COM port.





2. Launch command mode.
    a. Run Tera Term.
    b. Open the assigned COM port. The serial port settings are: 9600 baud, 8 bits, no parity, 1 stop bit, and no flow control.
    c. Type **$$$**.
    d. The module responds with <CMD>.
3. Review and reset the configuration.
    a. Check the configuration and firmware version.
        i. **get e**
        ii. **ver**
    b. Perform a factory reset (starts module in a known state).
        i. **factory R**
        ii. **reboot**

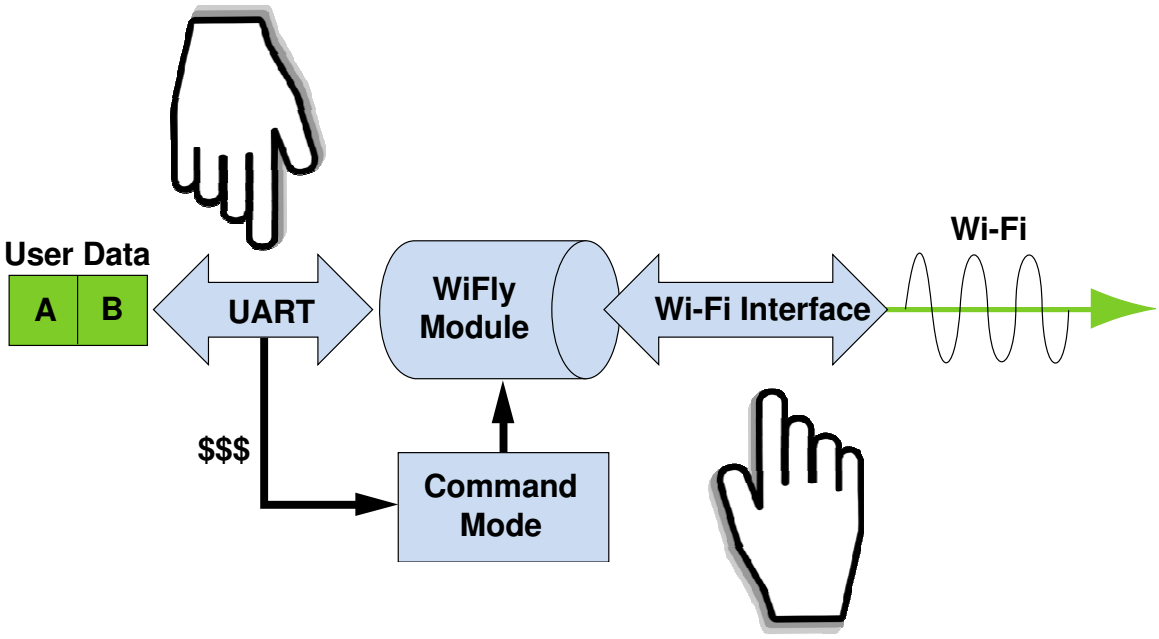


4. Search for networks.
    a. **$$$** (enter command mode)
    b. **scan**
5. Join a network.
    a. **join # 1** (remember the spaces)
    b. **leave**
    c. **join** <*string*>
    (e.g., **join RovingNET**)
    d. **leave**
6. Auto-join a network with persistent configuration.
    a. **set wlan ssid** <*string*>
    b. **set wlan pass** <*string*>
    c. **save**
    d. **reboot**

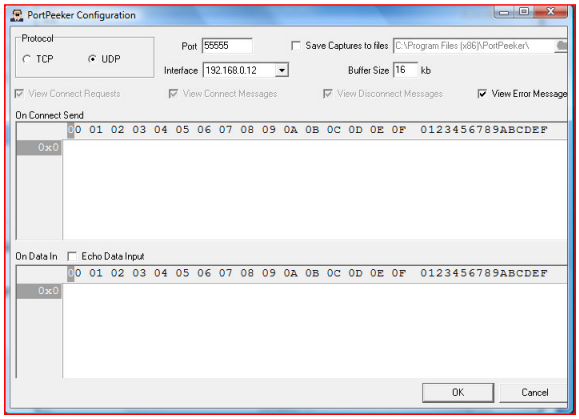
TIP: If the network is secure, set the pass phrase with **set wlan pass** <*string*> before joining the network.

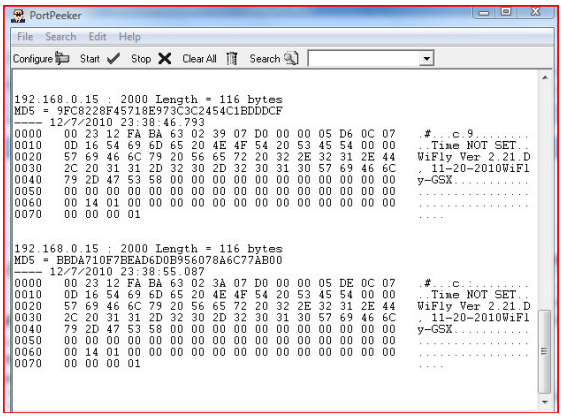
Lab 1 Interim Summary

So far, you have configured the module via the UART in command mode. Next, you will observe the Wi-Fi activity using PortPeeker on a PC.



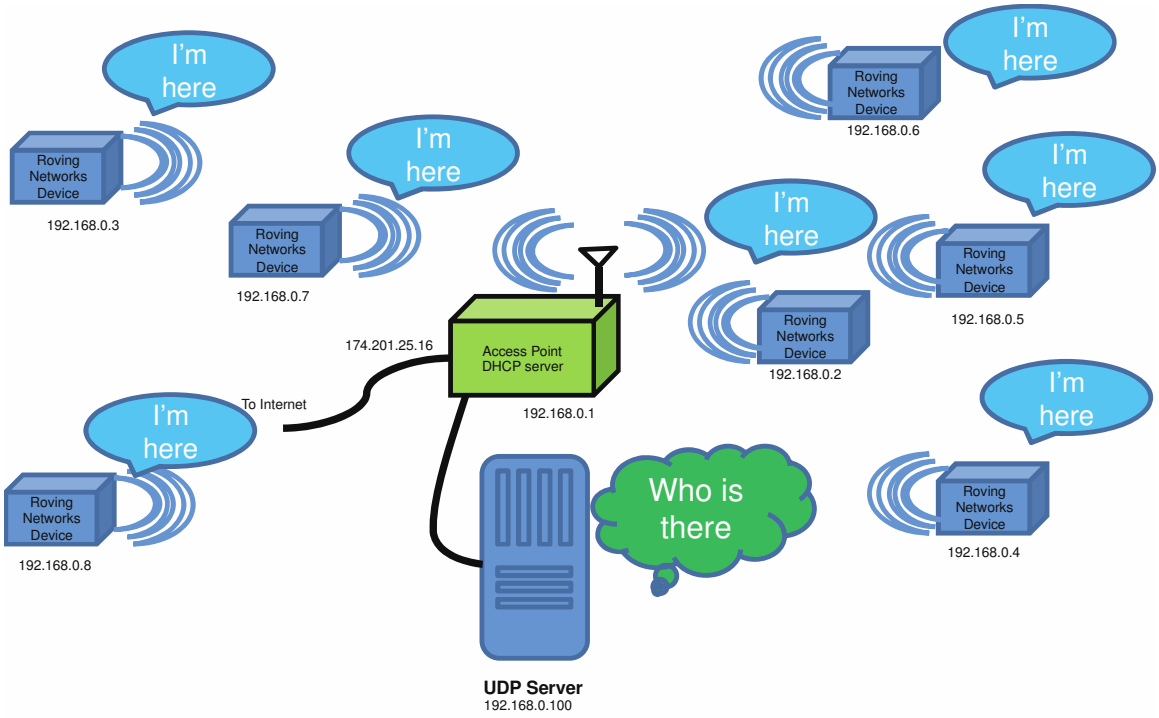
Procedure (Part 2):

