

# **NuMaker NuWicam**

## **Programming Guide**

*Jun. 29. 2016*

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## Introduction

**NuMaker NuWicam<sup>[1]</sup>** is an open-source Wi-Fi camera module. It is based on Nuvoton's N32905R3DN video MPU. N32905R3DN provides a powerful JPEG codec for encoding. NuWicam firmware provides audio and video streams over RTSP server. The format of video stream is Motion-JPEG with VGA resolution. The format of audio stream is G.711-alaw. It also provides a virtual COM software for high-speed UART connective. For example, mobile APP can read LM75 temperature sensor data from Nudurino board (or Nu-mbed board) or light on LEDs on Nudurino board over Modbus RTU protocol. User also can modify configurations over HTTP. We wish the NuWicam can help you get A/V stream and do some data sampling between mobile devices and some low-end MCUs easily.

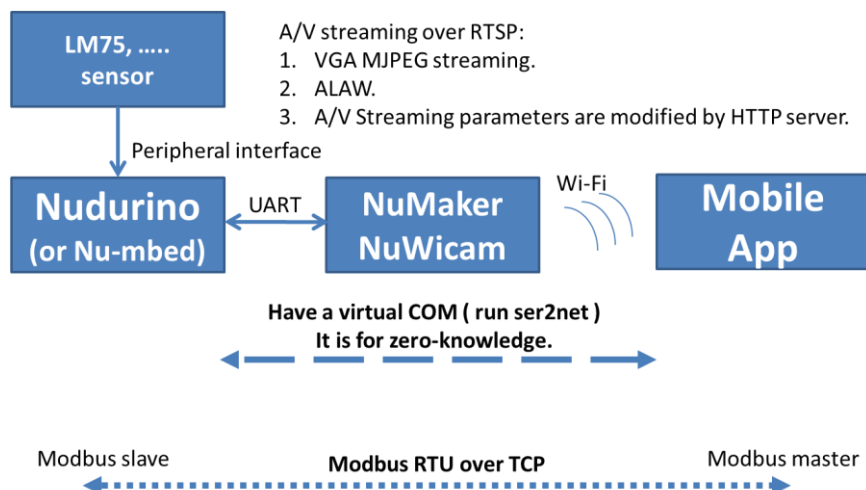


Figure 1 - An Application scenario



Figure 2 – NuWicam boards

[1] NuWicam is short form NuMaker NuWicam.

## HTTP server

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### Feature

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1. Porting light-weight HTTP server – boa.
2. CGI with extension name **.cgi**
3. Embedded C language CGI in boa HTTP server
4. Response in JSON format except for stream request

Content-type: application/json\r\n\r\n
{"value": "xxx"}

### Limitation

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1. Request string is case sensitive

