Setup of RPi Media Player

Commands which are not executed on the Raspberry Pi unit itself is referring to a Mac.

Download:

The Raspberry Pi Image can be downloaded here:

http://toolbox.llab.dtu.dk/fileadmin/RPi-images/RPi-Media-Player.img

Changing configuration files

The Raspberry Pi (RPi) is configured with a read-only filesystem to keep it stable in operation. To change any settings on it, we have placed relevant configuration files in the FAT partition of the memory card. To change any of the settings in the configuration files, turn off the RPi, take out the memory card and mount it on a regular computer. With a basic text editor you can now edit the files on the computer and save them back to the memory card. Then you remount the memory card in the RPi and turn on power again.

Configuration files often contain comments on how to configure them. Lines starting with "#" means the line is inactive. Often configuration examples are found "commented out" like that. It's for your convenience to uncomment and adapt such lines.

Default values:

Users: "root" and "pi"

Passwords: "12345" (both users)

DHCP is configured for ethernet.
Wifi is disabled.

Output resolution: Fixed to 720p50

Connecting the RPi to a TV:

The RPi *must* see a monitor or other input connected to it when it boots. Otherwise it will not properly output 720p50 as it is configured to do. Therefore, you must connect it to the input device via HDMI before turning on the power (or you will have to reset the unit afterwards). (It has been observed, that it will otherwise send out 60hz as default, but still 720p.)

Notice: Experiments have shown that some consumer HDMI switches doesn't appear as an input to the RPi, so make sure to connect it directly to a TV, not through some switch device.

Set up IP addresses (static and dynamic)

Internet connection is possible via the Ethernet jack. When the cabled ethernet is used for internet connection the on-board LEDs will blink affirmatively.

IP addresses are set in the files **wlan0** (wireless) and **eth0** (cabled) on the FAT partition of the SD card.

Static IP with:

```
IP=static
Address=('192.168.1.100/24')
Gateway='192.168.1.1'
DNS=('192.168.1.1')
```

Hint: Address=('192.168.1.100/24') is the same as IP address “192.168.1.100” and subnet mask “255.255.255.0”

And dynamic IP with:

```
IP=dhcp
```

To spot which IP has been assigned via DHCP, look in the DHCP table of the network router/DHCP server. The unit will most likely show up as “video-player” in the list.

It’s also possible to connect directly to the RPi by attaching a computer to the RPi directly with an Ethernet cable. The cable doesn’t have to be “crossed”. The computer and RPi must both be set up with static IP addresses of course. The connection can always be confirmed with PING, eg:

```
ping 192.168.1.100
```

Answer:

```
PING 192.168.1.100 (192.168.1.100): 56 data bytes
64 bytes from 192.168.1.100: icmp_seq=0 ttl=64 time=0.870 ms
64 bytes from 192.168.1.100: icmp_seq=1 ttl=64 time=0.975 ms
64 bytes from 192.168.1.100: icmp_seq=2 ttl=64 time=1.114 ms
....
```

How to set up Wifi including protected WLANs (VPA, VPA2)

Wifi connection is possible with an Edimax USB dongle placed in one of the RPis USB slots. When the dongle is used for internet connection the blue LED inside will blink.

To authenticate to a WPA Protected network, insert these lines

```
WPAConfigSection=(
    'ssid="INSERT_SSID_HERE"'
    'key_mgmt=WPA-PSK'
    'psk="INSERT_PASSPHRASE_KEY_HERE"'
)
```

Substituting **INSERT_SSID_HERE** and **INSERT_PASSPHRASE_KEY_HERE** with the relevant values. Eduroam connection can be established by using the block

You can also connect with Eduroam:

```
WPAConfigSection=(
 'ssid="eduroam"'
 'proto=RSN'
 'key_mgmt=WPA-EAP'
 'pairwise=CCMP'
 'auth_alg=OPEN'
 'eap=PEAP'
 'identity="sXXXXXX"'
 'password=hash:'
)
```

Where the password should be set to **hash:** followed by a hash calculated by executing

```
echo -n “password”| iconv -t UTF-16LE | openssl md4
```

Notice: There is no support for “captive portals” - the kind of Wifi connection where you only get internet access after typing in a username and password in a web browser login prompt.

How to debug Wifi connection

You need to login, so attach a network cable, probably set up a static IP and log on as root.

