

krzychb/esp-just-slip

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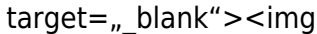
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version="1.1" viewBox="0 0 16 16" width="16"/>
  readme.md
</h3><article class="markdown-body entry-content" itemprop="text"><p>#esp-
just-slip</p>
```

<p>SLIP (Serial Line Internet Protocol) provides easy to implement method to encapsulate data packets sent over a serial connection. The esp-just-slip is an implementation of SLIP prepared for <a href=„<http://espressif.com/en/products/esp8266/>“>ESP8266 SoC. It is provided as C module <a href=„<https://github.com/krzychb/esp-just-slip/blob/master/justslip>“>justslip and includes verification of data integrity with <a href=„<https://en.wikipedia.org/wiki/Crc16>“>CRC16. Sample implementation of this module is available in file user_main.c and demonstrates sending of data packets between arduino and ESP8266.</p>
<p>##Implementation</p>
<p>esp-just-slip can set data using hardware UART0 serial or using software serial. Software serial provides flexibility which other pins to use for communication if UART0 is already used for other purposes. Software serial is implemented using <a href=„<https://github.com/plieningerweb/esp8266-software-uart>“>esp8266 software uart by <a href=„<https://github.com/plieningerweb>“>Andreas Plieninger. To provide verification if data has been transmitted correctly <a href=„<https://en.wikipedia.org/wiki/Crc16>“>CRC16 is used.</p>
<p>##Sample Test Scenarios</p>
<p>Testing of this application using s/w and h/w serial ports may be performed with sample hardware configurations defined below.</p>
<p>Please note that most of Arduino modules operate on 5V while ESP8266 on 3.3V To make the connection easier Arduino Pro Mini 3.3V has been used that provides direct compatibility of pin voltage to ESP8266. In other cases a 5V <> 3.3V voltage level shifter should be used or ESP8266 may be damaged if connected directly to 5V Arduino pins.</p>
<p>###SLIP over S/W Serial - Hardware Set Up</p>
Arduino Pro Mini 3.3V
ESP-12E LoLin V3 with USB by wemos.cc
Two USB-UART generic dongles used to monitor serial traffic received by ESP-12E
upload Arduino and then monitor serial traffic received by Arduino

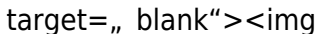
<p><a href=„<https://github.com/krzychb/esp-just-slip/blob/master/documents/just-slip-components-sws.jpg>“ target=„_blank“><img src=„<https://github.com/krzychb/esp-just-slip/raw/master/documents/just-slip-components-sws.jpg>“ alt=„alt Sample configuration - components“/></p>
<p>The following pins are used to connect particular modules:</p>
<table>
<thead>
<tr>
<th>Module</th>
<th>Pin Description</th>
<th>Pin No.</th>
<th><></th>
<th>Pin No.</th>
<th>Pin Description</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESP-12E</td>
<td>Soft UART Rx</td>
<td>GPIO14</td>
<td><></td>
<td>11</td>
<td>Soft UART Tx</td>
<td>Arduino</td>
</tr>
<tr>
<td>ESP-12E</td>
<td>Soft UART Tx</td>
<td>GPIO15</td>
<td><></td>
<td>10</td>
<td>Soft UART Rx</td>
<td>Arduino</td>
</tr>
<tr>
<td>ESP-12E</td>
<td>Ground</td>
<td>GND</td>
<td><></td>
<td>GND</td>
<td>Ground</td>
<td>Arduino</td>
</tr>
<tr>
<td>ESP-12E</td>
<td>UART1 Tx</td>
<td>GPIO02</td>

<>	Rx	UART Rx	USB-UART ESP
ESP-12E	Ground	GND	<>
GND	Ground	USB-UART ESP	
UART Tx	TXO	<>	Rx
UART Rx	UART Rx	USB-UART INO	
Arduino	UART Rx	RXI	<>
Tx	UART Tx	USB-UART INO	
Arduino	Reset	RST	<>
DTR	UART DTR	USB-UART INO	
Arduino	Power Supply	RAW	
<>	5V	Power Supply	USB-UART INO
Arduino	Ground	GND	<>
GND	Ground	USB-UART INO	

<https://github.com/krzychb/esp-just-slip/blob/master/documents/just-slip-connections-sws.jpg>

Please refer to folder <https://github.com/krzychb/esp-just-slip/blob/master/documents> for additional pictures of connections.