## Configuration

Configuration parameters list in JSON format or update

### List all Wi-Fi parameters

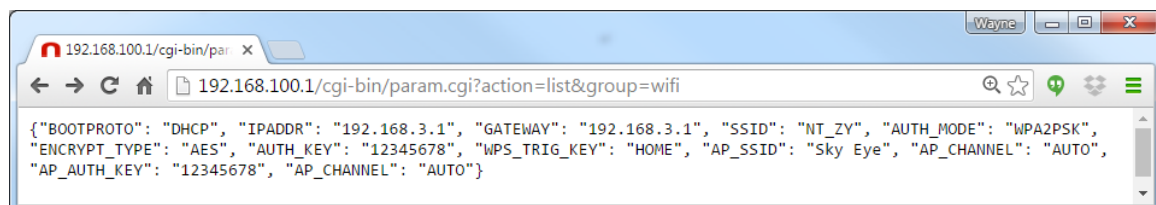
#### Request String

`http://<IP-Address>/cgi-bin/param.cgi?action=list&group=wifi`

#### Return Value

Name	Value	Description
BOOTPROTO	STATIC or DHCP	Boot protocol
IPADDR	xxx.xxx.xxx.xxx	IP address for static
GATEWAY	xxx.xxx.xxx.xxx	Gateway static
SSID	String	SSID
AUTH_MODE	OPEN/SHARED/WPAPSK/WPA2PSK	Authentication mode
ENCRYPT_TYPE	NONE/WEP/TKIP/AES	Encryption type
AUTH_KEY	String	Authentication key
WPS_TRIG_KEY	HOME	WPS key
AP_SSID	String	SSID
AP_AUTH_KEY	String	Soft AP's authentication key
AP_CHANNEL	1 ~ 13, AUTO	Soft AP's channel

#### Example Response Data



## Update Wi-Fi parameters

### Request String

`http://<IP-Address>/cgi-bin/param.cgi?action=update&group=wifi&{Name}={Value}`

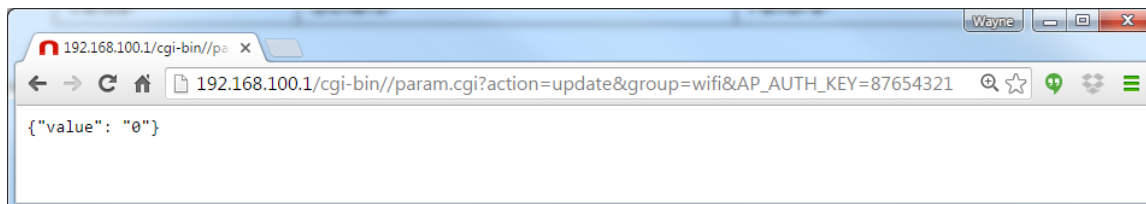
### Available Parameter List

Name	Value	Description
BOOTPROTO	STATIC or DHCP	Boot protocol
IPADDR	xxx.xxx.xxx.xxx	IP address for static
GATEWAY	xxx.xxx.xxx.xxx	Gateway static
SSID	String	SSID
AUTH_MODE	OPEN/SHARED/WPAPSK/WPA2PSK	Authentication mode
ENCRYPT_TYPE	NONE/WEP/TKIP/AES	Encryption type
AUTH_KEY	String	Authentication key
WPS_TRIG_KEY	HOME	WPS key
AP_SSID	String	SSID
AP_AUTH_KEY	String	Soft AP's authentication key
AP_CHANNEL	1 ~ 13	Soft AP's channel

### Return Value

Name	Value	Description
value	0	Success
value	Others	Failure

### Example Request String



## List all stream parameters

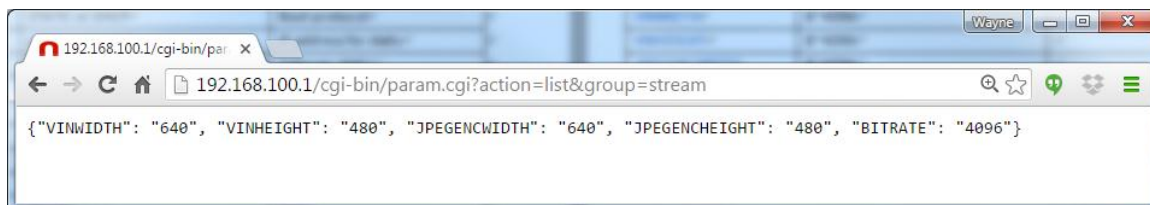
### Request String

http://<IP-Address>/cgi-bin/param.cgi?action=list&group=stream

### Return Value

Name	Value	Description
VINWIDTH	8~4096	Unit: pixel
VINHEIGHT	8~4096	Unit: pixel
JPEGENCWIDTH	8~4096	Unit: pixel
JPEGENCHEIGHT	8~4096	Unit: pixel
BITRATE	1024~8192	Unit: Kbps

### Example Response Data





## Update stream parameters

### Request String

`http://<IP-Address>/cgi-bin/param.cgi?action=update&group=stream&{Name}={Value}`

