

ARM® ARM926EJ-S
32-bit Microprocessor

NuMaker NuWicam
Programming Guide

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of NuMicro microcontroller based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

Table of Contents

1	INTRODUCTION	3
2	HTTP SERVER	4
2.1	Feature	4
2.2	Limitation	4
2.3	Configuraiton	4
2.3.1	List all Wi-Fi parameters	4
2.3.2	Update all Wi-Fi parameters	5
2.3.3	List all stream parameters	6
2.4	Subsystem	7
2.4.1	Restart	7
3	A/V STREAM OVER RTSP	8
3.1	Motion JPEG and G.711-ALAW streaming	8
4	VIRTUAL COM FUNCTION	9
4.1	UART From/To TCP connection	9
5	OPEN SOURCE LIST	10
6	REVISION HISTORY	11

1 INTRODUCTION

NuMaker NuWicam[1] 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 LM35 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.

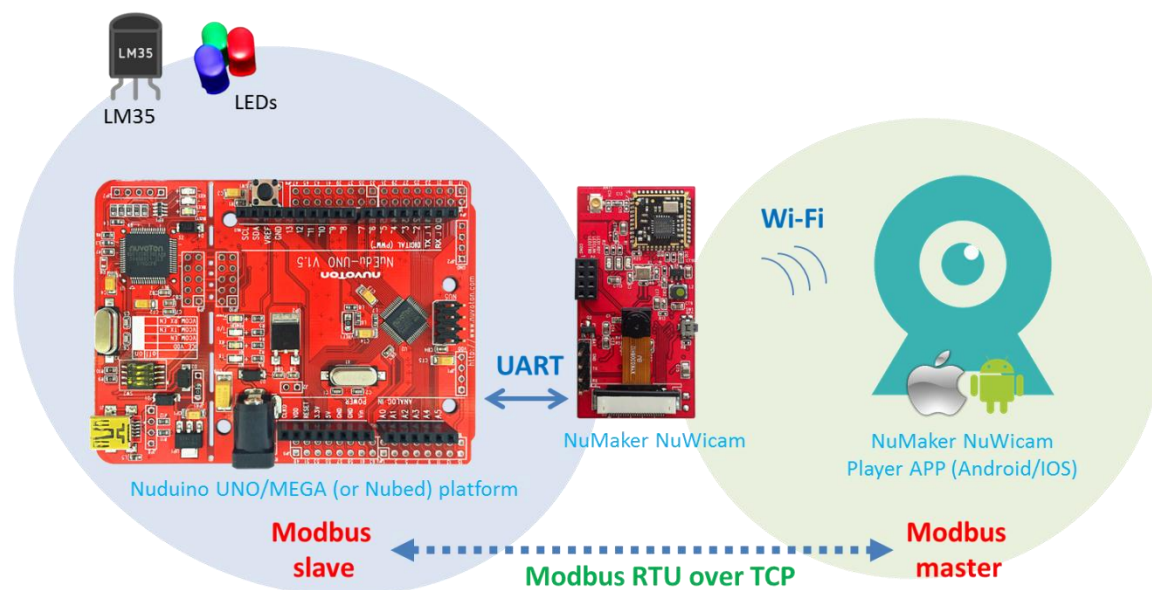


Figure 1-1 NuWicam application scenario

[1] NuWicam is short for NuMaker NuWicam.