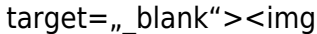
SLIP over H/W Serial - Hardware Set Up

- Arduino Pro Mini 3.3V
- ESP-01 with 3.3V power supply
- Two USB-UART generic dongles used to monitor serial traffic received by ESP-01
- upload Arduino and then monitor serial traffic received by Arduino

<https://github.com/krzychb/esp-just-slip/blob/master/documents/just-slip-components-hws.jpg>


The following pins are used to connect particular modules:

Module	Pin Description	Pin No.	<>	Pin No.	Pin Description	Module
ESP-01	UART0 Rx	GPIO3	<>	TXD	UART Tx	Arduino
ESP-01	UART0 Tx	GPIO1	<>	RXD	UART Rx	Arduino
ESP-01	Ground	GND	<>	GND	Ground	Arduino
ESP-01	UART1 Tx	GPIO02	<>	Rx	UART Rx	USB-UART ESP
ESP-01	Ground	GND	<>	GND	Ground	Arduino
Arduino	Soft UART Tx	11	<>	Rx	UART Rx	USB-UART INO
Arduino	Soft UART Rx	10	<>	Tx	UART Tx	USB-UART INO
Arduino	Reset	RST	<>	DTR	UART DTR	USB-UART INO
Arduino	Power Supply	RAW	<>	5V	Power Supply	ESP-01 PS
Arduino	Ground	GND	<>	GND	Ground	USB-UART INO

<https://github.com/krzychb/esp-just-slip/blob/master/documents/just-slip-connections-hws.jpg>

Please refer to folder <https://github.com/krzychb/esp-just-slip/blob/master/documents> for additional pictures of connections.

Software Overview ESP8255 application should be compiled and loaded to module using provided make file. Use define in file https://github.com/krzychb/esp-just-slip/blob/master/user/user_main.c to

choose between SLIP over s/w or h/w serial.

```
<div class=„highlight highlight-source-c“><pre>
comment define below if you would like to use Softuart #define USE_HW_SERIAL</pre></div>
<p>Arduino should be loaded using <a href=„https://www.arduino.cc/en/Main/Software“>Arduino
IDE</a>. There are two sketches for both s/w and h/w serial test scenarios available in the following
folders:</p>
<ul><li><a href=„https://github.com/krzychb/esp-just-slip/blob/master/ino-just-slip-
sws“>ino-just-slip-sws</a> - SLIP over S/W Serial</li> <li><a
href=„https://github.com/krzychb/esp-just-slip/blob/master/ino-just-slip-hws“>ino-just-slip-hws</a> -
SLIP over H/W Serial</li> </ul>
<p>Functionally of those sketches is identical to the application
loaded on ESP8266. There are some (slight) differences in code as Arduino sketches are written in
C++ while ESP8266 application is written in pure C.</p>
<p>Once applications are started the
following information is displayed on <a
href=„https://github.com/krzychb/esp-just-slip/blob/master/documents/just-slip-arduino-
terminal.png“>Arduino Serial</a> and <a
href=„https://github.com/krzychb/esp-just-slip/blob/master/documents/just-slip-esp8266-
terminal.png“>ESP8266 UART1</a> terminals:</p>
<pre>... 4F 2E 00 00 AB E6 71 77 4E E0 76 D8 :
2% 50 2E 00 00 23 80 4D 60 3D B5 DA C8 : 2% 51 2E 00 00 51 3C 15 59 C6 E6 32 0E : 2% ... </pre>
<p>First four columns contain counter of packets received, next 8 bytes contain random data and
last column contains percentage of packets lost or corrupt. Packets are sent every 30 ms at 57600
bps. Checking of UART input buffer for data is done every 10 ms.</p>
<p>Basing on results of first
test scenario (SLIP over s/w serial) on average 1% of packets received by Arduino are lost or corrupt.