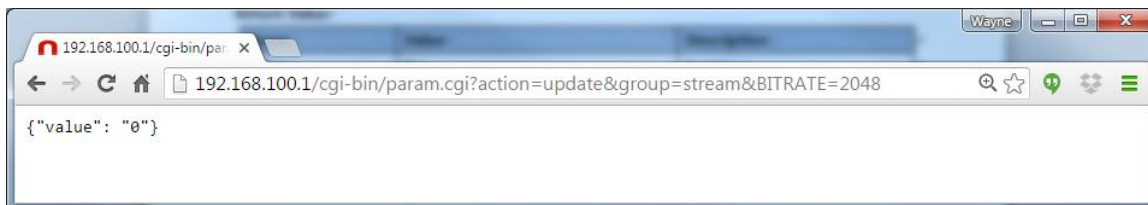
### Available Parameter List

Name	Value	Description
VINWIDTH	8~4096	
VINHEIGHT	8~4096	
JPEGENCWIDTH	8~4096	
JPEGENCHEIGHT	8~4096	
BITRATE	1024~8192	Unit: Kbps

### Return Value

Name	Value	Description
value	0	Success
value	Others	Failure

### Example Request String



## System

### Restart

#### Request String

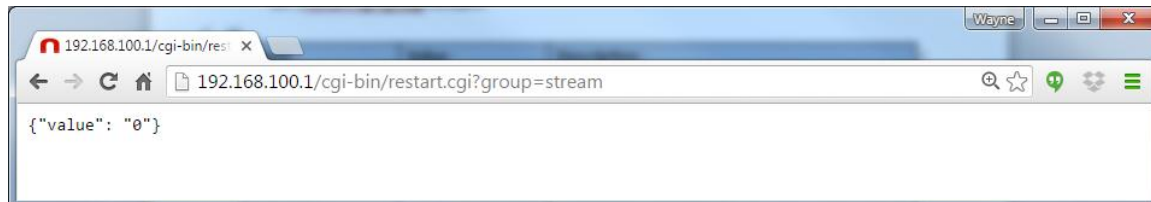
`http://<IP-Address>/cgi-bin/restart.cgi?group={Name}`

Name	Value	Description
wifi	wifi	Restart Wi-Fi start-up procedure.
board	board	Reset board.
stream	stream	Restart RTSP server.

#### Return Value

Name	Value	Description
value	0	Success
value	Others	Failure

#### Example Response Data



**NOTICE:** If you specify to restart board or Wi-Fi networking, you won't get response from NuWicam properly.

## A/V stream over RTSP

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### Motion JPEG and G.711-ALAW streaming

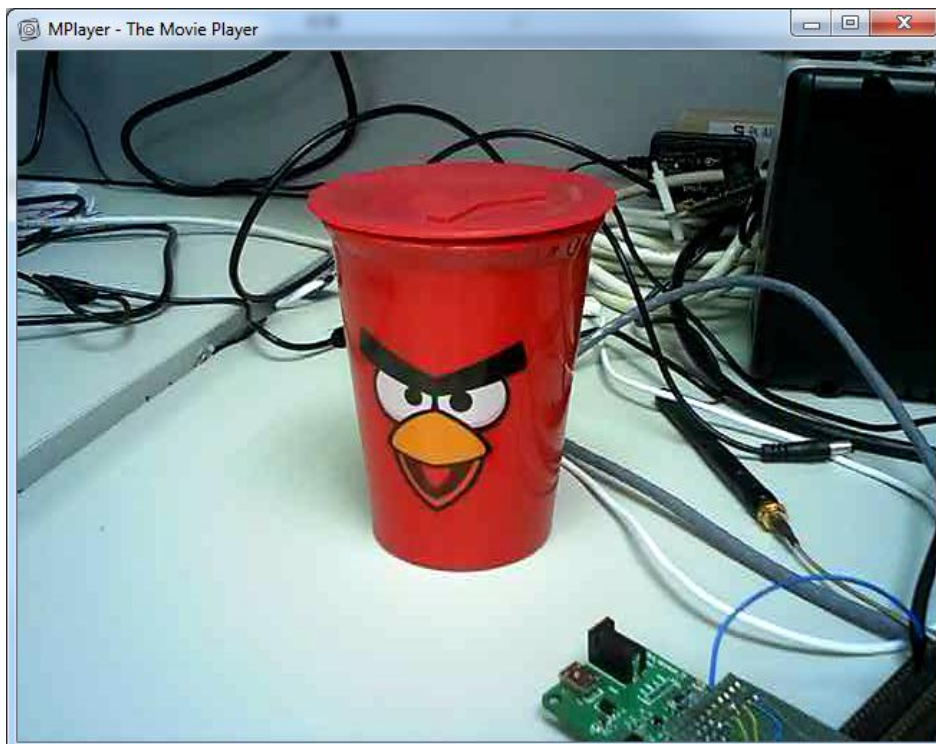
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The RTSP server is TCP port 554 by default.

