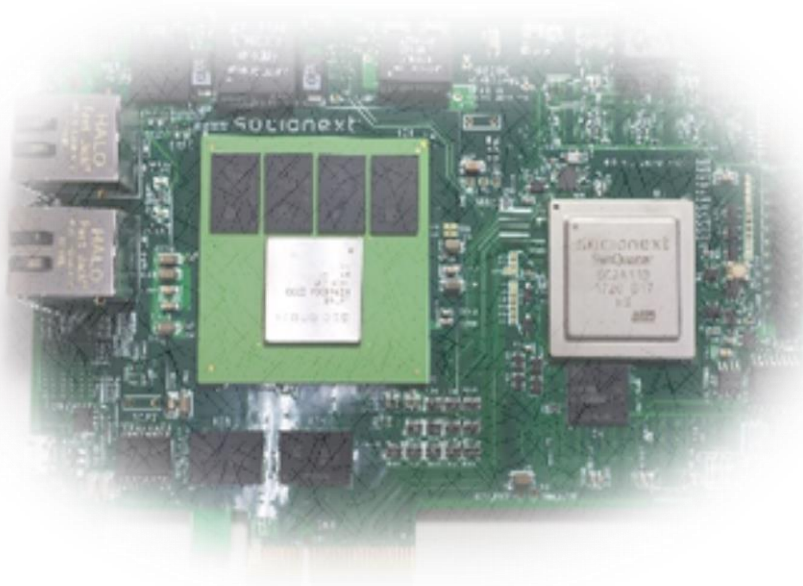


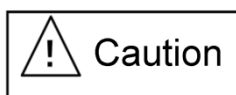
M820 Software Package V02 Application Guide (for Linux introduction)



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Socionext Inc.

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Revision History

Date	Revision	Description
Jun 24, 2019	2.00	First revision
Aug 1, 2019	2.01	Corresponds to V02L02R02 or later. - 1.1 Hardware Changed maximum number of inserted M820L units.
Oct 4, 2019	2.02	-2.2 Intallation of This Product 2) Install M820 driver and M820 application Changed note. (Time out error message correction) 6) Changed install procedure. - 2,6 Confirmation of the Encoding Operation 4) Added note.
Nov. 25, 2019	2.02a	The footer contents were changed.

Preface

The Objective of This Document

The purpose of this document is to provide the reader with an understanding of the setup procedure of the product "M820 Software Package V02 for Linux"

Target Readers

This document is intended for the following readers.

- Software engineers who will use the "M820 Software Package V02 for Linux".

Prerequisites

This document assumes that readers know the basics of technologies related to Linux, Codec, and networks.

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1. Preparation

This chapter describes the preparations necessary for using this product.

1.1 Hardware

To use this product, insert the M820L to the PCIe slot of the host PC.

Control of the M820L uses MSI-X interrupts. The number of M820L inserted depends on the number of MSI-X interrupts that can be assigned to m820L. The recommended number of MSI-X interrupts to allocate per M820L is 39. The number of MSI-X interrupts allocated per M820L can be reduced according to the operating environment. At most, you can insert 16 units.

For details, refer to "2.2 Installation of This Product" in this manual.

For how to insert the M820L, refer to the document named "M820L Hybrid Codec PCI Express Card User's Manual".

1.2 Operating Environment

Operation of this product is confirmed using the following OS and software.

Software	Version	File name	note
Red Hat Enterprise Linux (Host OS)	7	rhel-server-7.x-x86_64-dvd.iso	Please download from public web site.
FFmpeg	4.1 3.4.2	ffmpeg-4.1.tar.bz2 ffmpeg-3.4.2.tar.bz2	Please download from public web site.

Notes:

- The release version of the host OS which this products operation check was performed is described in the release note.
- In addition to the above software, there are some necessary packages that must be installed using the yum command.
Please make sure that you can use the yum command to install packages.
- If you use an environment other than the above operating environment, this product may not operate properly.

2. How to Setup

This chapter describes how to setup this product.

This procedure is described on the premise that the Host OS is already installed on the Host PC.

2.1 Connection Confirmation of the M820L Device

Check that the inserted M820L is recognized correctly from the host PC by following these instructions.

