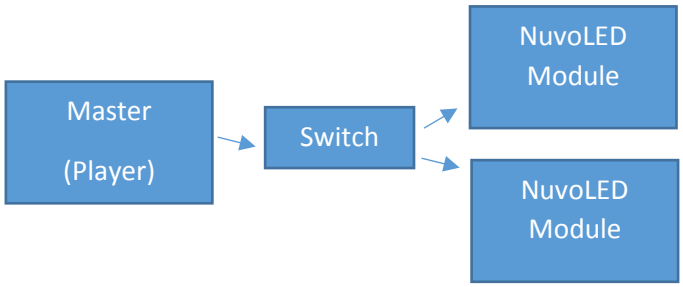
NuvoLED Interface Desciption

General Information

The Interface is based on the IEEE standard UDP Messages as connectionless interface.

The schema of connection is always there is only one MASTER (Player) in the LAN and several NuvoLED Modules can be attached via a switch or directly.



No DHCP should be used in the LAN, static fixed IPs are used.

The sending host at master shall be in the subnet with the mask 192.254.x.x

Following port is used for send and receive: 2000

All UDP messages from the master are sent as broadcast messages with 255.255.255.255 as destination IP.

All Messages are starting in the UDP Payload with 3 bytes with ASCII Character '$'.

In the pictures every block is a char / unit8 so 1 byte.

Module registration

At the beginning the Module must registered at the Master, therefore every module sends its registration message at startup every second until it is acknowledged by the master. After this the module advances into normal playing mode.

To force reregistration the master can send a registration request like following

UDP payload:

'$'	'$'	130	0	0

The registration message of a single Module looks like this.

'$'	'$'	15	MAC 24-31	MAC 16-23	MAC 8-15	MAC 0-7	HW Char 1	HW Char 2	HW Char 3	HW Char 4	width of module / 16	height of module / 16

Very important is the unique MAC (32 bits) address of a module.

The HW Char is 4 bytes identifier e.g. “P4T” giving the HW Version.

All used modules shall have separate addresses; modules with same addresses cannot be used in the same screen.

In the next step the master must send a configuration message as acknowledge and tell every module which part of the full picture is taken by which module.

By this the whole picture can set up by the single modules.

The configuration message sent by the master shall look like this:

‘$’	‘$’	120	fix 2	fix 32	(total screen width / 16)	(total screen height / 16)	total number of modules connected

Modul #1 Mac 8-15	Modul #1 Mac 0-7	Modul#1 fix 1	Modul#1 (witdh/16)	Modul#1 (height/16)	Modul#1 (offset x / 16)	Modul#1 (offset y / 16)
Modul #2 Mac 8-15	Modul #2 Mac 0-7	Modul#2 fix 1	Modul#2 (witdh/16)	Modul#2 (height/16)	Modul#2 (offset x / 16)	Modul#2 (offset y / 16)
…	…	…	…	…	…	…

So for every module you want to use you have to give the configuration, which MAC it has, which size (width/height) and on which offset position it is located in the full screen picture.

So the amount of configuration must fit to the “total number of modules connected” field in the 8th byte of the message.

This message shall be sent every time a new registration message was received by a module.

After this process if all required modules are registered correctly and content can be shown on the screen.

Sending Picture to registered modules

Sending Pictures to the module is quite easy, you have the choice out of several formats,

RGB8888 : RGB format in order red,green,blue without any header, so 128x128 size picture will result in 128x128x3 = 49152bytes

RGB565: RGB format in order red,green,blue without any header, so 128x128 size picture will result in 128x128x2 = 32768 bytes

JPEG: standard ISO baseline jpeg picture

The method to transport the picture is breaking the picture data in 1440 size big blocks and transport them over the LAN.

The single blocks are sent in the picture data message:

'$'	'$'	20	sync cnt	block#H	block#L	totalNum BlockH	totalNum BlockL	fix 45	payload byte 1	payload byte 2	payload byte …

So a 100kb picture of RGB data, will result in 69 x 1440 size blocks and one final block of the rest of 640 bytes.

So at the end we will have 70 picture data messages.

To have the data displayed at all modules in the same time, there is a sync message which does the job. For single pictures two sync message must be performed.

First sync message is shifting the data into the modules and finalizes transfer, the second sync message is making the data being shown up on the screen.

picture data messages n-1 for cont X	*picture data messages n for cont X*	10ms wait	Sync message #1 Sync cnt = x	40ms wait	Sync message #2 Sync cnt = x+1

Sync message looks like this

'$'	'$'	100	sync cnt

Sending Videos to registered modules

Sending video data is same like sending a sequence of single pictures just with the difference that you just send on sync after a frame and directly latch in the next picture before the next sync.

PIC X send	Sync message Sync cnt = X	*PIC X+1 send*	Sync message Sync cnt = X+1	*PIC X+2 send*	Sync message Sync cnt = X+2

After sync cnt 255 there is a rollover to 0 possible.

Very important: the time stretch between to sync messages shall not be smaller the 40ms !

Changing Setting

By the setting message the screen can be blacked out or put on again.

'$'	'$'	140	mode	not used = 0x00

mode = 0 display off (black)

mode = 1 display on