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Welcome to the Wind River VxWorks 7 for Makers. Using the evaluation environment provided in this kit you will be able to quickly get started running the VxWorks real-time operating system on the Intel Galileo and using Wind River’s professional development tools.

1.1 Overview

This evaluation will lead you through the steps required to run Arduino examples on VxWorks and outline how Wind River tools can aid in the debugging and analysis of embedded systems based on the Intel Galileo.

During this evaluation you will work with two separate systems:

- A host computer on which you will perform tasks such as building VxWorks, analyzing test results and debugging code. You can use almost any modern laptop or desktop PC as a host computer. The preferred specification for the host computer is listed in section 1.2.3 Host Computer Specification.
- An Intel Galileo, referred to as a target system, on which VxWorks will run.

During the evaluation you will connect these two systems together (using serial and Ethernet connections) and use them in cross-development mode. In this mode you will run Wind River Workbench Development Suite on your host computer to write, build, and debug software code that will run on the Intel Galileo.

1.2 What Is Required for the Kit

This kit assumes the following components:

- Intel Galileo board, Gen 1 or Gen 2
- 5V, 3.0A power supply
- Ethernet cable
- DB9 to 3.5mm TTL serial cable (Gen1)
- USB serial cable (DB9 to USB) (Gen1)
- USB to FTDI cable (Gen2)
- Micro SD Card with SD Card Adapter
- 8GB USB flash drive for writing the Embedded Development Kit LiveUSB image
- Grove Starter Kit Plus (or equivalent Arduino sensors and actuators)
1.2.1 Grove Starter Kit Plus

The Grove Starter Kit Plus includes an assortment of sensors and actuators useful to beginners getting started with Arduino. The examples provided have been tested using the following list of parts, however they should work with other Arduino-compatible parts:

- Grove - Base Shield
- Grove - Buzzer
- Grove - Sound Sensor
- Grove - Rotary Angle Sensor (P)
- Grove - Touch Sensor
- Grove - Light Sensor (P)
- Grove - Vibrator
- Grove - Temperature Sensor
- Grove - Relay
- Grove - Magnetic switch
- Grove - Switch(P)
- Grove - Red LED (3mm)
- Grove - Green LED (3mm)
- Grove - Blue LED (5mm)
- Grove - Servo
- Grove - Button(P)

1.2.2 Intel Galileo Hardware Specifications

This section describes the Intel Galileo specifications.

General specifications:
- **CPU:** Intel® Quark™ SoC X1000 (16K Cache, 400 MHz)
- **System Memory:** 8 MB Legacy SPI Flash; 512 KB of embedded SRAM; 256 MB DDR3 RAM

I/O specifications:
- **Ethernet:** 10/100 Ethernet connector
- **Serial:** RS-232 Serial Port 3-pin 3.5mm jack
- **SPI Flash Program port:** 7-pin header for Serial Peripheral Interface (SPI) programming
- **USB:** one USB 2.0-compliant host connector and one USB2.0/1.1 client connector
- **Arduino:** Shield interface compliant with Arduino Uno Revision 3 shield pinout.
- **ICSP:** 6-pin in-circuit serial programming (ICSP) header, located appropriately to plug into existing shields.
When using this evaluation kit, the Intel Galileo will be set to boot from the micro SD card slot. The micro SD card will be deployed with a fully-functional VxWorks 7 image that boots the board into VxWorks and enables connection to the Wind River Workbench development tools running on your host PC.

1.2.3 **Host Computer Specification**

During this evaluation you will run Wind River Workbench Development Suite, for which you will need a suitable host computer. The host computer may be a laptop or desktop PC with the following specifications.

<table>
<thead>
<tr>
<th>Host architecture:</th>
<th>Intel® Core™ Duo, 2 GHz or greater (recommended)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host memory:</td>
<td>2 GB RAM (recommended)</td>
</tr>
<tr>
<td>USB requirements:</td>
<td>USB 2.0 connection (required)</td>
</tr>
<tr>
<td>Host-target communication:</td>
<td>Ethernet, serial</td>
</tr>
</tbody>
</table>
Setting up the Evaluation

Before starting this evaluation, we will ensure that you have deployed VxWorks to your micro SD card, connected your Intel Galileo, and written the LiveUSB image to your USB flash drive. Please ensure that you work within a statically safe area and that you have all the required tools and parts available.

2.1 Deploying VxWorks

1. Download GEN2_IntelGalileoSDCard.zip from the URL in the registration e-mail. (Substitute GEN1_IntelGalileoSDCard.zip for first generation Galileo.)
2. Plug your micro SD card into the SD card adapter.
3. Connect your SD card adapter to your host computer.

