freescale TWR-LS1021A System Module User Guide

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Quick Start Rev. 0, 12/2015

Contents

QorIQ TWR-LS1021A OOBE Demo Quick Start

1 Introduction

The new TWR-LS1021A-PB development board is the most feature rich and high performance Tower system module offered by Freescale. This board enables compatibility and interoperability with other tower expansion modules. It provides an easily accessible and interchangeable suite of capabilities and features to support rapid prototyping and software development. The TWR-LS1021A-PB board is engineered to enable a wide range of applications, from IoT Gateways to industrial controllers, Secure Access Points, and asset management systems.

The module offers a high level of integration, excellent balance of performance-to-power, and robust capability delivered by the QorIQ LS1021A communications processor (which offers dual ARM Cortex-A7 cores running at up to 1 GHz delivering over 5,000 Coremarks of performance at a typical power level of under 3 watts). This platform also provides a comprehensive level of security, which includes secure boot, Trust Architecture, and tamper detection, in both standby and active-power modes.

This document describes how you can run the out-of-box-experience (OOBE) demo program, which shows the wireless networking, graphics, and audio playing functionalities of the TWR-LS1021A-PB board.

The access point features demo on LS1021A TWR platform is illustrated in the figure below.

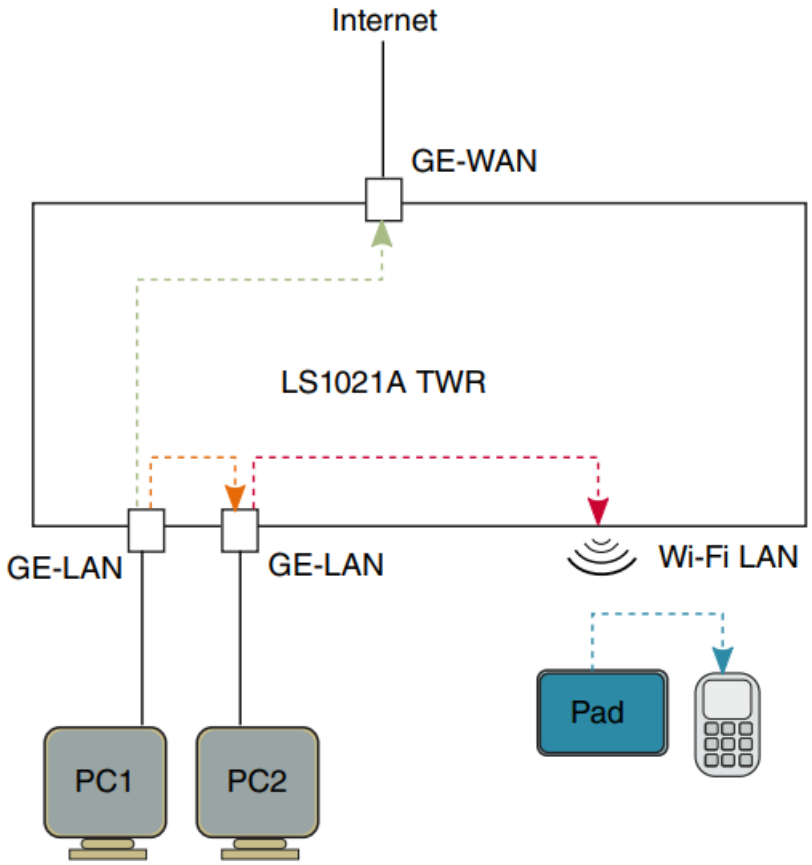


Figure 1. Access point features demo

This document covers the following sections:

- Features of the TWR-LS1021A OOBE demo
- Hardware requirements for the demo
- Preparing the board for the demo
- Setting up the TWR board
- Running the demos

2 TWR-LS1021A OOBE demo features

This section describes the features of wireless access point and the slideshow presentations using the TWR-LS1021A-PB board.