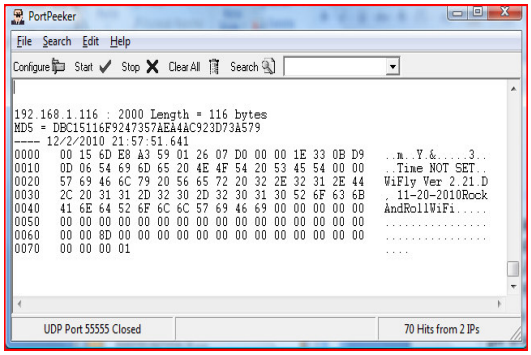


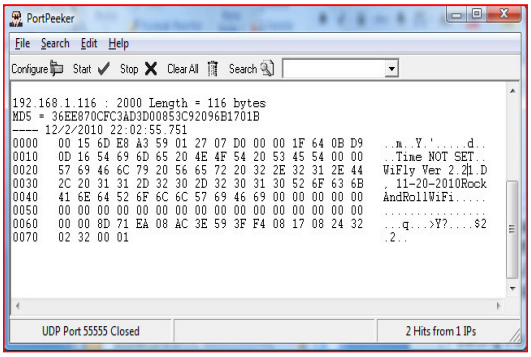


1. Associate the PC with the same AP as the module.
   a. Enter command mode and retrieve the module's IP address.
   b. **Ensure that the PC is on the same subnet.**
2. Launch and Configure PortPeeker.
   a. Click **configure**.
   b. Set port number to **55555** (default).
   c. Set protocol to **UDP**.
   d. Click **OK**.
3. Start UDP Packet Capture by clicking **Start.**
   If the PC & module are on same subnet, broadcast packets are shown.
   If there are multiple nodes on the network, look for YOUR IP address.

The following figure illustrates the process of device discovery via UDP broadcast. The module sends a UDP broadcast at programmable intervals to make itself discoverable. The UDP broadcast contains information that identifies the module on the network.

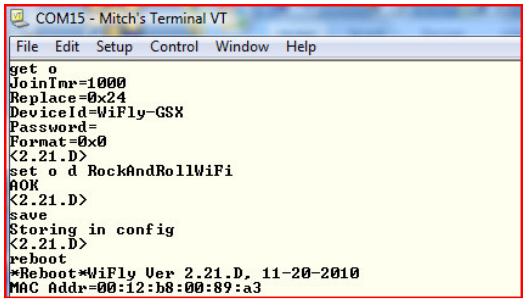


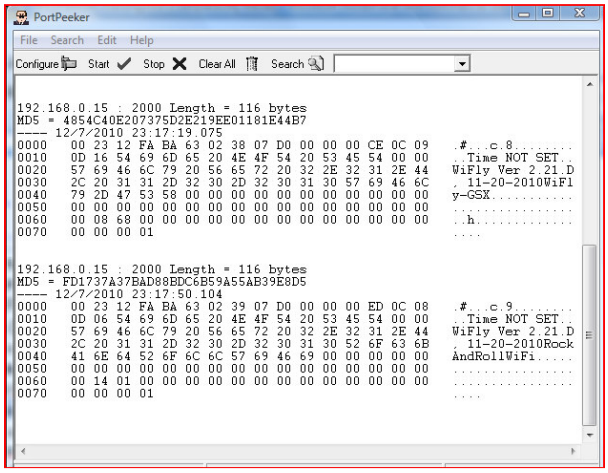




4. Set the UDP broadcast interval.
    a. Enter command mode
        i. **get broadcast** (observe current interval)
        ii. **set b i 3** (b=broadcast, i=interval)
        iii. **save & reboot**
    b. Review the UDP messages in PortPeeker.
5. Enable the sensor data in the UDP broadcast.
    a. Enter command mode.
        i. **set q s 0xff** (set sensor mask)
        ii. **save** to make persistent (reboot not required).
    b. Review the UDP messages in PortPeeker.

Device names can identify products on the network. You can also append the device ID to the UDP broadcast.

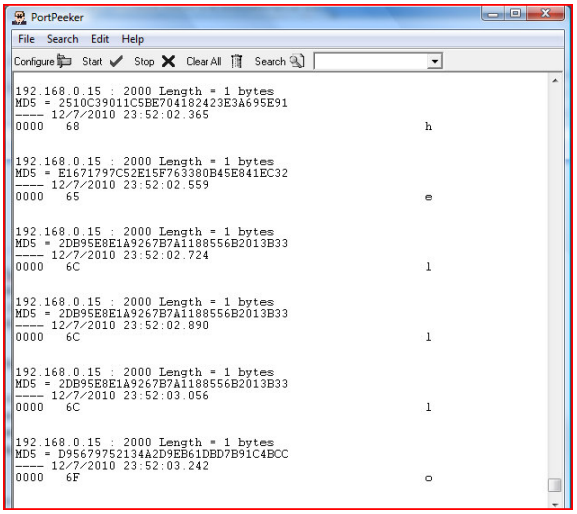




6. Set the device ID.
    a. Enter command mode.
        i. **get option**
        ii. **set o d RockAndRollWiFi** (o=optional, d=deviceID)
        iii. **save & reboot**
    b. Review the UDP messages in PortPeeker.
7. Set the broadcast UDP port.
    a. Enter command mode.
        i. **get broadcast**
        ii. **set b p 50000** (b=broadcast, p=port)
        iii. Save & reboot not required.
    b. Reconfigure PortPeeker to listen for UDP packets on port 50000
    c. Review the UDP messages in PortPeeker.

TIP: UDP Broadcast on by Default. Set Interval to 0 to Turn It Off.

```
<2.21.D>
get ip
IF=UP
DHCP=ON
IP=192.168.0.15:2000
NM=255.255.255.0
GW=192.168.0.1
HOST=192.168.0.12:55555
PROTO=UDP,
MTU=1524
FLAGS=0x7
BACKUP=0.0.0.0
```



8. UDP mode is not enabled by default. Enable UDP by setting the remote host, port, and protocol.
    a. Enter command mode.
        i. **factory R**
        ii. Associate with AP
        iii. **set ip host** <*address*>
        iv. **set ip remote 50000**
        v. **set ip proto 1** (IP protocol bitmask; 1 = UDP, see following table)

Bit Position	Protocol
0	UDP
1	TCP Server & Client (Default)
2	Secure (only receive packets with IP address matches the store host IP)
3	TCP Client only
4	HTTP client mode

        vi. **set comm timer 1000** (try 10, see the change)
        vii. **get ip**
        viii. **save & reboot**
    b. Type characters; they appear in PortPeeker.

