

How to convert data from serial port to IP packets

Serial IP is a feature where data coming from serial port is converted to IP packets and set to designated IP address. Correspondingly the received IP packets are converted and forwarded to serial interface. Serial IP configuration handling is divided into two sections for two interfaces:

- RS-232 connection in the radio unit (RU) and
- USB-Serial dongle attached to USB-A port of the central unit (CU)

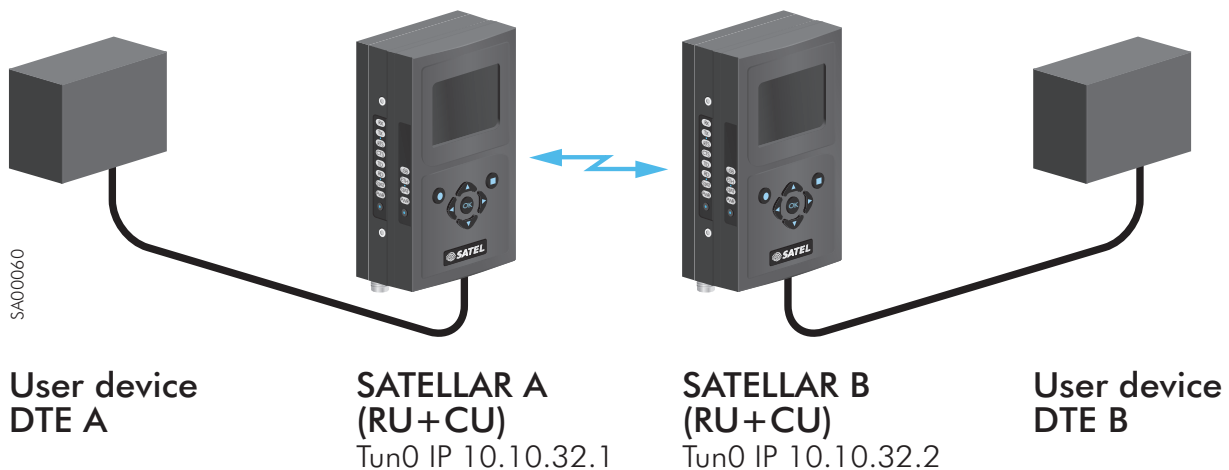
Central Unit handles all the IP related data traffic and the air interface is IP based. Central Unit is needed for stations using the serial IP (CU, router). Central Unit is not required if the station is acting only as a repeater (no terminal connection).

Examples

1. Point-to-point

Example “Point-to-point” presents the basic feature and usage of the configuration parameters.

Two user devices, DTE A and B are connected to SATELLARs via serial port connection and the SATELLARs are configured to have a radio connection.



Point-to-point example

SATELLAR A is having Tun0 IP 10.10.32.1 and SATELLAR B Tun0 IP 10.10.32.2 (can be obtained from screen saver or from Routing – IP category). SATELLAR B is a client which is the side that initiates the connection. It has been configured to listen messages from serial port and to send them to target address and port. SATELLAR A is a server side that has been configured to listen dedicated IP port and to forward messages to serial port. Transmission is always started from client side; it creates the connection between the SATELLARs. There are some differences for this when using UDP (See chapter 5. UDP).

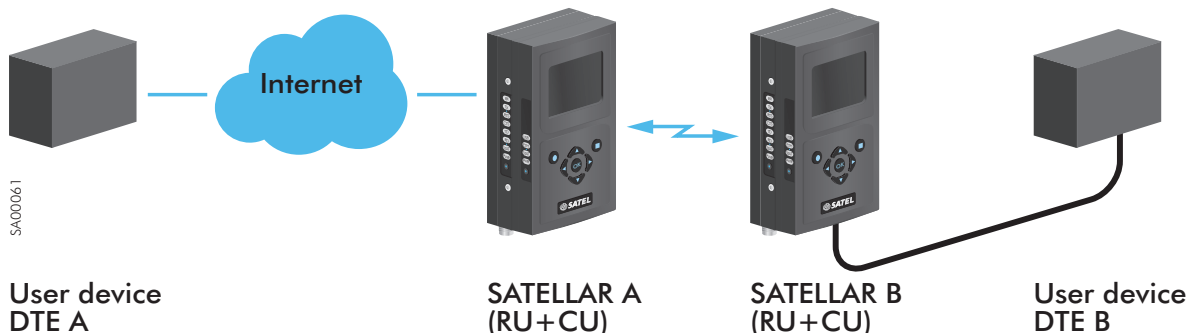
First, the serial port in both SATELLARs must be configured to match the User device configuration. After this the SATELLARs are able to communicate with each others.

Parameter	SATELLAR A	SATELLAR B
Mode	Server	Client
Protocol	TCP	TCP
Listening Port	2005	Irrelevant in this mode
Sending Port	Irrelevant in this mode	2005
Sender Target Address	10.10.32.2	10.10.32.1

The basic idea is to cross-configure SATELLARs to communicate with each other. Protocol can be also UDP as long as it is same in both ends.