Wireless access point:

- Three Ethernet ports and a Wi-Fi card – one Ethernet port as WAN and other Ethernet ports, Wi-Fi as LAN
- DHCP client/server
- Route and NAT (IP tables, IP route2)
- Wireless bridging

Slideshow presentation:

- Audio decoding/playing of MP3 at 128 kbit/s / 44.1 kHz (LAME/ALSA)
- LS1021A product family overview
- TWR-LS1021A overview
- TWR-LS1021A use cases

3 Hardware requirements

For all the features to be demonstrated, the following are required:

- TWR-LS1021A-PB board – QorIQ LS1021A Tower system module
- SD card (included with the TWR-LS1021A-PB board)
- HDMI display and an HDMI cable or TWR-LCD-RGB Graphical LCD Tower system module with RGB interface and the TWR-ELEV Tower system Elevator module
- USB mouse and keyboard
- Wired speakers with 3.5mm jack

Wireless access point-specific requirements:

- Mini PCIe wireless access card (for example: Atheros AR9287)
- Antennas (for example: Pulse Electronics Corporation W1038)
- Internet connection
- Wireless devices (for example: smart phones, laptops, and tablets)
- Wired (Ethernet RJ45) devices

NOTE

> For the Wi-Fi function, only Atheros AR9287 (mini PCIe card) is supported. And for the wired connectivity (Ethernet), RJ45 (up to 1000BaseT) is supported. Further, a maximum resolution of 1024×768 is supported on Dell displays.

3.1 Kit contents

The table below lists the standard kit contents of the TWR-LS1021A-PB board shipment:

Item number	Description	Quantity
700-28673	PWA, TWR-LS1021A-PB	1
600-76796	Cable, USB Type A male/Type Mini B male 3 feet	1
400-76004	Power supply (100/240V INPUT, 5V 6A output)	1
600-76809	Cable, US AC outlet, 5 feet, BLACK ROHS	1
600-77111	Cable, SATA power cable, 4P type connector to SATA power connector	1
901-76758	HW accessory, universal adaptor	1
979-28673	Packout, Standard final PDC PKG, accessories include SD Card, USB-Disk and Bracket	1
926-28673	Quick Start Guide, TWR-LS1021A-PB	1

4 Preparing the system for the demo

For preparing the system for the demo, you should –

- Prepare the SD card
- Configure the TWR-LS1021A-PB board

4.1 Preparing SD card for demo

The image files for the demo are available on the SD card shipped with the board. You should insert the SD card into the board to run the demo. However, if the SD card is not available or the image files have become corrupt, you need to prepare an SD card for the demo. For detailed instructions on formatting and preparing the SD card for the demo, see Preparing SD card for demo.

4.2 Configuring the board

To run the demos described in this guide, the SDK on the TWR-LS1021A-PB board must be re-flashed. If this has not been done earlier, see Configuring the TWR-LS1021A board for detailed instructions on flashing the board.

However, if you have already flashed the board, proceed to the next section.

5 Setting up TWR-LS1021A-PB board

This section describes setting up the TWR-LS1021A-PB board, adding other hardware for the demos, and configuring the board for the first time. This is a one-time activity that need not be done again for running any of the demos.

To set up the TWR-LS1021A-PB board:

1. Set the switch settings as described here (see the figure below for illustration).

- For NOR flash boot:

- Switch the SW3[5] to 0 (bank0)
- SW2[1:8] 0x10001111, SW3[1:8] 0x01100001

- For SD card boot:
  - Switch the SW3[1] to 0
  - Set the SW2[1:8] to 0x00101111
  - SW2[1:8] 0x00101111, SW3[1:8] 0x01100001

Figure 2. Switch/jumper settings and console port

1. +5V Power
2. UART/USB Console
3. SW2 [1:8] ON OFF OFF OFF ON ON ON ON
4. SW3 [1:8] OFF ON ON OFF off OFF OFF ON

2. Using a USB UART cable, connect the console port to a PC as shown in the figure.
3. Configure the console port using a terminal emulation program like TeraTerm, with the following parameters:

Baud rate	115200
Data	8 bits
Parity	No
Stop bit	1 bit
Flow Control	None

4. Plug in the Wi-Fi Card and insert the SD card as shown in the figure below.

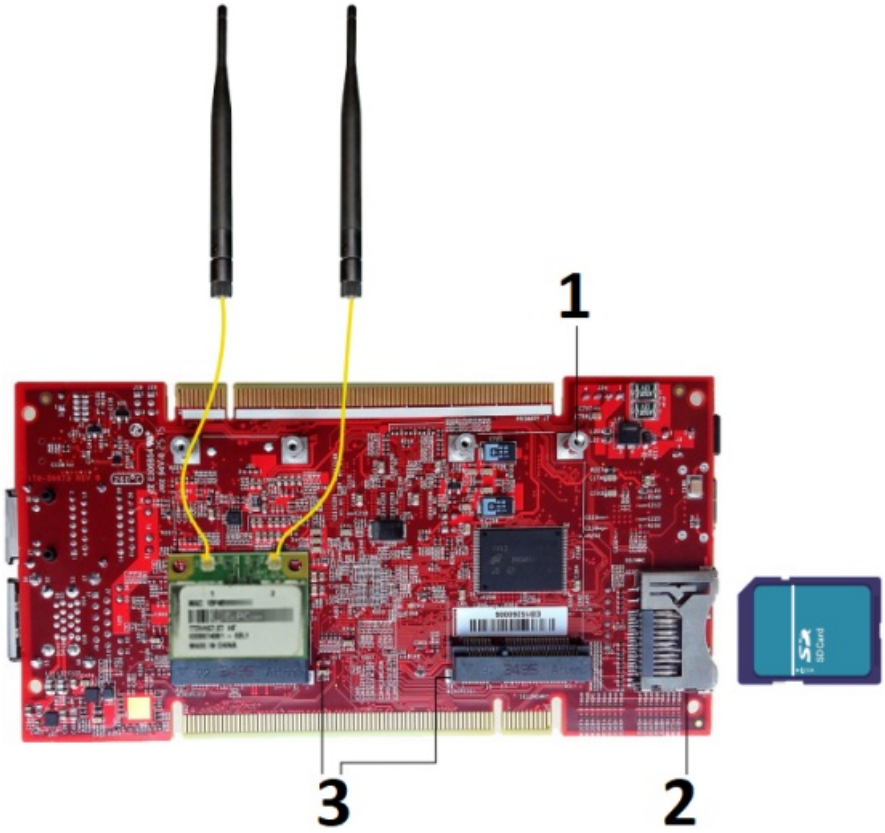


Figure 3. Inserting mPCIe Wi-Fi card and SD card

1. Mini PCIe mounting posts
2. SD Card slot
3. Mini PCIe

5. Add the remaining hardware as explained below:

NOTE

For this, you need the following additional hardware:

- HDMI cable to connect the monitor or the TWR-RGB-LCD display, as required. Note that you can use either the HDMI display or the LCD display at any given point of time.
- USB keyboard and mouse
- Ethernet cable to connect the TWR card to the Internet and the computer on LAN

- If you want to use a HDMI monitor/TV, connect it using a HDMI cable. For an illustration of the same, see Figure 4 below.
- If you want to use the TWR-RGB-LCD, plug it into the secondary TWR-EVEL. For an illustration of the same, see Figure 5 below.
- Plug in the USB keyboard and mouse.
- Plug in the WAN/Internet network cable.

The figure below shows setting up the hardware using the HDMI display.

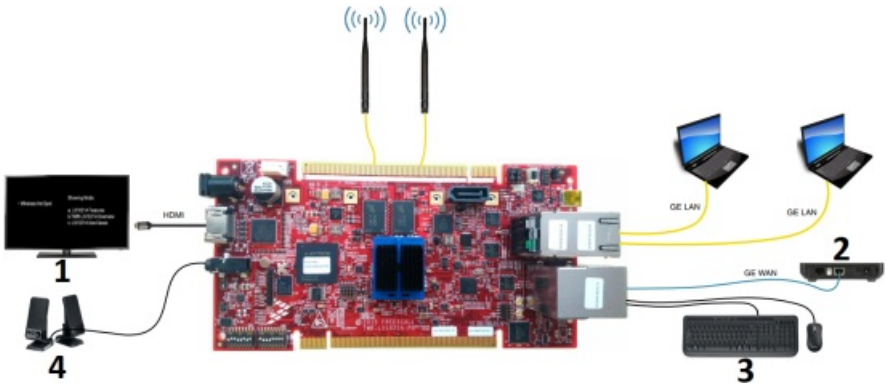


Figure 4. Hardware configuration using HDMI

1. TV or Monitor
2. Internet
3. USB keyboard and mouse
4. Wired speaker with 3.5mm plug

The figure below shows setting up the hardware using the LCD display.