**NOTE:** It is assumed that your SD card has come pre-formatted from the factory with a FAT32 file system on the first, primary partition. If you have formatted it to another file system or partitioning scheme, please reformat it now.
4. Open the GEN2_IntelGalileoSDCard.zip file with your preferred application.
5. Extract the contents of GEN2_IntelGalileoSDCard.zip to the top-level of the SD card.
6. Safely remove the SD card from your host computer.

2.2 Writing the LiveUSB image

2.2.1 Using Microsoft Windows

1. Download USB-R181731.1-1-02.img from the URL in the registration e-mail.
2. Plug your USB flash drive into your host computer.
4. Run the Win32 Disk Imager installer program.
5. Proceed through the installer wizard to install Win32 Disk Imager.
6. Run Win32DiskImage by double-clicking the icon on the desktop.
7. In the **Win32DiskImage** dialog, click the blue folder icon, next to the **Image File** text box.

8. In the **Select a disk image** dialog, choose **USB-R181731.1-1-02.img** and click **Open**.

9. Under **Device**, select the drive letter corresponding to your USB flash drive.

10. Click the **Write** button to write the image to your USB flash drive.

   **NOTE:** Caution! Writing the image to your USB flash drive will erase its data.

11. Before overwriting your USB flash drive, please confirm that you have selected the correct target device and wish to continue. Click the **Yes** button to proceed.

12. When the **Write Successful** dialog appears, click **OK**.

13. Click **Exit** to close **Win32 Disk Imager**.

### Using Linux

1. Download **USB-R181731.1-1-02.img** from the URL in the registration e-mail.

2. Open a terminal window.

3. Become the root user (eg. **sudo -s**)

4. Plug your USB flash drive into your host computer.

5. Run **dmesg | tail** in the terminal to determine the device name of your USB flash drive. (eg. **sdX**)

6. Run **mount** to examine mounted filesystems and look for any references to the device name from the previous step.
7. Unmount any filesystems mounted from your USB flash drive using the `umount` command (eg. `umount /dev/sdX*`)

8. Run the `dd` command to write the image file to your USB flash drive, where `sdX` represents the name of the device found in the previous step.

   `dd if= USB-R181731.1-1-02.img of=/dev/sdX bs=16M`

**NOTE:** Writing the image may take between 5 to 20 minutes depending on the speed of your USB flash drive or connection.

**NOTE:** Utilities like LiveUSB Creator and UNetbootin make changes to the format of the image when writing it to the USB flash drive. It is necessary to use a utility like `dd` that writes the image literally to the USB flash drive without any changes.

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### 2.3 Configuring the Intel Galileo for the LiveUSB Evaluation

Perform the following procedure to connect the Intel Galileo:

1. Ensure that the power supply is unplugged from the electrical outlet.
2. Insert the SD card created in section 2.1 into the SD card slot on the board.
3. Plug the barrel plug connector of the power supply into the jack on the board.
4. (For Gen1 boards, )Plug the 3.5mm audio jack connector of the DB9 to 3.5mm TTL serial cable into the serial port of the board.
5. (For Gen1 boards, )Plug the DB9 connector of the DB9 to USB serial cable into the DB9 to 3.5mm TTL serial cable.
6. (For Gen2 boards, )Plug the FTDI connector of the cable to FTDI header of the board.
7. Plug the USB cable into your host computer’s USB port.
8. Connect an Ethernet cable between the Ethernet port on the Intel Galileo and the Ethernet port on your host computer. This can either be a direct connection or through a hub or switch. Note that the evaluation host and Intel Galileo will be assigned pre-configured static IP addresses during the evaluation.

**NOTE:** Don’t power the board on at this point.
3.1 Booting the Host Computer

1. Before booting your host computer, ensure that the LiveUSB USB flash drive is correctly plugged into a USB port on the host computer.

2. Power on your host computer.

**NOTE:** You may have to interrupt the boot process to instruct the BIOS to boot from the USB flash drive instead of the internal hard drive. These steps are specific to your computer. A reference list for various manufacturers may be found here: https://craftedflash.com/info/how-boot-computer-from-usb-flash-drive.

If you are successful in getting your computer to boot from the USB flash drive, you will be presented with the graphical bootloader screen.
During the boot sequence, you will be presented with a screen to review and accept a click through license agreement for the evaluation. You may review the licenses and click the **Accept** button twice to accept the agreements.

You will then be presented with the LiveUSB desktop.
3.2 Summary

At this point, your host computer is booted from the LiveUSB and your Galileo hardware is connected but not powered on. You can proceed to the Evaluation Tutorial document.

3.3 Notes

- The evaluation is safe to use with your existing machine. When correctly used, no data will be written outside of the LiveUSB drive.
- The evaluation is interruptible — if you stop partway through, you can resume where you stopped.