

Application Note:

Demo programs for using the Lantronix® standard tunnel with a Kinetis™ microcontroller and the xPico® Wi-Fi® Tower Board

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Lab Setup

For the following labs, connect an xPico® Wi-Fi® Tower Board and a Freescale™ Kinetis™ K60 Tower board into the Tower system. Other microcontroller boards can be used, however the firmware will slightly change as different MCU boards have different connections for the Tower system serial ports.

Prior to running the labs, download and install CodeWarrior™ for Microcontrollers 10.x Special Edition, then download and install MQX 4.x from Freescale™.

Jumper settings

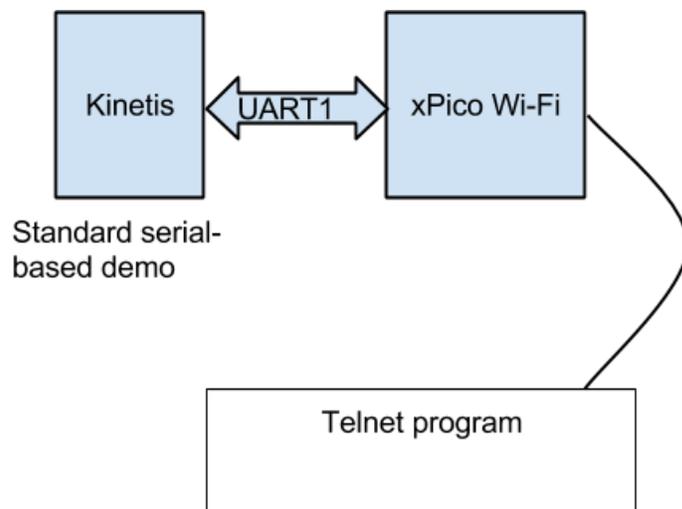
xPico Wi-Fi board:

- ◆ JP16 through JP19, set to 2-3
- ◆ JP5 and JP7 set to 2-3
- ◆ Everything else default

K60 board:

Make sure J6 is set 1-2 to have the on-board 50MHz feed the peripherals. If you've used this board with the TWR-SER, it would normally be set to 2-3.

Lab 1: Transparent Tunnel



1. In CodeWarrior, click on **File -> Import**. In the dialog box that comes up, select “Existing Projects into Workspace” under the General folder. Click Next.
2. Navigate to the C:\Freescale\Freescale_MQX_4_0\mqx\build\cw10\bsp_twrk60n512 directory and click OK.
3. Make sure bsp_twrk60n512 is checked, and click Finish.
4. Open the user_config.h file in the bsp_twrk60n512 project and configure:

- a. Under UART3 Settings:
 - i. BSPCFG_ENABLE_ITTYD set to true
 - ii. BSPCFG_ENABLE_TTYD set to false
 - iii. BSPCFG_SCI3_BAUD_RATE stays at 115200
- b. Under UART4 Settings:
 - i. BSPCFG_ENABLE_ITTYE set to true
 - ii. BSPCFG_ENABLE_TTYE set to false
 - iii. BSPCFG_SCI4_BAUD_RATE set to 9600
- c. Under Default MQX initialization parameters
 - i. BSP_DEFAULT_IO_CHANNEL set to "ttyd:" (this makes the default IO output for printf be the serial port on the Kinetis part instead of OSJTAG)
5. Save the user_config.h file.
6. Click on the Build button to re-compile the K60 BSP library. This makes the edits in the user_config.h file take effect.
7. Click on **File->Import** in the menu bar. In the dialog box that comes up, select "Existing Projects into Workspace" under the General folder. Then click **Next**.
8. Navigate to the C:\Freescale\Freescale_MQX_4.0\demo\hvac\cw10\hvac_twrk60n512 directory and hit **OK**.
9. Make sure hvac_twrk60n512 is checked, and click **Finish**.
10. Once the project is imported, make sure that the Int Flash Debug configuration is set for the project.
11. Connect USB cable to the OSJTAG USB connector on the K60 board.
12. Select the hvac_twrk60n512 project, go to Run->Debug As->CodeWarrior Download.
13. Make sure that your laptop Wi-Fi is connected to the xPico Wi-Fi device's SoftAP:
 - a. Look for SSID xPicoWiFi_xxxxxx where the last 6 characters are the last 6 characters of the xPico Wi-Fi serial number
 - b. Default password is XPICOWIFI
14. Once the Debugger window is active, click on the Resume button to start executing the demo
15. Open a telnet session to IP address 192.168.0.1 and port 10001.
16. You will now see the serial Shell interface of the HVAC demo. Follow the Freescale demo instructions to see available commands.
17. After done, re-open user_config.h in the BSP and edit:
 - a. BSP_DEFAULT_IO_CHANNEL back to "ttyf:"
18. Re-build the BSP

Lab 2: Connect xPico Wi-Fi to Infrastructure Network

1. By default the SoftAP mode is enabled with a default SSID of xPicoWiFi_xxxxxx. Where xxxxxx are the last six characters of the unique xPico Wi-Fi serial number. This number is available on the module label. For example if the serial number.
2. Connect your device to the xPico Wi-Fi device's Soft AP SSID. The default password is XPICOWIFI.
3. Open a standard browser and in the address field of the browser enter the following URL; xpicowifi.lantronix.com or alternatively use 192.168.0.1 as the IP Address.
4. When prompted enter the username of admin and password PASSWORD to access the Configuration and Management Web pages.