- 1) Install necessary software for installing this product
Install the necessary software for installing this product by the following procedure.

```
# sudo yum update -y
# sudo yum groups install "Development Tools" -y
# sudo yum install kernel-devel -y
# sudo yum install glib2-devel nasm -y
```

Note: The release version of the kernel is automatically updated by yum update.
When using with a specific kernel version, please disable automatic updating before installing.

- 2) Insert M820L
After turning off the host PC, insert the M820L to host PC according to " M820L Hybrid Codec PCI Express Card User's Manual ".
- 3) Confirm M820L device connection
Turn on the Host PC and log in to the Host OS.
Specify "vendor ID" and "device ID" to the argument of lspci command, and execute.
Then, confirm the M820L device is connected by checking the following displayed messages.
The "xx:xx.x" part of the displayed message is the PCI ID number.
If multiple M820Ls are inserted, a message for each board will be displayed.

vendor ID : 50c1

device ID : 0015

```
# lspci -d 50c1:0015
xx:xx.x Multimedia controller: Device 50c1:0015 (rev 01)
```

2.2 Installation of This Product

Install the software for using this product to the host PC by following these instructions. This explanation describes how to use FFmpeg 4.1. When using FFmpeg 3.4.2, please replace the description part of "4.1" with "3.4.2".

- 1) Decompress this product software
Create a directory on the host PC and copy this product to the created directory. Change the current directory to the directory to which this software was copied, and decompress the software.

```
# tar -xf M820_rXXXX.tgz
```

- 2) Install M820 driver and M820 application
Install the M820 driver and the M820 application included in this product.

```
# cd M820_rXXXX/01_Host/  
# sudo ./install.sh -v 4.1  
[sudo] password:  
Installing M820 encode driver...  
Installation start.  
Making and loading device driver...done.  
Installation completed.  
Installation of M820 encode driver completed.  
Installing M820 encode application...  
Installation of M820 encode application completed.
```

Note: If the M820 driver and the M820 application are already installed, please reinstall them.

```
# cd M820_rXXXX/01_Host/  
# sudo ./uninstall.sh -v 4.1  
# sudo ./install.sh -v 4.1
```

Note: To upgrade the kernel version of Host PC after installing the M820 driver, you must reinstall the M820 driver.

Note: The initial value of "ES output timeout error" and "Video raw data input timeout error" are 30 seconds. The appropriate timeout time depends on the Host PC environment. Please change this time (unit: ms) if "ERR: es output timed out." or "ERR: raw video input timed out." error occurs during encoding. Set the timeout with the definition value "FMB_CODEEC_STREAM_WAIT_TIME" of the source file "M820_rXXXX/01_Host/02_Host_Drv/fmb_user_def.h". After changing, repeat the procedure from "2) Installing M820 driver and M820 application".

```
#define FMB_CODEEC_STREAM_WAIT_TIME          (30000)
```

Note: Control of the M820L uses MSI-X interrupts.
Set the number of MSI-X interrupts to be allocated to M820L with the definition value "FMB_USE_IRQ_NUM_FOR_DMA" of "M820_rXXXX/01_Host/02_Host_Drv/fmb_user_def.h".
The relationship between the setting value and the number of MSI-X interrupts assigned to one M820L is as follows.

setting value	Number of MSI-X interrupts to assigned
1	11
2	15
4	23
8 (Default)	39 (Recommendation)

When changing the number of MSI-X interrupts assigned to the M820L, after changing the setting value, perform the procedure in "2) Install the M820 driver and M820 application". The smaller the setting value, the smaller the number of MSI-X interrupts used, but the encoding performance may be degraded depending on the encoding conditions.

```
#define FMB_USE_IRQ_NUM_FOR_DMA              (8)
```

Note: Set the number of buffers used to transfer Video RAW data from HOST PC to M820L with the definition value "FMB_USE_VRAW_INPUT_BUF_NUM" of "M820_rXXXX/01_Host/02_Host_Drv/fmb_user_def.h".
The possible setting value is 2 or 3 (Default value is "2").
The encoding performance sometimes improves by making the set value big by the HOST PC environment.
If the set value is made big, number of buffers increases, but the memory amount of consumption increases, therefore may be sometimes fail in installation of M820 driver with memory acquisition failure for buffers.

```
#define FMB_USE_VRAW_INPUT_BUF_NUM          (2)
```