On ESP8266 side this value is below 0.5% (0% reported on terminal). The reason of bigger number of
packet lost/corrupt on Arduino side is likely ESP8266 Wi-Fi routines that interrupt operation of
SoftUART sending the packets. This is only a hypothesis that should be verified by specific
testing.</p>
<p>Packages lost or corrupt for second test scenario were 0% on both Arduino and
ESP8266 side.</p>
<p>The following s/w version have been used when developing and testing of
esp-just-slip:</p>
<ul><li><a href=„http://programs74.ru/udkew-en.html“>Unofficial Development
Kit for Espressif ESP8266</a> v2.0.8 (esp_iot_sdk_v1.3.0_15_08_08)</li> <li><a
href=„https://www.arduino.cc/en/Main/Software“>Arduino iDE 1.6.5</a></li> <li><a
href=„https://www.arduino.cc/en/Reference/SoftwareSerial“>Arduino SoftwareSerial 1.0.0</a> -
available through Arduino iDE > Sketch > Include Library > Manage Libraries</li>
</ul>
<p>##Software API</p>
<p>The following functions are implemented:</p>
<div class=„highlight highlight-source-c“><pre>uint8_t ICACHE_FLASH_ATTR slipDecodeSerial(Softuart
*softuart, uint8_t *dataBuffer); uint8_t ICACHE_FLASH_ATTR slipDecodeSerialUart0(uint8_t
*dataBuffer); void ICACHE_FLASH_ATTR slipEncodeSerial(Softuart *softuart, uint8_t *dataBuffer,
uint8_t nCount); void ICACHE_FLASH_ATTR slipEncodeSerialUart0(uint8_t *dataBuffer, uint8_t nCount);
uint8_t ICACHE_FLASH_ATTR readKeyboard(uint8_t *dataBuffer); uint8_t ICACHE_FLASH_ATTR
appendCrc16(uint8_t *dataBuffer, uint8_t nCount); bool ICACHE_FLASH_ATTR checkCrc16(uint8_t
*dataBuffer, uint8_t nCount);</pre></div>
<p>###Read and Decode Data</p>
<div class=„highlight highlight-source-c“><pre>*softuart - pointer to software UART *dataBuffer - pointer
to data buffer to store received data returned value - number of bytes read to dataBuffer uint8_t
ICACHE_FLASH_ATTR slipDecodeSerial(Softuart *softuart, uint8_t *dataBuffer)</pre></div>
<p>Read
SLIP encoded data from software serial port, decode them and store in data buffer.</p>
<div class=„highlight highlight-source-c“><pre>*dataBuffer - pointer to data buffer to store received
data returned value - number of bytes read to dataBuffer uint8_t ICACHE_FLASH_ATTR
slipDecodeSerialUart0(uint8_t *dataBuffer)</pre></div>
<p>Read SLIP encoded data from UART0
serial port, decode them and store in data buffer.</p>
<p>###Encode and Write Data</p>
<div class=„highlight highlight-source-c“><pre>*softuart - pointer to software UART *dataBuffer - pointer
to data buffer to read data from nCount - number of bytes to read form dataBuffer void
ICACHE_FLASH_ATTR slipEncodeSerial(Softuart *softuart, uint8_t *dataBuffer, uint8_t
nCount)</pre></div>
<p>SLIP encode data taken from data buffer and send the over the software
serial port.</p>
<div class=„highlight highlight-source-c“><pre>*dataBuffer - pointer to data buffer
```

to read data from nCount - number of bytes to read from dataBuffer void ICACHE_FLASH_ATTR
slipEncodeSerialUart0(uint8_t *dataBuffer, uint8_t nCount)</pre></div> <p>SLIP encode data taken
from data buffer and send the over the UART0 serial port.</p> <p>###Append CRC16 to Data</p>
<div class=„highlight highlight-source-c“><pre> *dataBuffer - pointer to data buffer to calculate and
append crc16 nCount - number of data bytes in dataBuffer returned value - number of bytes in data
buffer including crc16 uint8_t ICACHE_FLASH_ATTR appendCrc16(uint8_t *dataBuffer, uint8_t
nCount)</pre></div> <p>Calculate CRC16 for data contained in data buffer and append result to
the end of data buffer</p> <p>###Check Data Integrity</p> <div class=„highlight highlight-
source-c“><pre> *dataBuffer - pointer to data buffer nCount - number of data bytes in dataBuffer
including crc16 returned value - true or false depending on result of crc16 check bool
ICACHE_FLASH_ATTR checkCrc16(uint8_t *dataBuffer, uint8_t nCount)</pre></div> <p>Perform data
integrity check by comparing CRC16 calculated for input data against CRC16 received.</p>
<p>###Print Data Buffer</p> <div class=„highlight highlight-source-c“><pre> *dataBuffer -
pointer to data buffer nCount - number of data bytes in dataBuffer including crc16 void
ICACHE_FLASH_ATTR printBuffer(uint8_t *dataBuffer, uint8_t nCount)</pre></div> <p>Print values
from dataBuffer for diagnostic purposes. The last two bytes of dataBuffer contain CRC16 and are not
printed.</p> <p>###Acknowledgments</p> <p>Development of this esp-just-slip was done using
the following resources:</p> <p>Thank you guys for your contribution to ESP8266 community. It is a
great pleasure to work with applications you have developed.</p> <p>###Contributing</p>
<p>Please report any <a href=„<https://github.com/krzychb/esp-just-slip/issues>“>issues and
submit <a href=„<https://github.com/krzychb/esp-just-slip/pulls>“>pull requests. Feel free to
contribute to the project in any way you like!</p> <p>###Author</p> <p>krzychb</p>
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