How-To Build Meteohub on SheevaPlug (generic way)

The SheevaPlug is a low power, small form factor device that can be seen as the successor of the famous NSLU2. Meteohub has now been experimentally ported to the SheevaPlug. Please be aware that this port is rather alpha, but it seems to work. At the moment Meteohub on SheevaPlug has these limitations:

- no WebCam support: This is also not planned for the future
- no WLAN support: Might be added via USB WLAN sticks in the future (low priority)
- no Labjack support: unclear if this can be added by a home-brew kernel module, low priority

Meteohub on SheevaPlug makes use of a SD card where operating system, Meteohub application and data are stored. Capacity is 4GB. It should be a SLC based card. As not all SD cards are working with the plug, you might have some experiments in front of you. SLC-based SD card that is proven to be working

- Transcend SDHC Class 6 150x: TS4GSDHC150

Weather stations are connected to the Meteohub by USB connector. This one USB port can be extended with an USB hub. It looks like it can be a passive USB hub, as the Meteohub on SheevaPlug provides the 500mA on USB and this should be enough to drive a few weather station USB connections and/or RS232-USB converter. SheevaPlug consumes about 5 watts , which is really effective. Meteohub's performance looks fine. It can do about 900 records per second during recomputation (NSLU2 is about 200, x86 Geode platforms are up to 2000).

So overall SheevaPlug looks like a quite attractive Meteohub platform, but there still is one major problem. Conversion of a SheevaPlug into a Meteohub is a complicated procedure and needs severe IT knowledge. The following instructions are for the tech savvy. Hopefully, there will be a more easy way of installation in the future, as the steps explained below are not ready for a broader customer base and are - frankly speaking - not ready for prime time at all. To make all this happen a Linux PC to provide the new boot loader via tftp and to login to the serial console via kermit will be of much help.

Files you need:

You find the needed files in the Wiki at: http://wiki.meteohub.de/Images#SheevaPlug

1. Meteohub installer for SheevaPlug:
   http://www.meteohub.de/files/u-boot.bin

2. Meteohub SD card image for SheevaPlug:
   http://www.meteohub.de/files/mhplug-v4.6j.rar

Remark: Meteohub image for SheevaPlug is based on a Debian Lenny Distribution for Kirkwood platform as instructed here: http://www.cyrius.com/debian/kirkwood/sheevaplug/

STEP 1: Prepare for Access to SheevaPlug's serial console

SheevaPlug has a mini USB connector that allows to access it's serial console. Serial console is needed to flash a newer, SD enabled boot loader to the SheevaPlug and to make some permanent boot settings. When you have a Windows PC, follow the instructions that came along the SheevaPlug (CD and online manuals). When you have a Linux PC, follow the steps below

1. Add a file named "/etc/udev/rules.d/99-sheevaplug.rules" to your system. The file should have the content displayed below. This is a udev rule that makes the USB-serial converter in the SheevaPlug known to the Linux PC and will result in establishing serial devices "/dev/ttyUSBx" when plugging in the mini-USB cable to the SheevaPlug:

```
# Marvell Sheevaplug
#
# if no driver has claimed the interface yet, load ftdi_sio
ACTION=="add", SUBSYSTEM=="usb", ENV{DEVTYPE}=="usb_interface", \
        ATTRS{idVendor}=="9e88", ATTRS{idProduct}=="9e8f", \
        DRIVER=="", \
        RUN+="/sbin/modprobe -b ftdi_sio"
#
# add the sheevaplug VID and PID to the list of devices supported by
ftdi_sio
ACTION=="add", SUBSYSTEM=="drivers", \
        ENV{DEVPATH}=="/bus/usb-serial/drivers/ftdi_sio", \
        ATTR{new_id}="9e88 9e8f"
#
# create a convenience symlink for the console device
ACTION=="add", KERNEL=="ttyUSB*", \
        ATTRS{interface}=="SheevaPlug JTAGKey FT2232D B", \
        ATTRS{bInterfaceNumber}=="01", \
        SYMLINK+="sheevaplug"
```

2. Plugin mini-USB cable to Linux PC and SheevaPlug. Check with "ls -la /dev/ttyUSB*" which devices have been established. Two new devices should be listed, use the second one of the newly established devices for serial communication with the SheevaPlug (from now on it is assumed that this device is named "/dev/ttyUSB1").