- 3) Decompress FFmpeg
Copy the FFmpeg source code to the directory "M820_rXXXX/01_Host/03_Tools/" and decompression it.
Please download FFmpeg source code from the public web site.

```
# cd ../01_Host/03_Tools/  
# tar -xf ffmpeg-4.1.tar.bz2
```

Reference:

The "M820_rXXXX/01_Host/03_Tools/" directory contains the FFmpeg installation sample script "ffmpeg_build.sh".

When this script is executed, after downloading FFmpeg from web via wget, 3) to 6) of this procedure are automatically performed.

```
# ./ffmpeg_build.sh -v 4.1
```

- 4) Execute FFmpeg configure
Execute the FFmpeg configure.

```
# cd ./ffmpeg-4.1/  
# ./configure --enable-shared
```

- 5) Apply FFmpeg patch file
Apply the patch to the FFmpeg source files to incorporate the M820 library into FFmpeg.
The patch file is stored in "M820_rXXXX/01_Host/03_Tools/" directory in this product.

```
# cd ..  
# sudo ./ffmpeg_patch.sh 4.1
```

Note: The patch to the FFmpeg source files "ffmpeg_patch.sh" calls the subscript "ff_patch_*.sh" in the process. Please use "ffmpeg_patch.sh" together with "ff_patch_*.sh".

- 6) Build and install FFmpeg
Build and install FFmpeg with the following commands.

```
# cd ./ffmpeg-4.1  
# make -j  
# sudo make install
```

2.3 Check the Device Number of the M820L

Check the device number of the M820L inserted to the host PC by following these instructions.

1) Check device file name

Specify the following path to ls command, and execute. Then, check the device file name.

Specify the PCI ID number to "xx:xx.x" in the path. Please refer to "2.1 Connection Confirmation of the M820L Device" for the PCI ID number.

```
# ls /sys/bus/pci/devices/0000:xx:xx.x/m820smb/  
m820smb0
```

The last number of displayed device's file name is **device number** of the M820L. This number is used to identify the M820L.

When multiple M820Ls are inserted to host PC, identify each M820L using this number.

2.4 Updating the M820L Software

You can update the software of the M820L to the latest version from the host PC using the update script provided in this product by following these instructions.

1) Update the software for M820L

Move to the directory which this product was copied to and execute the following commands.

```
# cd M820_rXXXX/02_M820_Update/  
# sudo ./update.sh <device_no>
```

Specify the device number of the M820L which you want to update to <device_no>. Please refer to "2.3 Check the Device Number of the M820L" to find out the device number of the M820L.

Notes:

- When multiple M820Ls are inserted, software update is necessary for each M820L.
- While updating the M820L software, please do not perform M820L operation such as encoding operation, checking the encoding status, executing M820L control utility, etc.

2) Check if host PC reboot is needed

Depending on update contents of the software, rebooting of the host PC may be necessary. In such case, a message asking whether to update or not will be shown before updating.

```
[Attention!]  
The basic firmware needs to be updated.  
If it will be updated, the host machine should be rebooted.  
Do you want to update it? [y/n]"  
(if n, the firmware except the basic firmware will be updated.)
```

3) Finish software update

If you updated the software which requires the host PC to be rebooted, the M820L will be stopped after the software update, and the following message will be displayed. After the message is displayed, please reboot the host PC.

```
Done M820 firmware update  
Since the basic firmware has been updated this time, please reboot the host  
machine
```

If you did not update the software which requires the host PC to be rebooted, or if there is no update, the M820L is rebooted after the software update, and the following message will be displayed.

```
Done M820 firmware update
```

2.5 Executing the M820L Self-Test

You can execute the self-test for the M820Ls inserted in the host PC by following these steps. The self-test are executed from the host PC using a script provided in this product.