TIP: The IP Protocol Value Is a Bit Mask. You Can Enable Both TCP & UDP Messages.

LAB 1 Conclusion

You have completed Lab 1. You have learned that:

- The RN-174-K with a terminal emulator and serial cable provides a simple, effective development environment.
- Joining networks is easy.
- You can discover WiFly devices via UDP broadcast.
- The module sends UART data as UDP packets when associated with a network in UDP mode.

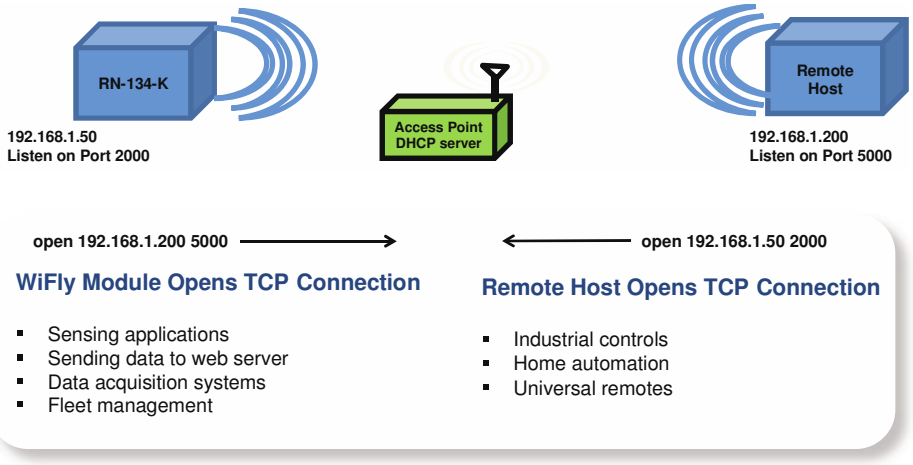
Lab 2: TCP

Purpose:

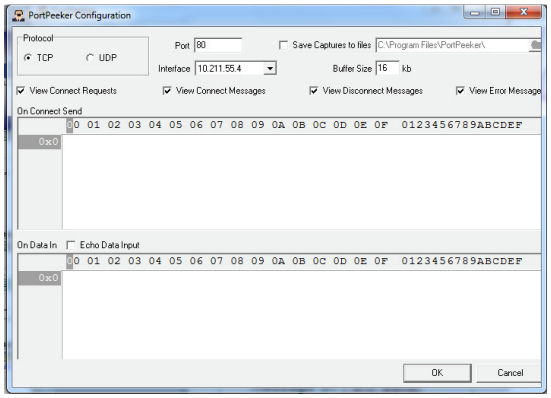
This lab will teach you how to:

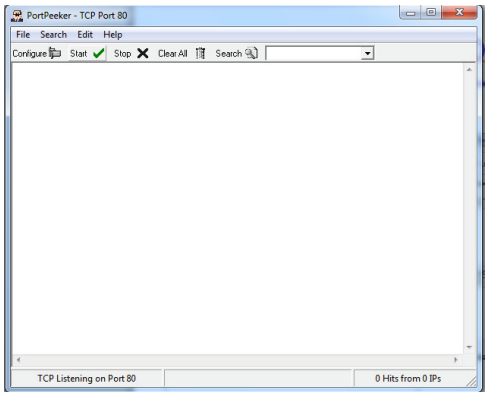
- Connect **from** the module **to** a remote host using TCP (client).
- Connect **to** module **from** remote host using TCP (server).
- Distinguish between TCP modes.
- Automatically open TCP connections using a timer.
- Control TCP connections with a microcontroller.
- Trigger a TCP flush based on different events.

TCP connections are point-to-point connections that provide reliable, guaranteed, in order data delivery. They are also known as sockets. See the following figure.

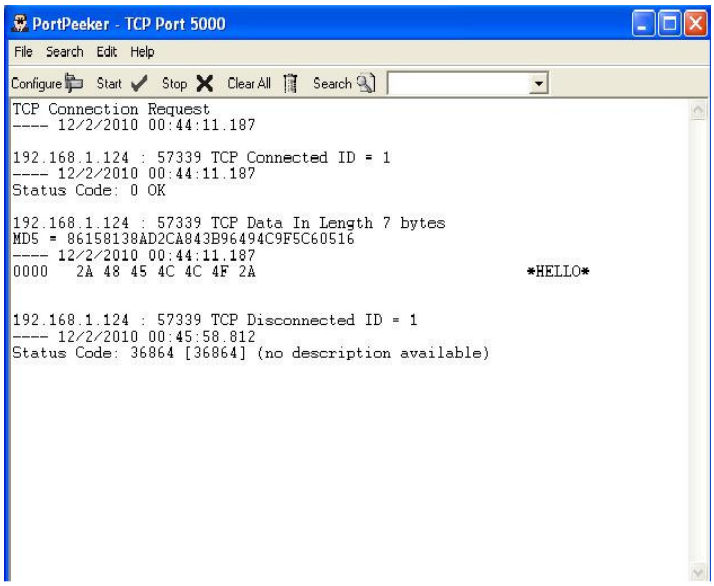


Procedure:

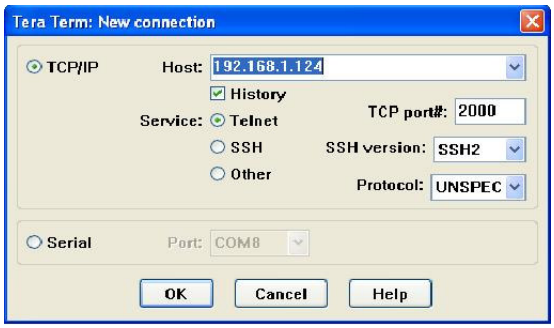


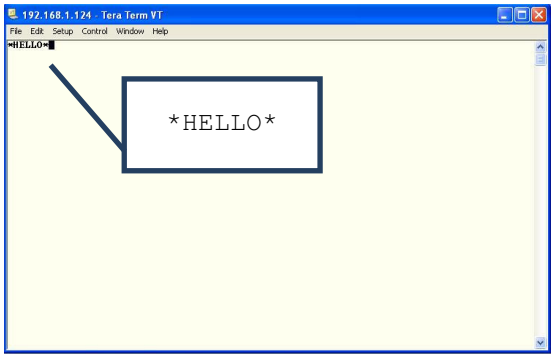


1. Associate your computer with the AP.
2. Launch PortPeeke.
3. Configure PortPeeke.
    a. Click Configure (note your PC's IP address in the Interface box).
    b. Set port to 5000 (the port number matches the remote port of the WiFly module).
    c. Set the protocol to TCP.
4. Click Start to capture TCP packets.