2. TCP Server

SATELLAR is configured to listen the defined IP Port number and forward data from the port to the serial port (IP to Serial-conversion).



TCP Server, conversion from IP to serial port

DTE A

Ethernet IP Address 192.168.1.1
 IP Route 192.168.2.0/24 via 192.168.1.2
 Application able to send messages to dedicated address and port configured to send to 192.168.2.10 port 2006

SATELLAR A

Ethernet IP Address 192.168.1.2
 RMAC 1 i.e. Tun0 10.10.32.1
 Packet Route to 2
 IP Route 192.168.2.0/24 via 10.10.32.2

SATELLAR B

Ethernet IP Address 192.168.2.10
 RMAC 2 i.e. Tun0 10.10.32.2
 Packet Route to 1
 IP Route 192.168.1.0/24 via 10.10.32.1
 Serial IP configuration as above
 Serial port configuration in line with User device DTE B

DTE B

Serial port configuration in line with SATELLAR B

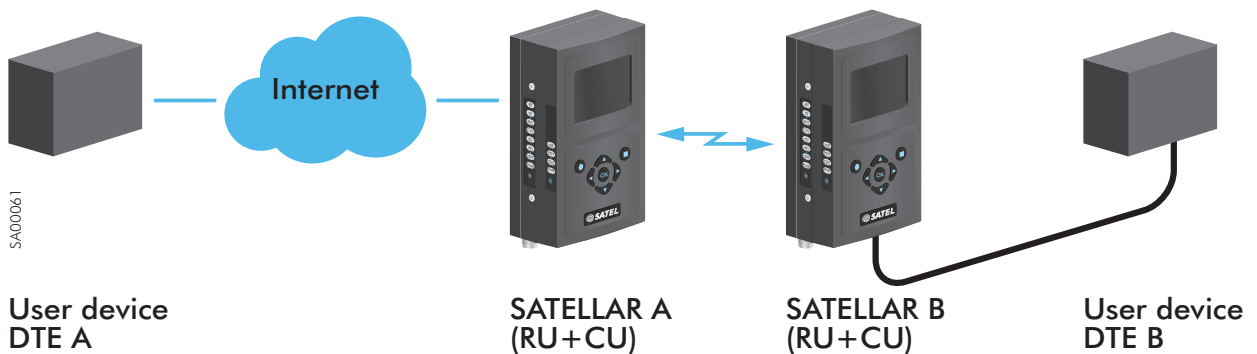
User Device DTE A has an Ethernet IP address 192.168.1.1. SATELLAR B has two IP addresses Tun0 10.10.32.2 and Eth0 192.168.2.10 which both can be used depending on the routing configuration in User device DTE A. Ethernet address is used in this example.

SATELLAR A does not have any Serial IP connection and it is configured to have a radio connection with SATELLAR B. User device DTE A must be set to route messages to SATELLAR B via SATELLAR A. In this case SATELLAR A has an IP 192.168.1.2. User device DTE A must have a route 192.168.2.0/24 via 192.168.1.2 and must also have an application able to send messages to dedicated address and port, in this case to port 2006 at 192.168.2.10

Parameter	SATELLAR B
Mode	Server
Protocol	TCP
Listening Port	2006

3. TCP Client

In TCP client case whenever data comes from the serial port, the data is buffered and sent to target address. This can be e.g. some on-demand service sending some e.g. log data whenever there is something to be sent. Setup is similar to the TCP server case.



TCP Client

DTE A:

IP address 192.168.1.1

SATELLAR A:

IP address 192.168.1.2

SATELLAR B:

IP address 192.168.2.10

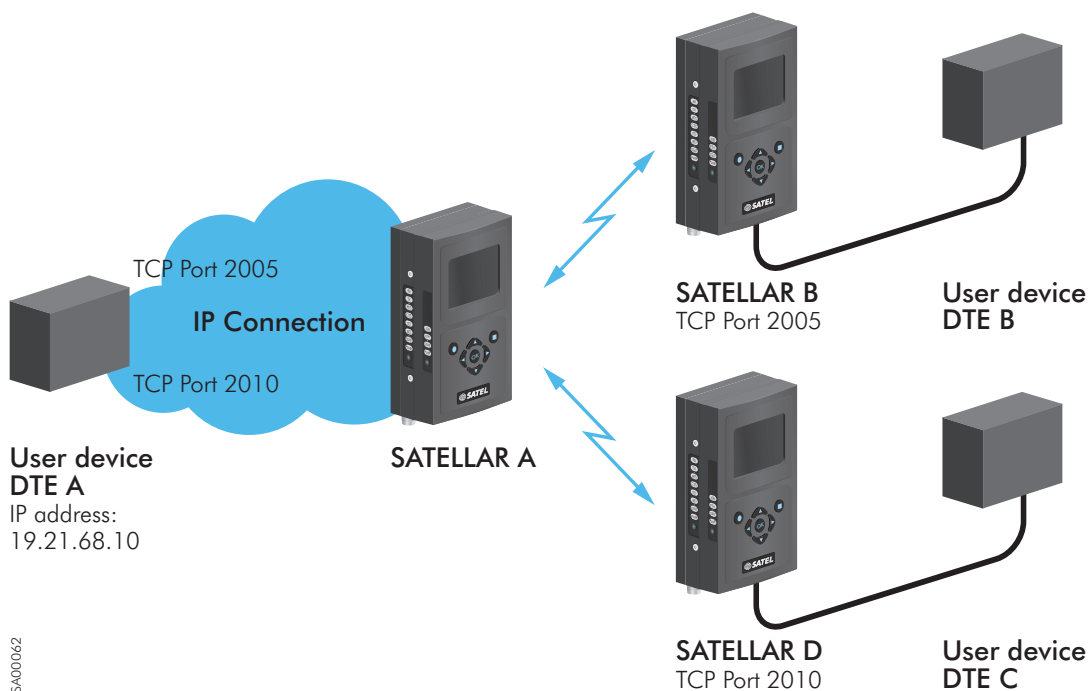
User Device DTE A has IP address: 192.168.1.1, SATELLAR A: 192.168.1.2 and SATELLAR B: 192.168.2.10. SATELLARs are configured to have a radio connection, and IP routes are configured so that devices are able to communicate with each other, i.e. route from User device DTE A to SATELLAR B via SATELLAR A, and from SATELLAR B to User device DTE A via SATELLAR A.