STEP 2: Prepare for Update of SheevaPlug's boot loader "u-boot"

In order to make SheevaPlug booting from SD the standard boot loader "u-boot" has to be updated (If you have an up-to-date boot loader in your SheevaPlug that can boot from SD card, you can skip steps 2 and 4). This is done by flashing a new image that gets provided by tftp. To make all this happen, you need a tftp server running. Usually you do this as follows on your Linux PC. As this depends on the Linux variant you are using, you might look for details about how your Linux distribution handles tftp.

1. create directory "/tftpboot" on your Linux PC

2. enable tftp as an xinitd service by changing line"disable = yes" in file "/etc/xinetd.d/tftp" into "disable = no". By this xinitd gets informed that it should start tftp if a tftp client request comes in. Please also check that line "server_args = -s /tftpboot" is there, which names the directory for access that you have just created.

3. copy downloaded "u-boot.bin" file into "/tftpboot/" directory. (Location of "u-boot.bin" is explained in "Files you need" section of this document.

STEP 3: Login via Serial Console on SheevaPlug

Now login via Kermit to the SheevaPlug and do some operations in the boot loader.

1. connect SheevaPlug and Linux PC as explained in Step 1. Start Kermit (or a similar terminal program) on your Linux PC. Give these commands to Kermit

```
set line /dev/ttyUSB1
set speed 115200
set parity none
set hand none
set stop-bits 1
set modem none
set flow none
connect
```

STEP 4: Flash SD-enabled Boot Loader

Please keep in mind that Flashing the boot loader might brick your SheevaPlug. You are doing this at your own risk! If you are not willing to take this risk, just don't do it.

1. Press reset "button" (it is behind the tiny pin hole in the whity body of the SheevaPlug) and watch boot messages flow through your Kermit terminal window. Press a key to stop the boot loader and to get a "Marvel>>" prompt.

2. Give command "printenv" to get the IP that has been provided to the SheevaPlug. If no IP there, give command

```
ipaddr=192.168.1.218
```

3. In order to flash the SD enabled u-boot version, you have to define the IP of your Linux PC that acts as a tftp server. It is assumed that this ip is 192.168.1.180. To flash the u-boot image give these commands:

```
setenv serverip 192.168.1.180
bubt u-boot.bin
```

4. When asked to delete environment variables, answer "no".

5. When "Copy to Nand Flash... done" appears u-boot has been updated. Give command "reset" to restart the SheevaPlug and stop boot process again by pressing a key.

STEP 5: Tell Boot Loader about SD Boot

1. Enter these six commands at boot loader prompt "Marvel>>"

```
setenv mainlineLinux yes

setenv arcNumber 2097

setenv bootargs_root 'root=/dev/mmcblk0p1 rootdelay=10'

setenv bootcmd_mmc 'mmcinit; ext2load mmc 0 0x0800000 /boot/uInitrd;
ext2load mmc 0 0x400000 /boot/uImage'

setenv bootcmd 'setenv bootargs $(console) $(bootargs_root); run
bootcmd_mmc; bootm 0x400000 0x0800000'

saveenv
```

STEP 6: Setup SD Card

Previous steps did a preparation of the SheevaPlug to boot from SD card. Last step is to prepare a SD card. This can be most easily done by using "DiskImage" from an Windows XP machine or by "dd" on a Linux PC environment. As the Meteohub SD card image includes 3 partitions it is essential that you copy this data in raw mode to your SD card. You do that on a Linux machine by "dd if=mhplug-vx.x.img of=/dev/sde bs=1M" assuming that Meteohub image file is named "mhplug-vx.x.img" and SD card is recognized as "/dev/sde" on your Linux PC. When using DiskImage on Windows, please make sure that you select the target drive as "physical drive" (you have to scroll down the list of target drives until the very end to find these).

SD card must have a capacity of 4GB. If it is bigger, just 4GB are used. When it is smaller, Meteohub will not work.

STEP 7: Start Meteohub

1. Insert prepared SD card into SheevaPlug (contact side up) and press reset "button". If serial console is still connected you see messages scrolling through. Don't care about boot errors regarding "mtdblock", internal Nand Flash is not used by Meteohub.

2. When boot has finished, Meteohub can be reached by it's IP exactly like any other Meteohub.