5. With the module connected to the PC over the USB-Serial cable, open Tera Term on the serial COM port.
6. Restore the module to the factory defaults:
    a. Enter command mode.
    b. **factory R**
    c. Associate with AP.
    d. **save** & **reboot**
7. Open a TCP connection using the command **open** <*IP_address*> **5000** ***OPEN*** is shown on serial port (Tera Term window) and a packet with ***HELLO*** is shown on PortPeeker.
8. Close the TCP connection:
    a. Enter command mode.
    b. **close**
    c. Close string *CLOS* displayed in Tera Term.
9. Extra credit: change the COM timer to 2000 and observe the difference on Port Peeker.





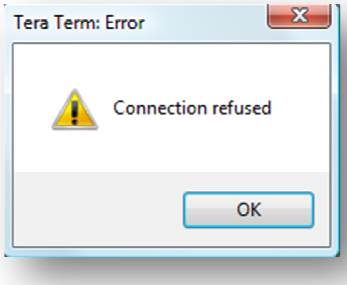
10. In command mode, obtain the module's IP address using **get ip**.
11. Open Telnet Connection from PC Using Tera Term (Use Existing Instance)
    a. Click **File > New connection**.
    b. Select **TCP/IP**.
    c. Select **Telnet**.
    d. In **Host** field, type the module's IP address.
    e. **TCP port#** is 2000 (default listening port).
    f. Click **OK**.

    The ***HELLO*** message is shown in the Telnet window indicating a successful TCP connection.
12. Type in the Telnet window; data appears in the serial port window and vice versa.
13. You can configure the module remotely over Telnet by entering command mode.

The module supports three TCP modes:

- TCP client and server mode
  - Default mode initiates and accepts TCP connections
  - Currently supports one active connection at a time
  - Concurrent TCP connections supported in future
- TCP client ONLY mode
  - ONLY initiates TCP connections; cannot accept incoming connections
- Secure mode
  - ONLY receives packets from host that matches stored host IP address

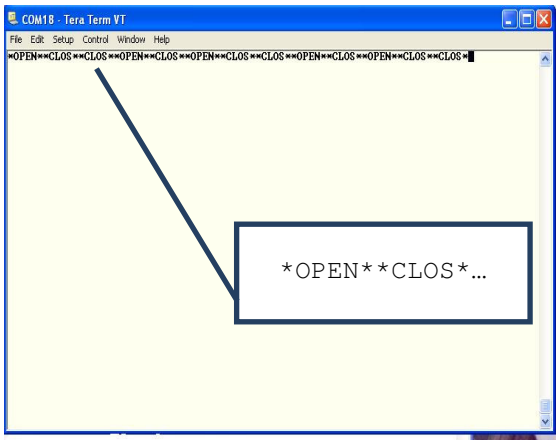
TIP: Refer to User Manual for More Details on TCP Modes



14. Set up the module in TCP mode.
    a. **set ip proto 8**
    b. **save & reboot**
15. Open a new Telnet connection to the module from Tera Term. The second connection is refused, indicating that the TCP_Client mode is working correctly.

The module can automatically open a TCP connection to the remote host on powerup or when waking from sleep.

- Auto-Connect Controlled by **autoconn** Setting
  - **set sys auto 1** // Attempts to open TCP connection immediately once only
  - **set sys auto** <*value*> // Attempts to open TCP connection every // <*value*> seconds
  - **set sys auto 255** // Attempts to open TCP connection once & // go back to sleep immediately // when connection is closed
- Auto-Connect Requires Module to Store Remote Host's IP Address & Port #
  - **set ip host** <*host IP address*>
  - **set ip remote** <*port*>
- Once TCP Connection Is Opened, It Can Be Closed in Several Ways
  - **close** command
  - Idle timer
  - Remote host
- Idle Timer Closes TCP Connection after Preset # of Seconds of No Activity (No Tx or Rx) on the TCP Link
  - **set com idle** <*value*> //Closes the TCP connection after <*value*> seconds of inactivity



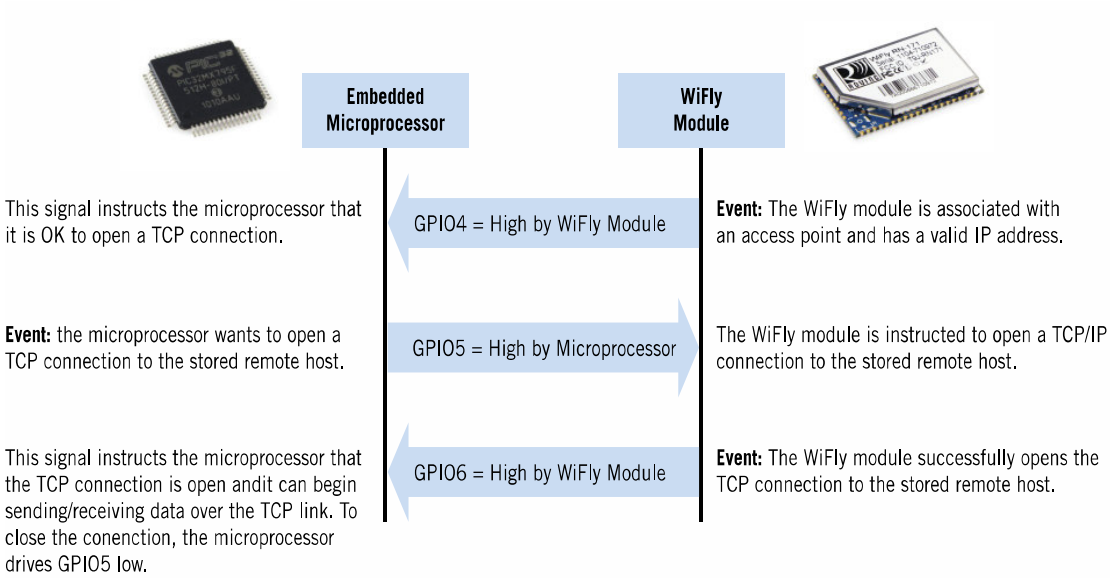
16. Configure the module open a TCP Connection Every 10 seconds, Drops Connection after 3 seconds Inactivity
    a. **set ip host** <*address*>
    b. **set ip remote 5000**
    c. **set sys auto 10**
    d. **set comm idle 3**
    e. **save**
    f. **reboot**
17. PortPeeker: Connection Opens & Closes
18. Tera Term: Open & Close Strings Shown when Each Connection Opens & Closes

The firmware uses GPIO 4, 5 & 6 to blink the status LEDs on the evaluation board (see Section 2.4 in the user manual for the standard LED function). Alternative functions are described below:

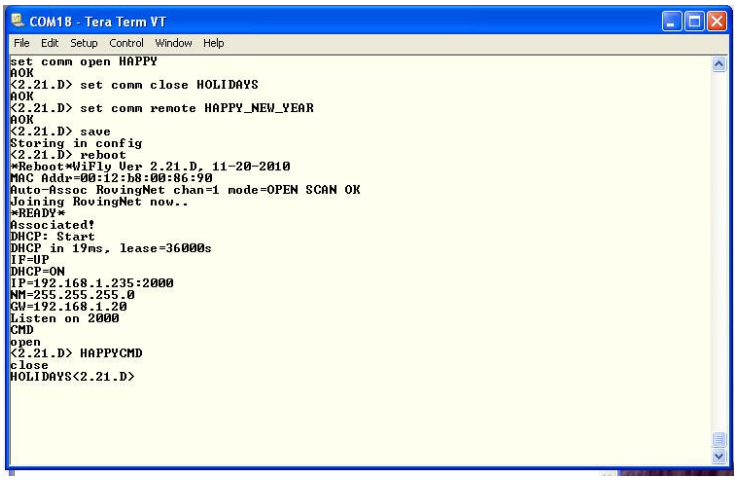
GPIO	Function	Description
4 (GRN)	Output	High once associated, authenticated & has IP address.
5 (RED)	Input	Set high to trigger TCP connection, low to disconnect.
6 (YLW)	Output	High when connected over TCP, low when disconnected.