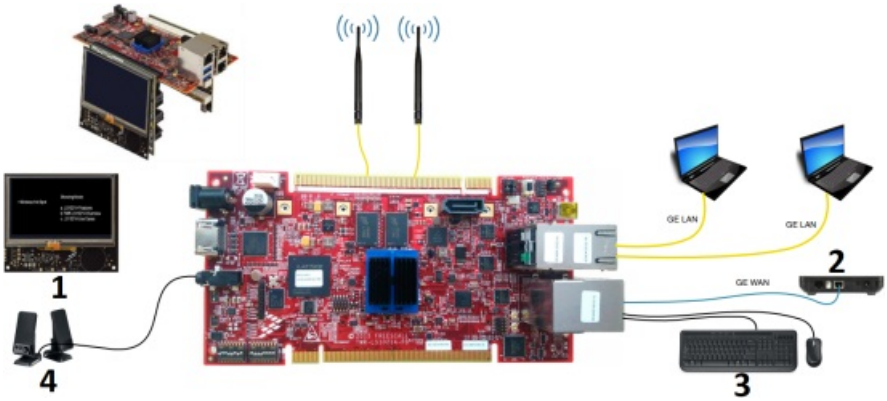


Figure 5. Hardware configuration using TWR-LCD-RGB

1. TWR-LCD-RGB
2. Internet
3. USB keyboard and mouse
4. Wired speaker with 3.5mm plug

6 Running the demos

To boot the system and display the main menu, run the command =>run sdboot.

You can see the main menu on the LCD/HDMI display as shown below.

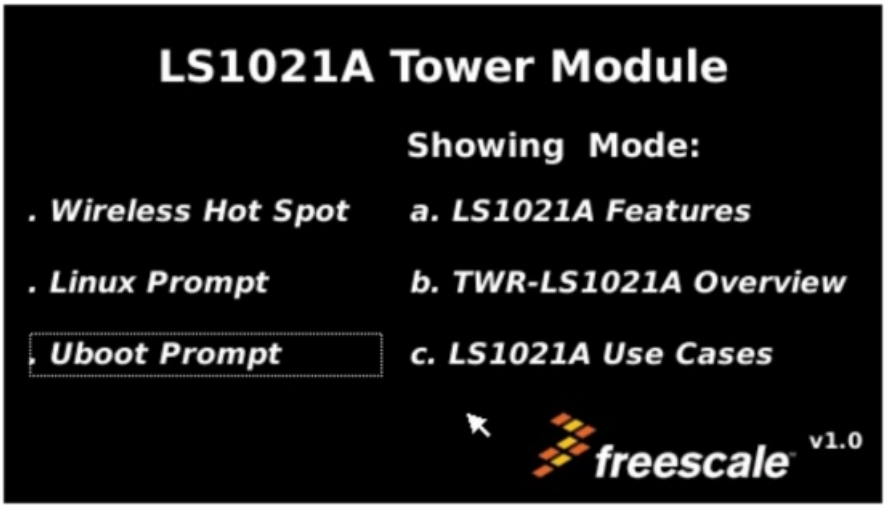


Figure 6. Main menu

The following table describes the options in the main menu:

Option	Description
Wireless Hot Spot	Select this option to configure the TWR-LS1021A-PB board into a Wi-Fi Access-Point/router and view the wireless networking status or log information.
Linux Prompt	Select this option to view the steps to boot with alternative uImage, rootfs, dtb images.
Uboot Prompt	You can view instructions to flash new RCW and/or U-Boot images to the board.
Slideshow mode	You can play the corresponding slides with audio.