Then you can execute this command:

```
journalctl -f -u netctl-auto@wlan0.service
```

You should see output something like this if it works:

```
[root@video-player ~]# journalctl -f -u netctl-auto@wlan0.service
-- Logs begin at Thu 1970-01-01 01:00:05 CET. --
Jan 01 01:00:18 video-player wpa_actiond[189]: Interface 'wlan0' connected to network
'T8A2'
Jan 01 01:00:19 video-player dhcpcd[259]: version 6.3.2 starting
Jan 01 01:00:21 video-player dhcpcd[259]: DUID 00:01:00:01:1a:49:8f:50:80:1f:02:ab:a7:2f
Jan 01 01:00:21 video-player dhcpcd[259]: wlan0: IAID 02:ab:a7:2f
Jan 01 01:00:21 video-player dhcpcd[259]: wlan0: soliciting a DHCP lease
Jan 01 01:00:23 video-player dhcpcd[259]: wlan0: offered 192.168.1.51 from 192.168.1.1
Jan 01 01:00:32 video-player dhcpcd[259]: wlan0: leased 192.168.1.51 for 86400 seconds
Jan 01 01:00:32 video-player dhcpcd[259]: wlan0: adding route to 192.168.1.0/24
Jan 01 01:00:32 video-player dhcpcd[259]: wlan0: adding default route via 192.168.1.1
Jan 01 01:00:33 video-player dhcpcd[259]: forked to background, child pid 494
```

(Enter “ctrl+c” to exit this view.)

if the Edimax is not inserted, you will see something like this:

```
[root@video-player ~]# journalctl -f -u netctl-auto@wlan0.service
-- Logs begin at Thu 1970-01-01 01:00:05 CET. --
Jan 01 01:01:34 video-player systemd[1]: Dependency failed for Automatic wireless network
connection using netctl profiles.
```

if there is a faulty “key” inserted (passphrase for WLAN), it will look something like this:

```
[root@video-player ~]# journalctl -f -u netctl-auto@wlan0.service
-- Logs begin at Thu 1970-01-01 01:00:05 CET. --
Jan 01 01:00:16 video-player systemd[1]: Starting Automatic wireless network connection
using netctl profiles...
Jan 01 01:00:16 video-player netctl-auto[160]: Included profile 'wlan0'
Jan 01 01:00:18 video-player netctl-auto[160]: ioctl[SIOCSIWAP]: Operation not permitted
Jan 01 01:00:18 video-player netctl-auto[160]: ioctl[SIOCSIWENCODEEXT]: Invalid argument
Jan 01 01:00:18 video-player netctl-auto[160]: ioctl[SIOCSIWENCODEEXT]: Invalid argument
Jan 01 01:00:18 video-player systemd[1]: Started Automatic wireless network connection
using netctl profiles.
Jan 01 01:00:19 video-player wpa_actiond[198]: Starting wpa_actiond session for interface
'wlan0'
```

If your RPi is internet connected with both ethernet and wifi, it will automatically choose the ethernet connection by default but fall back to wifi if the ethernet cable is detached. This

may introduce a break in streaming though. If the ethernet cable is re-introduced it will begin to use this connection again. This may also introduce a break in streaming.

Other network debugging tips:

Try command:
`netctl`

See more configuration examples in:

`/etc/netctl/examples`

How to log in via SSH

`ssh root@[ip-address]`

or

`ssh pi@[ip-address]`

(After login as user “pi” you can change to root with “su” as usual. Default passwords are the same for the two users.)

default password: “12345”

Notice: If you try to login and the RPi doesn’t have a correct name server, you may experience a delay of some 10-15 seconds before you are asked to enter your password.

If during login you are asked the following question, you probably want to answer “yes”:
The authenticity of host '192.168.1.51 (192.168.1.51)' can't be established.
RSA key fingerprint is 4f:b7:16:6b:68:d4:35:15:93:9c:a3:bc:0f:1c:be:b9.
Are you sure you want to continue connecting (yes/no)? yes

Login via SSH should be possible right after the boot-up image has been shown.

How to change password:

Login as “root”
Then, execute this command:

`mount -o remount,rw /`

(This will mount the filesystem as write-enabled. It’s normally read-only.)

Then, write this command and follow instructions:

`passwd [username]`

Notice: If you don’t enter a username (such as “pi”), you will change the password for the root user.

Reboot your RPi and test the new password to make sure it got saved onto the memory card.