The microcontroller opens or closes the TCP connection to the stored remote host by driving GPIO5 high or low. This setup requires a hardware configuration that is not part of this lab. The microcontroller can monitor the TCP connection status by readying GPIO6:

- High = Connected
- Low = Not Connected



19. Enable Alternative Functions
    a. **set wlan ssid** <*string*>
    b. **set sys iofunc 0x70**
    c. **save**
    d. **reboot**
    e. Evaluation board LEDs do not turn on
20. After Module Associates with AP
    a. Associate with AP
    b. **save & reboot**
    c. Green LED goes on (GPIO4)
21. Connect/Disconnect TCP Connection
    a. Enter command mode (**$$$**)
    b. **open** <*address*><*value*>
    c. Red LED blinks & connection closed because RN-174-K board's GPIO5 pulled to GND
    d. Enter command mode (**$$$**)
    e. **leave** // disassociate from AP
    f. Green LED goes OFF



22. Microcontroller Can Look for UART comm Strings as Indication of TCP Connection Status:
    a. Factory reset
    b. **reboot**
    c. Associate with AP
    d. **set ip host** <*address*>
    e. **set ip remote 5000**
    f. **set comm open HAPPY**
    g. **set comm close HOLIDAYS**
    h. **set comm remote HAPPY_NEW_YEAR**
    i. **save & reboot**
    j. Enter command mode
    k. **open**
    l. See open string in Tera Term
    m. See remote string in PortPeeker
    n. Enter command mode
    o. **close**
    p. See close string in Tera Term

Tip: Microcontroller Can Read UART Open & Close Strings to Determine TCP Connection Status

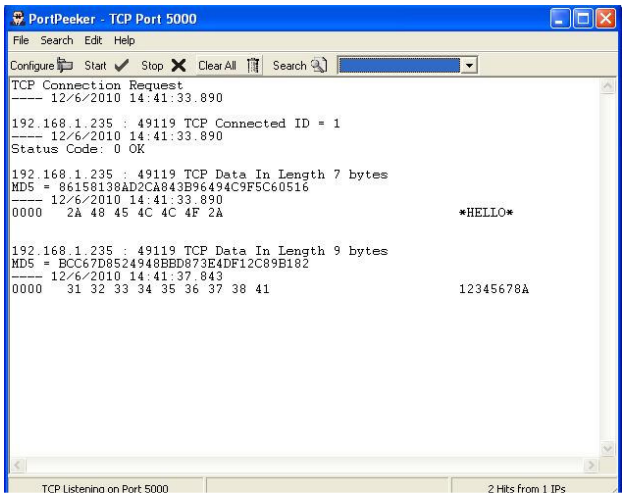
When data is written to the module's UART, the TCP packets are forwarded based on:

- Flush timer
- Flush size
- Match character

A TCP packet is sent when any of these events occur. The parameters are logically ORed to determine when a TCP packet is sent. When configured correctly, the module can be optimized for low latency or high throughput.

- Low latency: use lower flush timer value and flush size
- High throughput: use higher flush timer value and flush size

Tip: Module Tries to Optimize Automatically for Bandwidth by Increasing Default Flush Size with Higher Baud Rates



23. Forwarding Packets Based on Flush Timer
    a. **set comm timer 1000**
    b. **save**
    c. **open**
    d. Type text after TCP connection opens
    e. After you stop typing, TCP packet is sent 1 second later
24. Forward Packets Based on Match Character
    a. **set c t 0** ***(why do we send this command?)***
    b. **set comm match 65**
       This parameter expects ASCII decimal character or HEX value of the match character (e.g., 65 = Capital A)
    c. **save**
    d. **open**
    e. Type 12345678A
    f. TCP packet sent out after you type A character
    g. Observe packet in PortPeeker
25. What Do You Learn from Using 'get c' Command?

Lab 2 Conclusion

You have completed Lab 2. You have learned that:

- The module can open a TCP connection to the remote host and accept incoming connections from the remote host.
- Auto-Connect automatically opens a TCP connection
- The idle timer can automatically close a TCP connection
- Alternative GPIO functions allow a microcontroller to control and monitor TCP connections
- **comm open**, **close**, and **remote** strings can indicate the TCP connection status
- TCP packets are forwarded based on
  - Packet size
  - Match character
  - Flush timer

Lab 3:
Sleep/Wake Timers & FTP Client Mode

Purpose:

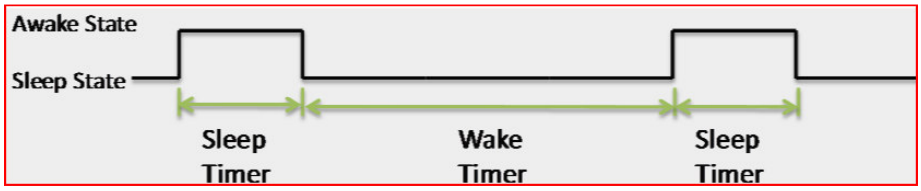
This lab will teach you how to:

- Configure the module in a low power state.
- Upgrade the module firmware via FTP.
- Create log files on FTP Server for
    - Data acquisition systems
    - Fleet management systems
    - Upgrade embedded CPU firmware

WiFly modules are designed to be ultra-low power. Therefore, you can build applications that can run on batteries for a prolonged time. To take advantage of the ultra-low power mode, put the module in a sleep state. The module draws 4 uA current while in a sleep state.

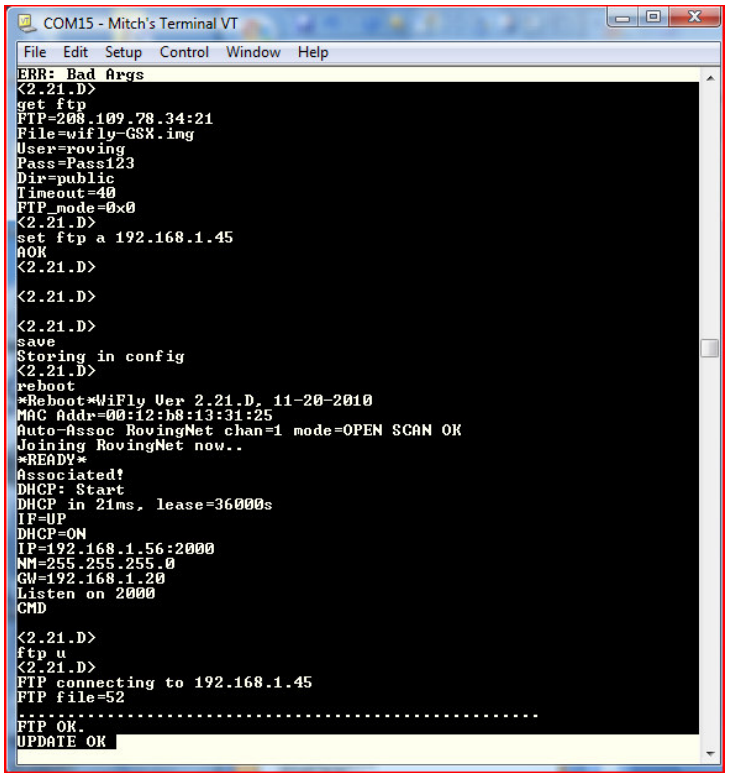
Mechanisms to Sleep	Mechanism to Wake
Sleep Command	Sensor Inputs (Sens 0-3 pins)
Sleep Timer	On RX data
GPIO 8 from micro controller	CTS pin from micro controller
	Force Awake pin from micro controller
	Wake Timer