6.1 Wireless hotspot

This section describes the networking functionality of the demo. To do so:

1. Check and ensure that the WAN network and the wireless card are plugged in.
2. To start the network demo, click the **Start** button at the bottom left corner of the screen. See the figure below for reference.

Figure 7. Wireless hotspot menu

You can see the network demo starting in the NetWork Info window on the right.

3. Wait for a few seconds. You will see netdemo start… end; This indicates that the networking functionality of the demo has started successfully.
4. To connect wireless devices such as smart phones and tablets, to the board, use the following credentials:

SSID: Freescale_LS1021A
Password: 12345678
You can see the information about the wireless devices connected to the board under **Wifi Client** window on the left.

5. To go back to the main menu, click the **Exit** button at the bottom-right corner of the screen.
6. To stop the networking activity and disconnect all the devices, click the **Stop** button at the bottom-left corner of the screen.

6.2 Slideshow mode

The Slideshow Mode contains the following slide shows that provide more information on the TWR-LS1021A board.

- LS1021A features
- TWR-LS1021A Overview
- LS1021A Use Cases

In the slideshow mode, use the following keys to navigate between the slides:

Key/Mouse click	Action
Page Down, Right Arrow, Down Arrow, Enter key, or lef t click on the mouse	To go to the next page
Page Up, Up Arrow, Left Arrow, or right click on the mo use	To go to the previous page
Space	To pause or resume the slide show
Home key	To go to the first page
End key	To go to the last page
Esc key	To exit playing and go back to the main menu

Appendix A Preparing SD card for demo

If you are using an SD card that was not shipped with the TWR-LS1021A-PB board, it should be formatted and prepared before it can be used for the demo. To support booting the system from the SD card, instead of NOR flash, you should preserve a given space at the beginning of SD card (for example 2 MB or 4 MB). On a Windows PC, you may use any third party tool to partition the SD-card.

To prepare the SD card on a Linux PC:

1. Use the fdisk command to partition the SD card to a single W95 FAT32 partition, starting from sector 8192.
2. Run the mkfs.vfat command to format the above partition
3. Using the dd command and copy u-boot-with-spl-pbl.bin to the boot sector of the SD card.

NOTE

You can find the u-boot-with-spl-pbl.bin on the USB stick shipped with the board

See an illustration of preparing the SD card on a Linux PC below:

$sudo fdisk/dev/sdb

Command (m for help): n
Partition type:

p primary (0 primary, 0 extended, 4 free)
e extended

Select (default p):
Using default response p
Partition number 1-4, default 1):
Using default value 1
First sector (2048-15523839, default 2048): 8192
Last sector, +sectors or +size{K,M,G} (8192-15523839, default 15523839): +400M

Command (m for help): t
Selected partition 1
Hex code (type L to list codes): b

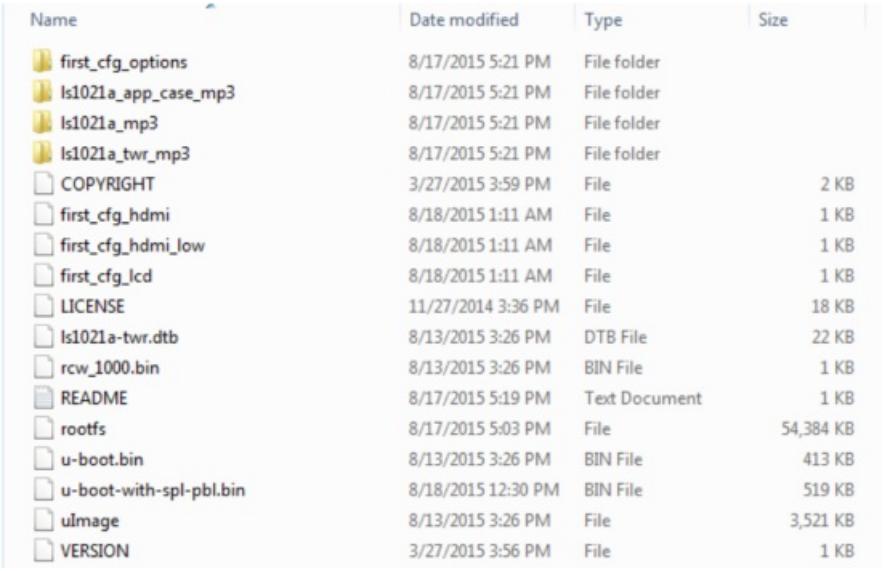
Changed system type of partition 1 to b (W95 FAT32)

Command (m for help): w
The partition table has been altered!