2 HTTP SERVER

2.1 Feature

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"}

2.2 Limitation

1. Request string is case sensitive

2.3 Configuraiton

Configuration parameters list in JSON format or update

2.3.1 List all Wi-Fi parameters

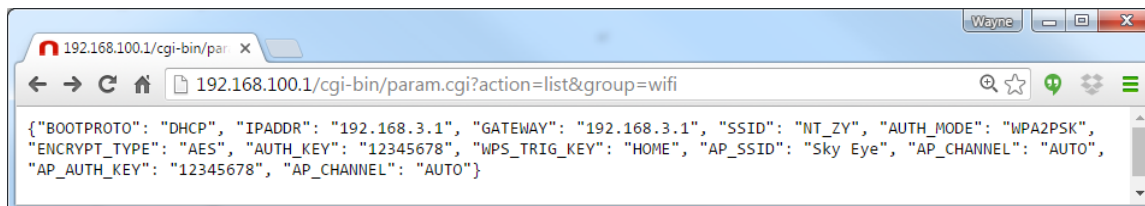
Request String

<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



2.3.2 Update all Wi-Fi parameters

Request String

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

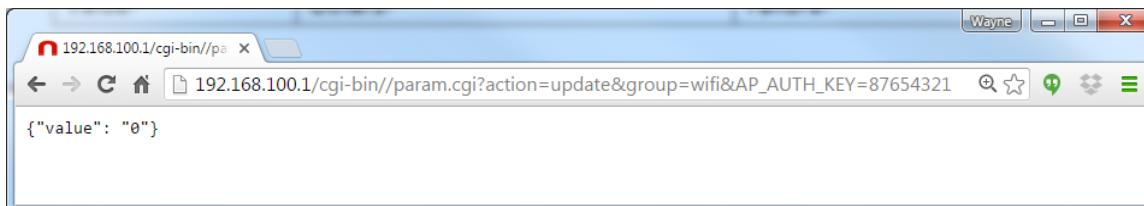
Available Parameter List

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



2.3.3 List all stream parameters

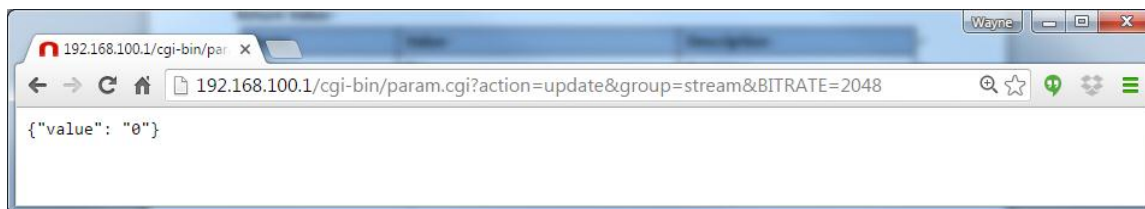
Available Parameter List

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



2.4 Subsystem

2.4.1 Restart

Request String

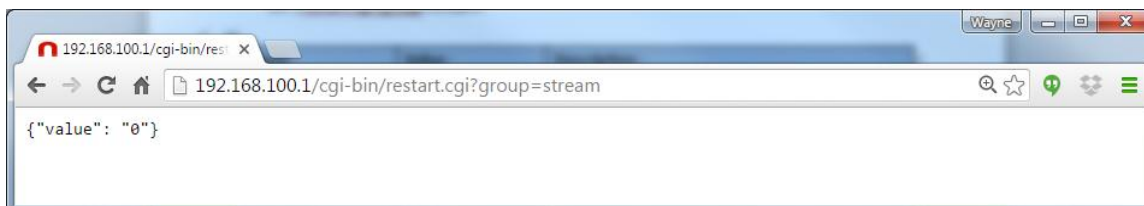
http://<IP-Address>/cgi-bin/restart.cgi?group={Name}

Name	Description
wifi	Restart Wi-Fi start-up procedure.
board	Reset board.
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.

3 A/V STREAM OVER RTSP

3.1 Motion JPEG and G.711-ALAW streaming

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

The RTSP server is TCP port 554 by default. You can use **mplayer** or **VLC** on window platform and NuWicam Player APP to get streams.

Command: `mplayer -nocache "rtsp://192.168.100.1/cam1/mpeg4"`

4 VIRTUAL COM FUNCTION

4.1 UART From/To TCP connection

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.

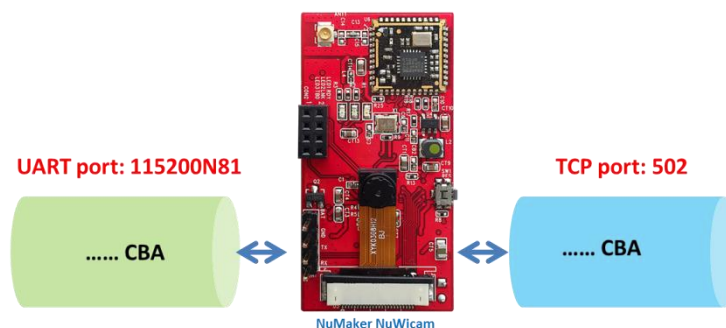


Figure 4-1 UART transparent transmission

5 OPEN SOURCE LIST

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

6 REVISION HISTORY

Date	Revision	Description
2016.07.31	1.00	1. Initially issued.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

*Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*