The screenshot displays the xPico Wi-Fi configuration web interface. The interface has a header with the 'xPico Wi-Fi' logo and the 'LANTRONIX' brand name. On the left side, there is a navigation menu with the following items: QuickConnect, Status (highlighted with a home icon), Filesystem, HTTP, Line, Network, System, Tunnel, and WLAN Profiles. The main content area is divided into several sections:

- Product Information:**

Product Type:	xPicoWifi
Firmware Version:	1.0.0.0R5
Build Date:	Jun 12 2013 (17:01:35)
Serial Number:	0080A338010B
Uptime:	0 days 02:44:43
Permanent Config:	saved
- Network Settings:**
 - Interface (ap0):**

State:	Up
SSID:	XpicoWiFi_98010B
Security Suite:	WPA2
IP Address:	192.168.0.1
 - Interface (wlan0):**

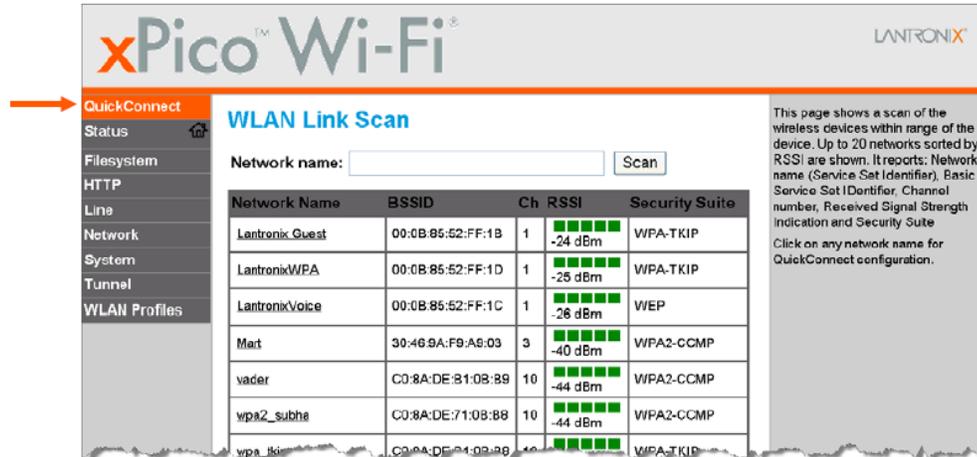
Connection State:	Connected
Radio Firmware Version:	2.2.1
Active WLAN Profile:	skynet
IP Address:	172.19.100.89/16
Default Gateway:	172.19.0.1
Hostname:	
Primary DNS:	172.19.1.1
Secondary DNS:	172.19.1.2
 - Line Settings:**

Line 1:	9600, None, 8, 1, None Tunnel
Line 2:	9600, None, 8, 1, None Trouble Log
 - Tunneling:**

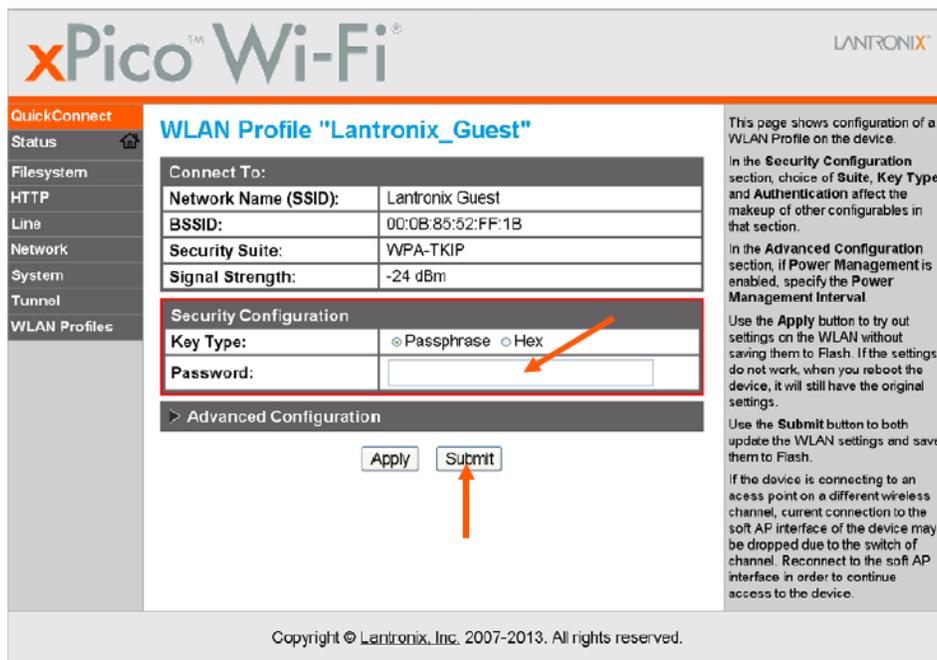
Tunneling	Accept Mode
Tunnel 1:	Waiting

At the bottom of the interface, there is a copyright notice: Copyright © Lantronix, Inc. 2007-2013. All rights reserved.