1) Execute the M820L self-test

Move to the directory which this product was copied to and execute the following commands.

```
# cd M820_rXXXX/01_Host/01_Host_App  
# sudo PATH=$PATH ./self_test.sh <device_no>
```

Specify the device number of the M820L which you want to perform the self-test on to <device_no>.

Please refer to "2.3 Check the Device Number of the M820L" to find out the device number of the M820L.

Notes:

- Execute the self-test only when this product is correctly installed.
- When the message of reboot instruction of the host PC is displayed during the M820L software update, the self-test must be performed after rebooting.
- The M820L self-test time takes about 15 minutes.
- When multiple M820Ls are inserted, the self-test is necessary for each M820L.
- While executing the self-test, please do not interrupt the self-test by pressing Ctrl-C or by turning off the Host PC.
If you interrupt the self-test, please execute the self-test again and confirm that all functions succeed the tests before using the M820L.
- While executing the self-test, please do not perform M820L operations such as encoding operation, checking the encoding status, executing the M820L control utility, etc.

2) Confirm the M820L self-test execution result

When the M820L self-test is completed, the following message is displayed. The return value will be 0.

```
M820 CHECK ALL OK
```

When the test fails, the following message is displayed. The return value will be a value other than 0.

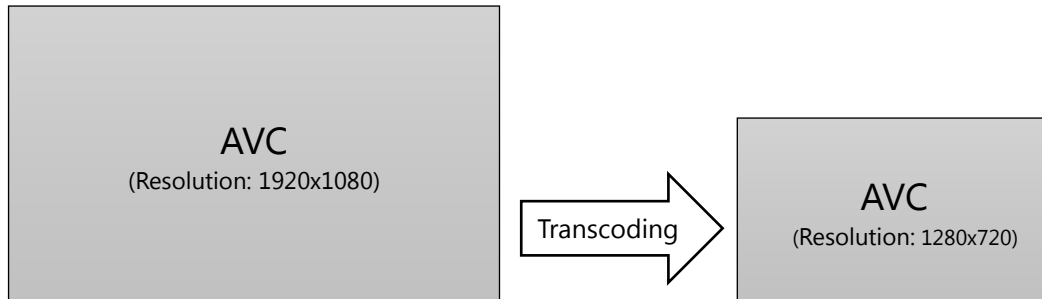
```
M820 CHECK NG
```

An information file (LOG_x_xx_YYYYMMDDhhmmss_NG.tgz) containing the error information will be created in the current directory.

In case an error was detected, please contact our sales department.

2.6 Confirmation of the Encoding Operation

You can check the encoding operation of the MB86M30 by following these steps.
The sample file "sample_video_01.mp4 (AVC format: 1920 x 1080 video)" included in this product will be used to check if transcoding works properly.
The video will be transcoded to AVC 1280 x 720 format.
For details of the encoding functions of the MB86M30, refer to the document named " M820 Software Package V02 Application Guide (operation)".



You can check the transcoding operation by the following procedure.

- 1) Boot the M820L
Boot the M820L according to the procedure of "3.1 Starting the M820L".
- 2) Set the video codec
Set the encoding video codec as AVC.
The video codec can be set by executing the "M820_rXXXX/01_Host/01_Host_App/change_codec.sh" script included in this product. Specify the device number of the M820L by using the "-d" option, and specify the video codec (AVC) by using the "-c" option.
Use the directory that you copied this product as the current directory and execute the following commands.

```

# cd ./M820_rXXXX/01_Host/01_Host_App/
# ./change_codec.sh -d 0 -c h.264
set H.264 codec
Restarting encode application
Done
  
```

- 3) Set the output resolution
Set the output channels of the encoding and the output resolutions (maximum size) of the encoding.
The output channels and the output resolution can be set by executing the "M820_rXXXX/01_Host/01_Host_App/set_resolution.sh" script included in this product. Specify the device number of the M820L by using the "-d" option, and specify the resolution (maximum size) of output by using the "-f" option.
In this case, specify 1920x1088 as the output resolution (maximum size) for output channel (0-7).

```
# ./set_resolution.sh -d 0 -f 8ch_sample.txt  
M820 Initial Settings Are Now "ON"
```