Procedure:



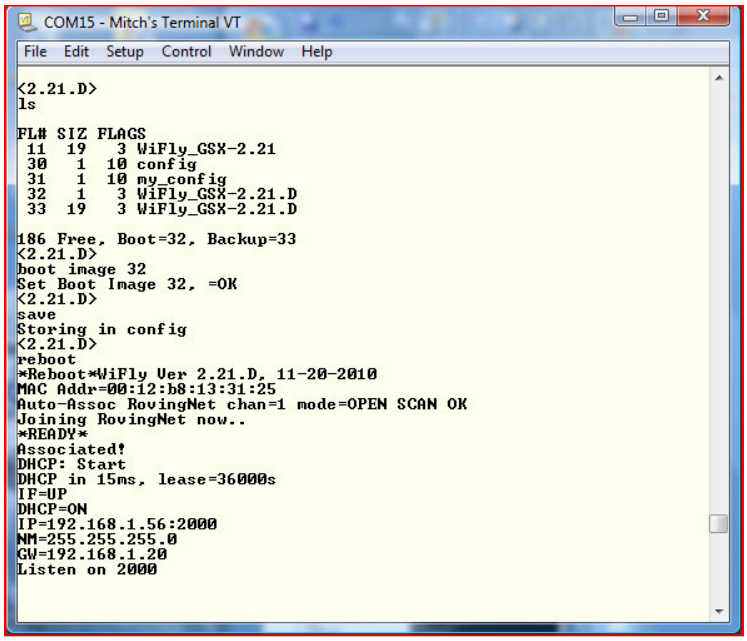
1. Configure module in sleep/wake cycle.
    a. Enter command mode.
    b. **factory R**
    c. Associate module with AP.
    d. **save** & **reboot**
2. Set Wake Timer: # Seconds in Deep Sleep before Wake Up.
    a. **set sys wake 10**
3. Set Sleep Timer: # Seconds before Entering Deep Sleep.
    a. **set sys sleep 5**
    b. **save** & **reboot**
    c. LEDs cycle on & off (except blue).
    d. Observe module reboot on wake up in Tera Term.

TIP: Do Not Set Sleep Timer to Less than 2 Seconds or It Is Hard to Go into Command Mode & Reconfigure Module before It Sleeps Again



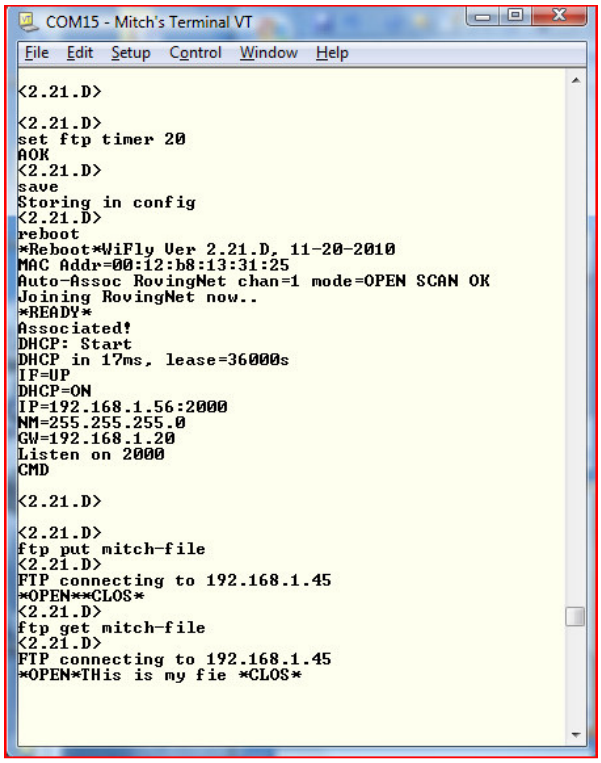
4. Module defaults to connect to Roving Network's FTP server.
5. Module must be associated to a network with Internet access.
6. Use Local FTP Server.
    a. Enter command mode
    b. **factory R**
    c. Associate module with AP
    d. **save** & **reboot**
7. Update Firmware.
    a. Enter command mode
    b. **set ftp address** *<local_FTP_server>*
    c. **ftp update**
    d. **ver**
    e. **reboot**
    f. Enter command mode
    g. **ver**

NOTE: After Downloading New Firmware, Restore Module to Factory Defaults Before Using It



The firmware is stored in embedded flash memory. The boot image is the firmware version that the module is currently running. After a successful update, the boot image changes to the new firmware file.

8. Change Boot Image
    a. Enter command mode
9. View Files in Flash
    b. Enter command mode
    c. **ls**
10. Change Boot Image
    d. Enter command mode
    e. **boot image** <*file_name*>
    f. **reboot**



The FTP client can stream files to/from an FTP server, which is useful in applications such as data logging. FTP servers can accept multiple clients concurrently.

11. Configure FTP Setup
    a. Enter command mode
    b. **factory R & reboot**
    c. Associate module with AP
    d. **set ftp address** <*address*> (e.g., ftp svr addr)
    e. **set ftp user** <*string*> (e.g., roving)
    f. **set ftp pass** <*string*> (e.g., Pass123)
    g. **set ftp dir** <*string*> (e.g., public)
    h. **set ftp timer 20**
    i. **save & reboot**
12. Create and Read File on Server
    a. Enter command mode
    b. **ftp put** <*string*>
    c. Type characters, wait until *CLOS* shown
    d. **ftp get** <*string*>

Lab 3 Conclusion

You have completed Lab 3. You have learned that:

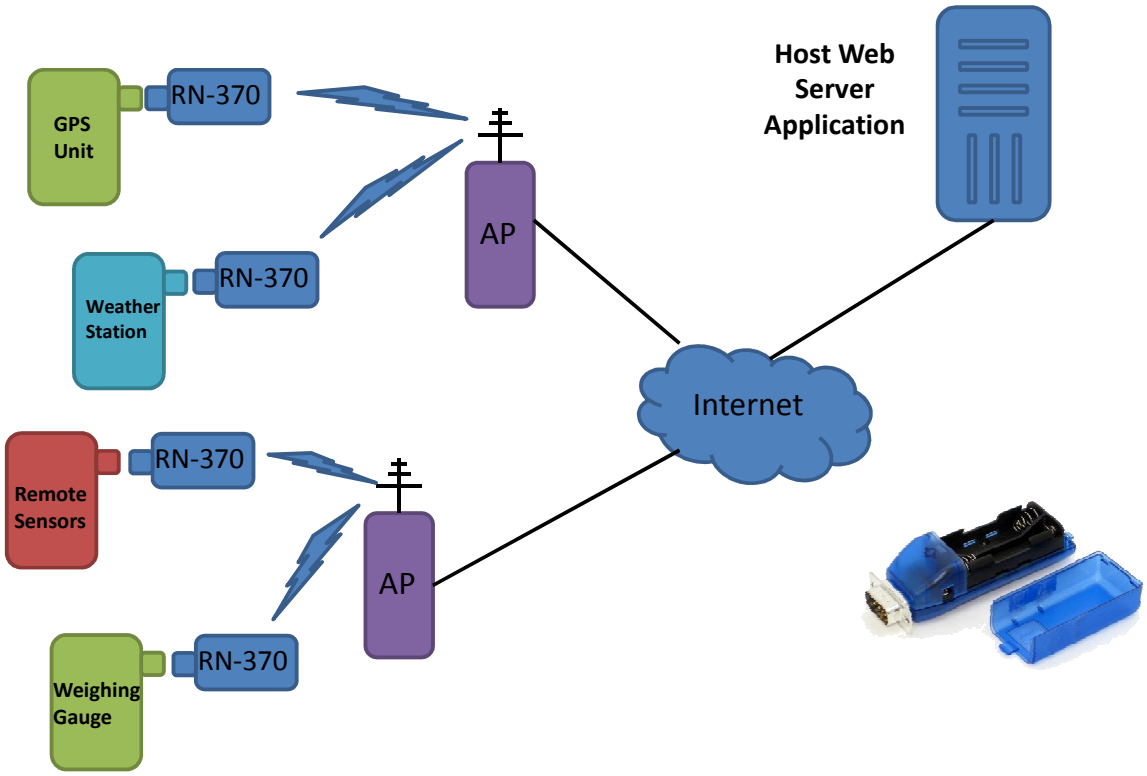
- Sleep and wake timers allow the module to deep sleep to save power and periodically connect to the network.
- You can use the FTP client to update firmware.
- You can use the FTP **put** and **get** commands to transfer files.
- FTP **put** combined with sleep/wake is useful for data logging applications.

Lab 4:
Enabling HTTP Client Mode

Purpose:

This lab will teach you how to:

- Program the module to post analog sensor data to web server without having to use a micro controller
- Configure the module to send data to a web server periodically
- Program module to wake up of different trigger options



HTTP mode allows you to analog sensor data and module data to a web server as key/value pairs. To enable this mode, use the **set ip proto 18** command. The module connects to a web server using the IP address or URL. The web server listens on port 80 (default) for incoming connections. For each request:

- Web server responds with **200 OK**
- Closes the connection

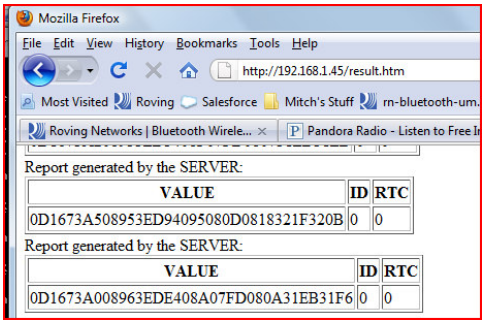
Procedure:

1. In HTTP Client Mode, Module Sends Request Message
   a. GET /server3.php?value=0F300000111122223333444455556666777\n\n
   b. Request message includes comm remote string & sensor readings
2. Configure HTTP Client Mode and Request Message
   a. Go into command mode
   b. Associate the module with AP
   c. **set ip proto 18** // Enable HTTP & TCP protocols
   d. **set ip host 0** // Set IP address if known
   e. **set dns name www.rovingnetworks.com** // Set DNS name if not
   f. **set ip remote 80** // Standard web server port
   g. **set comm remote GET$/server3.php?value=** // $ is replaced by space character
   h. **set q sensor 0xff** // Sample all sensors inputs
   i. **set option format 7** // Send header & sample sensor data
   j. **save & reboot**
   k. Enter command mode
   l. **open**

Format

2 Bytes GPIO	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7
0F30	0000	1111	2222	3333	4444	5555	6666	7777

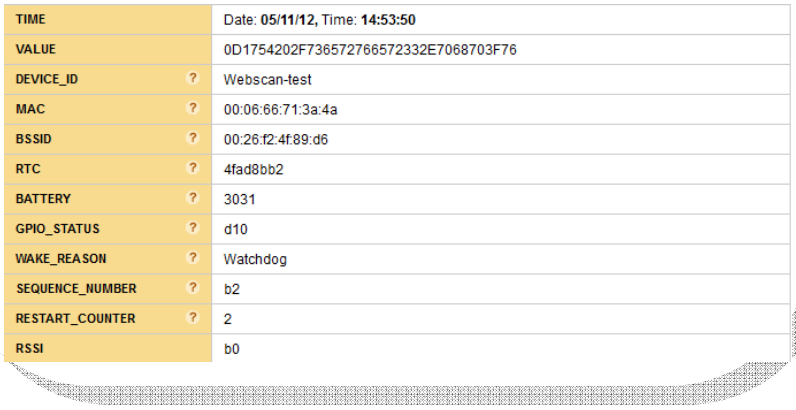
*OPEN*HTTP/1.1 200 OK
Date: Fri, 19 Nov 2010 19:24:07 GMT
Server: Apache
X-Powered-By: PHP/5.2.13
Connection: close
Content-Type: text/html
Server accepted values
ID: 0
VALUE: **0D16CF2907ED3EB640AB07E607F4321C3219**
RTC: 0
CLOS GPIO values Sensor Data



3. Open Web Browser. The PC must be associated with your AP connected to the internet
4. In Address Bar, type www.rovingnetworks.com/wiflys/view. Enter your MAC address to view the data posted by your module.
5. For this lab, go to the IP address of the local web server provided by the instructor. <IP_Address>/results.htm

Tera Term Output

*OPEN*SEND-WEBPOST
HTTP/1.1 200 OK
Date: Mon, 06 Dec 2010 17:56:28 GMT
Server: Apache
X-Powered-By: PHP/5.2.13
Connection: close
Content-Type: text/html
Server accepted values
 Device ID
ID: servertest
VALUE: 0D16CF2908043E8540200801080432363 23A
RTC: 3ad82
CLOS Real Time Clock



TIME	Date: **05/11/12**, Time: **14:53:50**
VALUE	0D1754202F736572766572332E7068703F76
DEVICE_ID	Webscan-test
MAC	00:06:66:71:3a:4a
BSSID	00:26:f2:4f:89:d6
RTC	4fad8bb2
BATTERY	3031
GPIO_STATUS	d10
WAKE_REASON	Watchdog
SEQUENCE_NUMBER	b2
RESTART_COUNTER	2
RSSI	b0