(Cut power or write the command “reboot”)

How to confirm internet connection from the RPi shell

The internet connection can be checked by pinging google,

```
[pi@video-player ~]$ ping google.com
PING google.com (74.125.136.138) 56(84) bytes of data.
64 bytes from ea-in-f138.1e100.net (74.125.136.138): icmp_seq=1 ttl=47 time=24.0
ms
64 bytes from ea-in-f138.1e100.net (74.125.136.138): icmp_seq=2 ttl=47 time=23.5
ms
^C
--- google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 23.510/23.764/24.018/0.254 ms
[pi@video-player ~]$
```

If you don't succeed with the above command, try to ping IP address 8.8.8.8 (googles nameserver). If this works, it indicates that the nameserver is not present to the RPi - but it has internet connection at least.

How to set output resolution and framerate

These are set in the config.txt file on the fat partition, according to http://elinux.org/RPi_raspi-config .NOTE: Image viewing support breaks if the resolution is changed from 720p .

How to create and change start-up picture

Just place a properly named .png file on the FAT partition of the SD card.

How to play a video clip upon start up

With *no* playlist.txt file (on the SD card or any attached usb devices - playlist.txt files on USB devices takes precedence), files on any attached usb device with a prefix "start" will be played initially at boot up and looping. If a file prefixed "start" exists it will automatically be added to the queue of files from a playlist.txt file if such exists (and thus be part of the playlist loop).

Notice: The RPi will search sub-folders on your USB stick for files prefixed "start". If you trashed some files and didn't empty trash, they may still reside in a hidden folder (such as ".trashes" on a Mac OSX computer). This can result in unexpected behaviour.

Using the TCP interface

In the "playlist.txt" file you need to insert a line like

```
TCPinterfaceActive = true
```

Then you can access the device with telnet on port 9994

How to list all clip names via network

From your computer, open a terminal window (Mac OSX) and type:

```
$ nc [ip-address] 9994
LIST
```

You will see output like this:

```
DTU_TEMO_F14.mp4 temo
DTUExecSummary.mp4
```

How to command the playback of a clip via network

```
$ nc ip 9994
PLAY:file=entire-filename.mp4
```

Instead of the filename you can also use an alias.

How to stop playing

```
$ nc ip 9994
STOP
```

How to see what is playing:

```
$ nc ip 9994
IS_PLAYING
```

You will see output like this:

```
CURRENTLY_PLAYING:DTUExecSummary.mp4
```

How to set up one or more streams

Streams are configured in a playlist.txt file. Only raw RTMP streams are supported atm. Here are some examples:

```
rtmp://82.201.53.52:80/livestream/tv538
rtmp://94.242.221.176:1937/live/stream153
rtmp://rtmp.infomaniak.ch/livecast/vitatv
rtmp://94.242.221.176:1937/live/stream44
```

Streams are watched continuously, and the first stream to come online is played.

How to set up a looping playlist with video, stills and streams

A playlist with filenames for videos and images will automatically loop. Streams in that file as described above, will override the currently playing item if they come online during playback. This happens first as the playing video is finished.

You can add aliases for files in the playlist (the last word in a line)

Example of a playlist file:

```
TCPinterfaceActive = true


# Streams

# EXAMPLES:
#rtmp://82.201.53.52:80/livestream/tv538 tv538
rtmp://94.242.221.176:1937/live/stream153 MTV
#rtmp://rtmp.infomaniak.ch/livecast/vitatv vitatv
#rtmp://94.242.221.176:1937/live/stream44 VH1
```

```
#Video play list:
RED30sec.mp4
DTU_TEMO_F14.mp4 temo
DTUExecSummary.mp4
```

Log message commands:

```
journalctl -f -u video-server
```

Streaming traffic and TV power status

The RPi is sensitive to CEC commands sent from your TV. This means that the RPi will stop retrieving streams when the TV turns off and thereby informs the RPi of it's sleep-status. This feature could be useful even if the TV doesn't actually show the RPis output on the screen, but that is not the case - or at least it may depend on TV model. So, there may be some gray zones there.

If you want to check if the RPi is retrieving network traffic, log in on the RPi and execute this command :

```
[root@video-player ~]# ifconfig
```

You'll see output like this:

```
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.35  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::ba27:ebff:fea6:59df  prefixlen 64  scopeid 0x20<link>
        ether b8:27:eb:a6:59:df  txqueuelen 1000  (Ethernet)
        RX packets 35561  bytes 48450070 (46.2 MiB)
        RX errors 0  dropped 1  overruns 0  frame 0
        TX packets 14206  bytes 1324319 (1.2 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 0  (Local Loopback)
        RX packets 62  bytes 5316 (5.1 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 62  bytes 5316 (5.1 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlan0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 80:1f:02:ab:a7:2f  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[root@video-player ~]#
```

In this example the RPi is connected by ethernet (eth0) and when a stream is received, the number highlighted in red will seem to increase every time you run this command (run same commands again by pressing the up-arrow on the keyboard and then press enter when you see the command appear on the prompt). The number indicates received network traffic. When you turn off the connected input (TV), this number should stop increasing if CEC is working as expected.