rtsp://<Server-IP address>:port/cam1/mpeg4

You can use **mplayer** or **VLC** on window platform and NuWicam APP to get these streams.

Command: [mplayer -nocache "rtsp://192.168.100.1/cam1/mpeg4"](rtsp://192.168.100.1/cam1/mpeg4)



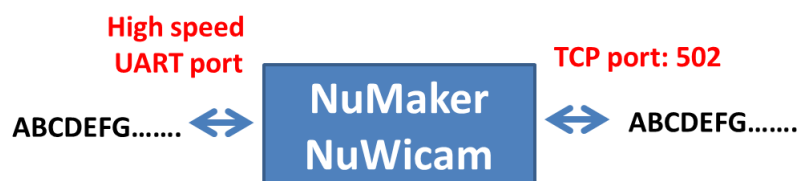
## Virtual COM

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### UART From/To TCP connection

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We ported **ser2net** open source package to do a virtual COM function. By default, we configure the High speed UART port and a TCP port 502 is the pair. The baud rate setting is '115200N81' by default. If you need to modify these parameters, you can modify "/mnt/nuwicam/etc/ser2net.conf" file.



## Open-source List

Item	Description	URL & Major modification
uclibc-gcc-4.8	GCC toolchain	<a href="https://buildroot.org/">https://buildroot.org/</a>
linux-2.6.35.4	Linux kernel	<a href="http://www.linux.org/">http://www.linux.org/</a>
busybox.1.15.2	Linux shell	<a href="http://www.busybox.net/about.html">http://www.busybox.net/about.html</a>
dnsmasq-2.60	DHCP server	<a href="http://www.thekelleys.org.uk/dnsmasq/doc.html">http://www.thekelleys.org.uk/dnsmasq/doc.html</a>
hostapd	Wi-Fi access point and authentication server	<a href="http://hostap.epitest.fi/wpa_supplicant/">http://hostap.epitest.fi/wpa_supplicant/</a>
spook-20050207	RTSP server	<a href="http://www.litech.org/spook/">http://www.litech.org/spook/</a> Major modification: (1) Support H/W JPEG encoding acceleration.
wireless-tool.29	Network configuration utilities	<a href="http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Tools.html">http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Tools.html</a>
wpa_supplicant	IEEE 802.11i supplicant	<a href="http://hostap.epitest.fi/wpa_supplicant/">http://hostap.epitest.fi/wpa_supplicant/</a>
ser2net-2.10.0	Serial to Network Proxy	<a href="http://ser2net.sourceforge.net/">http://ser2net.sourceforge.net/</a>
boa-0.94.13	Light-weight Webserver	<a href="http://www.boa.org/">http://www.boa.org/</a>

## History

Date	Description
2016/05/31	a) First version.
2016/06/22	a) Append Open-source list chapter.
2016/06/29	a) Append 'NuMaker' as prefix name.

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