6. Append Device ID & RTC Value to Sensor Data so Server Can Identify It
    a. *Device String*: Appends **&id=**<*value*>, where <*value*> is device ID string set with **set opt device** <*string*> command
    b. *Real-Time Clock*: Appends **&rtc=**<*time*>, where <*time*> is real-time clock value in message as 32-bit HEX value in format aabbccddeeff
7. Turn Off Auto Connect
    a. Go into command mode
    b. Set sys auto 0
    c. Save & reboot
8. Append Device Name & RTC
    a. Go into command mode
    b. **set option device** <string>
    c. **time** // Get network time
    d. **set option format 31**
    e. **save & reboot**
9. Post Data
    a. Go into command mode
    b. **open**

The module can wake on receiving UART data, associate with an AP, and send a request message containing the UART data:

10. **factory R & reboot**
11. Associate module to AP
12. **set ip proto 18** // set HTTP client mode
13. **set ip host 0** // IP address of web server
14. **set dns name www.rovingnetworks.com** // OR DNS name
15. **set ip remote 80** // Web server port
16. **set comm remote GET$/server3.php?value=** // Set request message header
17. **set uart mode 2** // Automatically connect using trigger mode
18. **set sys trigger 1** // Wake up on uart RX data
19. **set sys sleep 10** // Put WiFly module to sleep after 10 seconds
20. **set option format 1** // Sends out HTTP header
21. **set comm timer 2500** // Allows multiple keystrokes per request
22. **save & reboot**

In Tera Term, type characters to wake the module, associate to AP, and send data as an HTTP message to the web server.

NOTE: You Cannot Send both Sensor & UART Data in Same Request Message.

```
OPEN*SEND-WEBPOST
HTTP/1.1 200 OK
Date: Mon, 06 Dec 2010 18:25:36 GMT
Server: Apache
X-Powered-By: PHP/5.2.13
Connection: close
Content-Type: text/html
Server accepted values <br />
ID: 0<br />
VALUE: oving      ← Data with first byte missing
RTC: 0
*CLOS*
```

When serial UART data arrives, the module auto-connects to the web server and sends:

GET /server3.php?value=<*user's serial data*> \n\n

NOTE: First Data Byte Dropped because Module Must Initialize before Sending Data over Wireless Interface. To Avoid This Issue, the Module Should Wake on CTS Signal Using **set sys trigger 2** or Send First Byte Twice.

Lab 4 Conclusion

You have completed Lab 4. You have learned that:

- Module Supports HTTP Client Mode Natively
- When Configured, the Module Can Append
  - GPIO values
  - Sensor data
  - Real-time clock
  - Device name
  - UART data
- Module Can Wake Up on UART Data
  - May result in dropping first byte
  - Waking up on CTS is better option

Lab 5:
Access Point (AP) Mode

Purpose:

This lab will teach you how to:

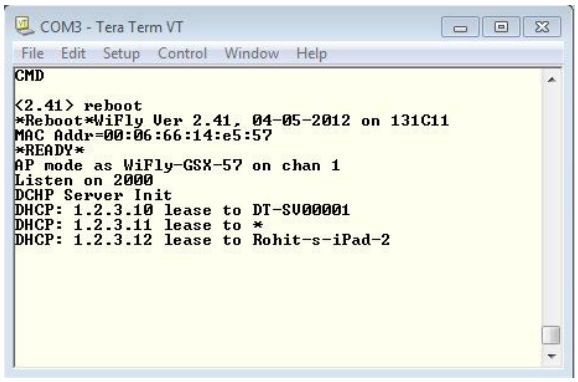
- Create a default AP network.
- Create a custom AP network in software.
- Connect to the AP network created by the module.
- View associated devices and lease times.

Roving Networks' modules now have the capability to act as a soft access point. The advantages of this mode are:

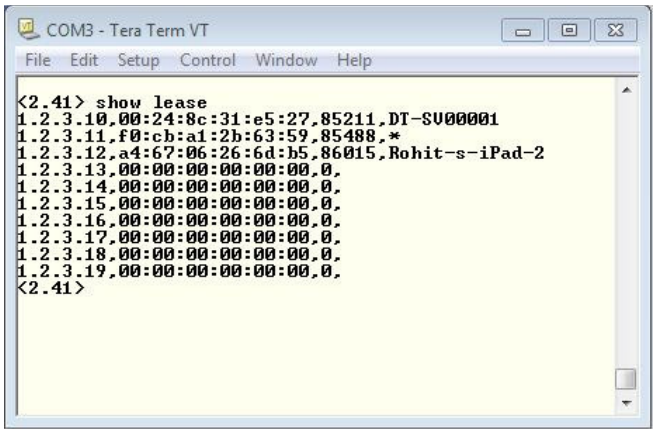
- Enables Android devices to talk to modules without need for infrastructure
- Runs a DHCP server
- Supports up to 7 clients
- Supports routing between clients
- Will support WPA2-AES personal security in future

Procedure:

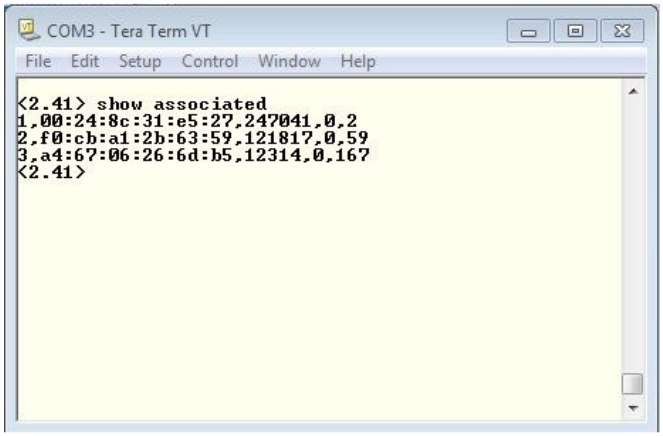
1. Download Firmware Supporting AP Mode via FTP
   a. RN-131: **ftp update wifly-242.img**
   b. RN-171: **ftp update wifly7-242.img**
   c. RN-370: **ftp update wiflyA-242.img**
2. Install Jumper at J6 to Enable AP Mode in Hardware
   a. SSID: WiFlyAP-*XX*, where *XX* is last two bytes of MAC address
   b. Channel: 1
   c. DHCP server: Enabled
   d. IP address: 1.2.3.4
   e. Netmask: 255.25.5255.0
   f. Gateway: 1.2.3.4
3. Create Custom AP Network with User-Defined Settings
   a. **set wlan join 7** // Create AP mode network
   b. **set wlan channel** <*value*> // Specify channel to create // network
   c. **set wlan ssid** <*string*> // Set up network SSID
   d. **set ip dhcp 4** // Enable DHCP server
   e. **set ip address** <*address*> // Specify IP address
   f. **set ip net** <*address*> // Specify subnetmask
   g. **set ip gateway** <*address*> // Spcify gateway
   h. **save** // Store settings
   i. **reboot** // Reboot module in AP mode



4. From PC/Mobile Phone/Tablet, Connect to Module-Created Network. The module Displays Client's Device Name.



5. View Device Lease Times using the **show lease** command.



6. View List of Connected Devices using the **show associated** command.