5. Click on **QuickConnect** on the left side bar.



6. Upon selection of the QuickConnect option, the xPico Wi-Fi scans and displays up to 20 wireless devices in order of strongest signal strength at the top. Click on a network name to view the connection to that desired Access Point.
7. When the selected Access Point profile displays, enter the password and click Submit to directly connect to the Access Point and to add the profile and configuration details to the WLAN profiles.



8. Click on Status, then look for "IP Address" under Interface (wlan0) to see the IP address that was assigned to the xPico Wi-Fi by the infrastructure network.
9. You can now connect to the xPico Wi-Fi from the infrastructure side and the Soft AP side.
10. Configure the tunnel for the later labs:
11. Click on **Tunnel** on the left side bar, then **Accept**.
 - a. Mode is Always
 - b. Local Port 10001

- c. Protocol TCP
- d. Flush Line Enabled
- e. Block Line and Network Disabled

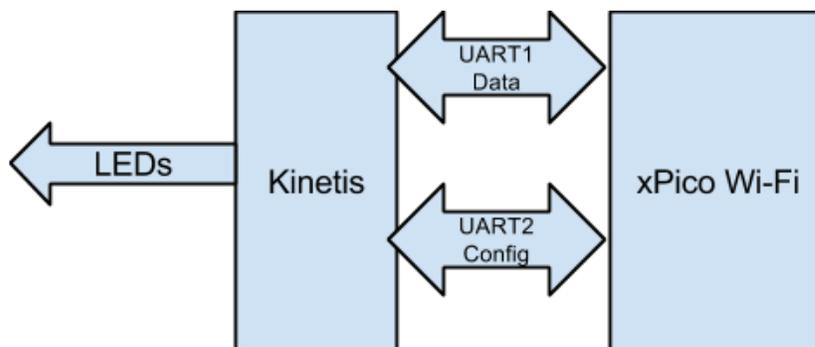
12. Click on **Connect**.

- a. Mode is Start Character
- b. Start Character is <control>B
- c. Flush Start Character Enabled
- d. Host 1 is ltrxpost.appspot.com, Port is 80
- e. Reconnect Time is 15 seconds
- f. Flush Line Disabled
- g. Block Line and Block Network Disabled

13. Click on **Disconnect**.

- a. Stop Character <control>A
- b. Flush Stop Character Enabled
- c. Timeout 10000
- d. Flush Line Enabled

Lab 3: Toggle LEDs with Standard Tunnel



The Kinetis microcontroller runs a custom program that receives commands via a UART. These commands cause it to toggle the state of the LED indicators that are on the Kinetis board. The user controls these commands from the network side using the xPico Wi-Fi standard tunnel connection.

The second UART is connected for sending status information from the xPico Wi-Fi to the Kinetis microcontroller. This status information is sent in response to the commands via the first UART.

1. Unzip the source code with this lab into a directory.
2. xPico Wi-Fi tunnel configuration must be set per instructions in Lab 2.
3. In CodeWarrior, click on File -> Import. In the dialog box that comes up, select "Existing Projects into Workspace" under the General folder. Click **Next**.
4. Navigate to where you unzipped the file, and select the XPW_DEMO directory, click **OK**.

5. Right click on XPW_DEMO, go to Debug As->CodeWarrior Download.
6. Once the Debugger window is active, click on the Resume button to start executing the demo.
7. Telnet into the IP address of the device, port 10001. If you enter a 1, you will toggle LED1 on the Kinetis board. Enter a 2, and it will toggle LED2. The response will be the current status of the LEDs, the SSID that the xPico Wi-Fi is connected to, the IP address, and the RSSI on the Client connection.
8. As an alternative to Telnet, use the Android application found in the zip file to access it.
 - a. If your Android device is connected via Wi-Fi to the Soft AP of the xPico Wi-Fi, set the IP address to 192.168.0.1.
 - b. If your Android device is connected to the same AP as the xPico Wi-Fi Client side, then use the xPico Wi-Fi IP address.

Lab 4: Post Data to the Cloud

The program running on the Kinetis processor reads the status of the potentiometer on the K60 board. When it changes, it opens an outbound connection to a Google App Engine custom application via the xPico Wi-Fi standard tunnel. It then sends an HTTP packet to post the data from the potentiometer to the Cloud.

1. Make sure that the xPico Wi-Fi is connected to an infrastructure network that has internet access.
2. The Kinetis K60 should be running the same firmware used in the previous lab.
3. The xPico Wi-Fi Tunnel configuration should be set the same as Lab 2.
4. Rotate the potentiometer in the K60 Tower board.
 - a. The LED for Serial 1 will blink, indicating that the xPico Wi-Fi is sending and receiving data.
5. Using a web browser, navigate to <http://ltxpost.appspot.com>.
6. Find the serial number of your xPico Wi-Fi on the left hand side and click on it.
7. The data being posted each time the potentiometer is moved will show up in the main part of the window.