Creating a copy of the SD card (on a Mac)

To create an image (uncompressed), something like this did it:

```
sudo dd if=/dev/rdiskX of=/[path]/RPiMediaPlayer.img bs=1m
```

You'll have to type in the root password.
The output might look something like this after a few minutes:

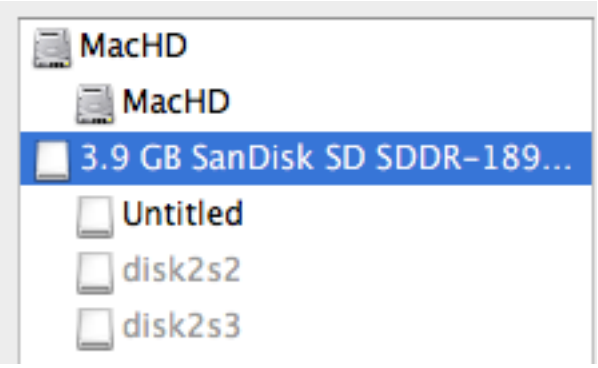
```
3724+0 records in
3724+0 records out
3904897024 bytes transferred in 253.739066 secs (15389420 bytes/sec)
```

To write the uncompressed image back, something like this works:

```
sudo dd of=/dev/rdiskX if=/[path]/RPiMediaPlayer.img bs=1m
```

You'll have to type in the root password.
The output might look something like this after a few minutes:

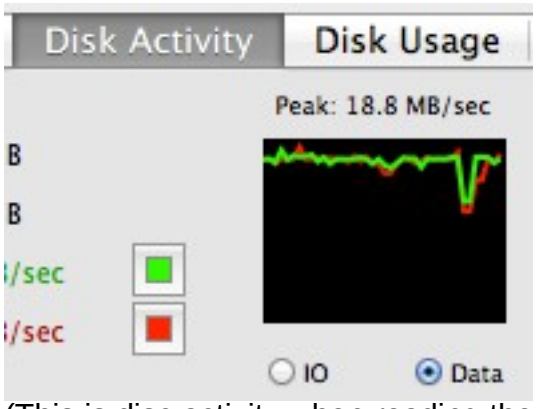
In both cases, rdiskX should be the correct number of the disk. This can be seen inside Disk Utility:



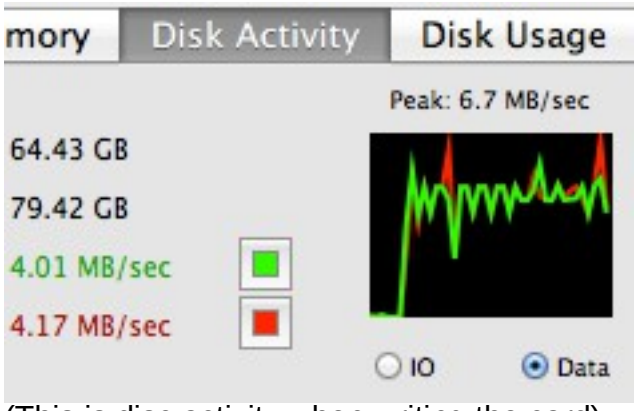
The unmounted disks named "disk2s2" and "disk2s3" reveals that the value of **rdiskX** must be "rdisk2" in this case.

You may need to eject the memory card (but not physically remote it from the computer) before you can write back to it. (If a writing operation results in a "Resource busy" message)

Reading the image to disk may progress significantly faster than writing it back to the memory card. Examples are 5 minutes to read it, 15 minutes to write it. This depends on memory card speed, your card reader speed etc. You can get an indication of speed from Activity Monitor during the process. The Terminal output itself will appear to stand still.



(This is disc activity when reading the card)



(This is disc activity when writing the card)

Development TODO:

- CEC:
  - Disconnecting HDMI cable doesn't stop stream
  - Changing channel or AV input on a Sony Bravia didn't stop stream (but so did turning off the TV with the remote).
  - Probably more similar cases.

- See IP address and WLAN status on screen during boot?
- UDP type interface?