$sudo mkfs.vfat/dev/sdb1
$sudo dd if=u-boot-with-spl-pbl.bin of=/dev/sdb bs=512 seek=8

Insert the SD card in a Windows PC and copy all files under \OOBE-demo\SDcard\ folder of the USB stick to the root directory of the SD card. The total size of this folder is less than 100 MB.

The figure below shows the files to be copied to the SD card.



Name	Date modified	Type	Size
first_cfg_options	8/17/2015 5:21 PM	File folder	
ls1021a_app_case_mp3	8/17/2015 5:21 PM	File folder	
ls1021a_mp3	8/17/2015 5:21 PM	File folder	
ls1021a_twr_mp3	8/17/2015 5:21 PM	File folder	
COPYRIGHT	3/27/2015 3:59 PM	File	2 KB
first_cfg_hdmi	8/18/2015 1:11 AM	File	1 KB
first_cfg_hdmi_low	8/18/2015 1:11 AM	File	1 KB
first_cfg_lcd	8/18/2015 1:11 AM	File	1 KB
LICENSE	11/27/2014 3:36 PM	File	18 KB
ls1021a-twr.dtb	8/13/2015 3:26 PM	DTB File	22 KB
rcw_1000.bin	8/13/2015 3:26 PM	BIN File	1 KB
README	8/17/2015 5:19 PM	Text Document	1 KB
rootfs	8/17/2015 5:03 PM	File	54,384 KB
u-boot.bin	8/13/2015 3:26 PM	BIN File	413 KB
u-boot-with-spl-pbl.bin	8/18/2015 12:30 PM	BIN File	519 KB
uImage	8/13/2015 3:26 PM	File	3,521 KB
VERSION	3/27/2015 3:56 PM	File	1 KB

Figure A-1. Files to be copied to the SD card

NOTE

You can also download the images from the website http://url.freescale.net/sdk18.

This completes preparing of the SD card for the demo.

Appendix B Configuring the TWR-LS1021A board

This section explains flashing/configuring the TWR-LS1021A-PB board for the first time. To configure the board:

1. Power on the TWR-LS1021A-PB board and stop at the U-Boot prompt by pressing any key before it boots into Linux.
2. Configure the demo using the commands below.

NOTE

This is a one-time configuration and you can skip this step if you have already run the demo earlier.

a. To set the MAC address for each eTSEC port for Linux kernel, use the following commands:

```
=>setenv ethaddr xx:xx:xx:xx:xx:xx
=>setenv eth1addr xx:xx:xx:xx:xx:xx
=>setenv eth2addr xx:xx:xx:xx:xx:xx
```

NOTE

xx:xx above, indicates the MAC address values. See the labels on the TWR board's eTSEC ports for the exact values.

b. To load the configuration script for setting up LP-UART console port and LCD/HDMI display, use the following commands:

- For TWR-LCD-RGB:

```
=>fatload mmc 0 82000000 first_cfg_lcd
```

- For HDMI 1920×1080 (non-Dell brand) wide screen display:

```
=>fatload mmc 0 82000000 first_cfg_hdmi
```

- For HDMI (other displays):

```
=>fatload mmc 0 82000000 first_cfg_hdmi_low
```

c. To run the configuration script:

```
=>source 82000000
```

Wait till this operation completes and the prompt returns to =>

You may now reboot the system using the reboot command and run the demo.

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Documents / Resources

	freescale TWR-LS1021A System Module [pdf] User Guide TWR-LS1021A System Module, TWR-LS1021A, System Module

References

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