Current Resolution Type Settings:

State: "ON"

Values:

CH00: 2, CH01: 2, CH02: 2, CH03: 2

CH04: 2, CH05: 2, CH06: 2, CH07: 2

CH08: 0, CH09: 0, CH10: 0, CH11: 0

CH12: 0, CH13: 0, CH14: 0, CH15: 0

CH16: 0, CH17: 0, CH18: 0, CH19: 0

0 : No Transcoding

1 : Used for single channel transcoding

2 : Maximum size of output resolution = 1920 x 1088

3 : Maximum size of output resolution = 1280 x 720

4 : Maximum size of output resolution = 864 x 576

5 : Maximum size of output resolution = 640 x 480

6 : Maximum size of output resolution = 320 x 240

9 : Maximum size of output resolution = 1088 x 1920 or 1920 x 1088

10 : Maximum size of output resolution = 720 x 1280 or 1280 x 720

33 : Used for single channel transcoding with resize (for m30trc only)

Restarting encode application

Done

4) Execute FFmpeg

Execute the following FFmpeg command, and check the encoding operation and the output result.

```
# ffmpeg -i ../04_Sample_Video/sample_video_01.mp4 -c:v m30enc_h264  
-resize 1280x720 output.mp4
```

Note: FFmpeg will be installed under the "/usr/local/bin" directory by this procedure.

If FFmpeg was already installed in different directories, there will be multiple FFmpregs. To execute the installed FFmpeg, specify the full path or set PATH giving priority to the installation destination.

5) Check display after FFmpeg execution

After executing FFmpeg, the following logs will be displayed.

After processing is completed, "#" is displayed on the console. At this state, the console is ready for an input.

```

ffmpeg version 4.1 Copyright (c) 2000-2018 the FFmpeg developers
built with gcc 4.8.5 (GCC) 20150623 (Red Hat 4.8.5-36)
configuration: --enable-shared
libavutil      56. 22.100 / 56. 22.100
libavcodec     58. 35.100 / 58. 35.100
libavformat    58. 20.100 / 58. 20.100
libavdevice    58.  5.100 / 58.  5.100
libavfilter    7. 40.101 /  7. 40.101
libswscale     5.  3.100 /  5.  3.100
libswresample  3.  3.100 /  3.  3.100
Input #0, mov,mp4,m4a,3gp,3g2,mj2, from 'sample_video_01.mp4':
  Metadata:
    major_brand      : isom
    minor_version    : 512
    compatible_brands: isomiso2avc1mp41
    encoder          : Lavf57.83.100
  Duration: 00:00:22.00, start: 0.016000, bitrate: 14579 kb/s
    Stream #0:0(eng): Video: h264 (High) (avc1 / 0x31637661), yuv420p(tv, bt709), 1920x1080 [SAR 1:1 DAR 16:9], 14344 kb/s, 29.97 fps, 29.97 tbr, 30k tbn, 59.94 tbc (default)
      Metadata:
        handler_name    : VideoHandler
    Stream #0:1(eng): Audio: aac (LC) (mp4a / 0x6134706D), 48000 Hz, stereo, fltp, 317 kb/s (default)
  ...
bitrate=6483.3kbits/frame= 479 fps=158 q=-0.0 size= 13312kB time=00:00:16.21
bitrate=6726.1kbits/frame= 547 fps=155 q=-0.0 size= 15616kB time=00:00:18.49
bitrate=6916.4kbits/frame= 618 fps=153 q=-0.0 size= 17664kB time=00:00:20.84
bitrate=6942.7kbits/frame= 660 fps=135 q=-0.0 Lsize= 21877kB time=00:00:21.99
bitrate=8148.1kbits/s dup=5 drop=0 speed=4.49x
video:21506kB audio:347kB subtitle:0kB other streams:0kB global headers:0kB muxing
overhead: 0.107026%
*****
transcoding frames : 660 frames
output frames      : 660 frames
-----
start              : 23:35:20.746798153 [UTC]
finish             : 23:35:25.622942703 [UTC]
duration          : 00:00:04.876144550
*****

```

6) Check output from FFmpeg execution

Check that the transcoded result (output.mp4) by FFmpeg can be played correctly.

7) Shut down the M820L

Shut down the M820L according to the procedure of "3.2 Shutting Down the M820L".

3. Starting and Shutting down the M820L

This chapter describes how to start and shut down the M820L.
Please strictly follow the instructions.

3.1 Starting the M820L

The following shows how to start the M820L System. Follow the procedure below to start the M820L system.

- 1) Boot the system of host PC
Turn the power of host PC on, and boot the system of host PC.

- 2) Boot the M820L
Boot the M820L by using the M820L control utility.
Execute the following commands. Then, check the return value of the utility to confirm that it booted normally.
Specify the device number of the booting of the M820L by using the "-device" option.
Please refer to "2.3 Check the Device Number of the M820L" for the device number of the M820L.

```
# m820_util -device 0 bootup
Bootup Start
Done
# echo $?
0
```

If the M820L has already been booted, the following messages will be displayed.

```
# m820_util -device 0 bootup
Already Bootup
Done
# echo $?
0
```

Note: While starting the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.

3) Set the time on the M820L

Set the time of the M820L from host PC, using the script provided by this product.

Execute "M820_rXXXX/01_Host/01_Host_App/date_set.sh" script included in this product.

Specify the device number of the M820L which is being set up to the argument of the script.

Then, check the return value of the utility to confirm the process was finished properly.

```
# ./date_set.sh 0
# echo $?
0
```

Note: Please set the time of the M820L immediately after booting the M820L.

4) The M820L is ready

Execute the "m820_enc_status" command to confirm that encoding is possible (Status is "Running"). It takes about 2 seconds from the completion of M820L startup to enabling encoding.

For details of the "m820_enc_status" command, refer to the document named " M820 Software Package V02 Application Guide (operation)".

3.2 Shutting Down the M820L

If the host PC is shut down, the power supply to the M820 will be shut off. Therefore, it is necessary to stop the internal system of the M820L before shutting down the host PC. The following shows how to shut down the M820L. Follow the procedure below to shut down the M820L.

1) Shut down the M820L

Shut down the M820L using the M820L control utility.

Specify the device number of the M820L to shut down by using the "-device" option.

Execute the following commands. Then, check the return value of the utility to confirm that it shut down normally.

```
# m820_util -device 0 shutdown
Shutdown Start
Done
# echo $?
0
```

Note: While shutting down the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.

2) Shut down the system of the host PC

Shut down the system of the host PC, and turn off the power of the host PC.

3.3 Starting and Shutting Down When Multiple M820Ls are Inserted

When multiple M820Ls are inserted, start and shut down each M820L by specifying the device number of the M820L by using the "-device" option of the M820L control utility. Please refer to "2.3 Check the Device Number of the M820L" in this manual for how to check the device number of the M820L.

The following shows how to start and shut down the M820L when two units of M820Ls are inserted.

3.3.1 Starting the M820Ls When Multiple M820Ls are Inserted

e.g.) In the case of starting the M820Ls which device numbers are 0 and 1.

- 1) Boot the system of the host PC
- 2) Boot the M820L (device number = 0)

```
# m820_util -device 0 bootup
Bootup Start
Done
# echo $?
0
```

- 3) Boot the M820L (device number = 1)

```
# m820_util -device 1 bootup
Bootup Start
Done
# echo $?
0
```

- 4) Set the time of the M820L (device number = 0)

```
# ./date_set.sh 0
# echo $?
0
```

- 5) Set the time of the M820L (device number = 1)

```
# ./date_set.sh 1
# echo $?
0
```

- 6) The M820Ls are ready (device number = 0, 1)

3.3.2 Shutting down the M820Ls When Multiple M820Ls are Inserted

e.g.) Shutting down the M820Ls which device numbers are 0 and 1.

- 1) Shut down the M820L (device number = 0)

```
# m820_util -device 0 shutdown  
Shutdown Start  
Done  
# echo $?  
0
```

- 2) Shut down the M820L (device number = 1)

```
# m820_util -device 1 shutdown  
Shutdown Start  
Done  
# echo $?  
0
```

- 3) Shut down the system of the host PC

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