User device DTE A must have an application that opens port listening to messages coming from SATELLAR B. SATELLAR A does not have any Serial IP configuration. SATELLAR B has following serial port configuration, where it is assumed that User Device DTE A has port 2005 open:

Parameter	SATELLAR B
Mode	Client
Protocol	TCP
Sending Port	2005
Sender Target Address	192.168.1.1

4. Multipoint-to-point

Multipoint-to-point case can be presented as an extended case of TCP Client.



In this example the User device DTE A is capable simultaneously listen several ports. Both SATELLAR B and SATELLAR C are configured to send the messages to User device DTE A, but to different ports. Following configuration is set to SATELLAR B and SATELLAR D, when User device DTE A has IP address 192.168.1.1:

Parameter	SATELLAR B	SATELLAR C
Mode	Client	Client
Protocol	TCP	TCP
Sending Port	2005	2010
Sender Target Address	192.168.1.1	192.168.1.1

One option for this kind of tasking is serial port virtualizing that can be done e.g. with HW VSP application:
http://www.hw-group.com/products/hw_vsp/index_en.html

The application creates virtual serial ports which are actually IP addresses and ports i.e. user defines IP address and port combination which then creates a (virtual) serial port to system. By this way different applications can use these connections as serial ports although they are actually IP connections.

5. UDP

UDP mode can be used similar to TCP modes with some extension.

In point-to-point case the mode of the device can be either client or server. Due to the nature of the protocol both devices need to be able to send and receive independently from the other device. See chapter 7.4.3 *UDP and TCP protocols (in SATELLAR Digital system part III: radio unit)* for more detailed protocol explanation.

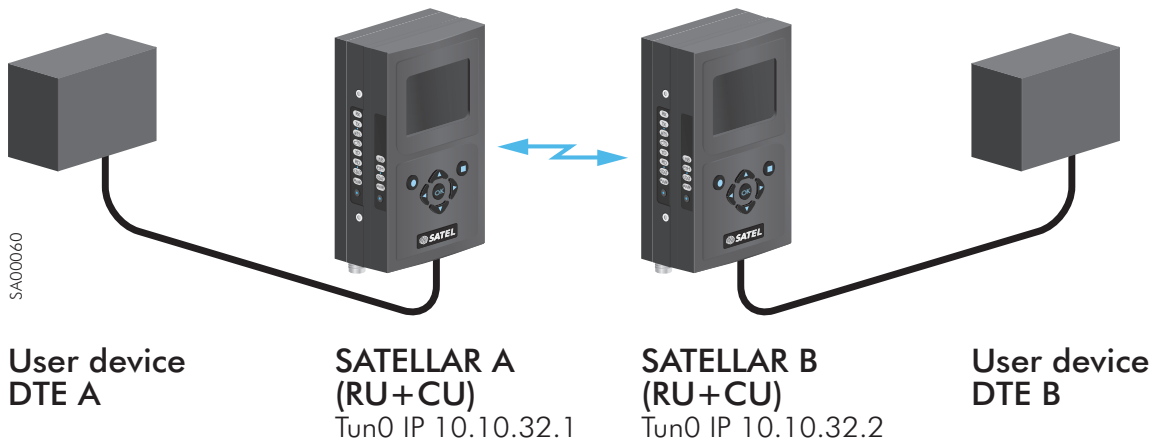
Parameter	SATELLAR A	SATELLAR B
Mode	Server	Server
Protocol	TCP	TCP
Listening Port	2005	2006
Sending Port	2006	2005
Sender Target Address	10.10.32.2	10.10.32.1

When using UDP in the Server mode in generally and some replies are needed to be sent, also the target address needs to be set. This concerns also the Client mode and listening of replies.

Parameter	SATELLAR B
Mode	Server
Protocol	UDP
Listening Port	2006
Sending Port	2005
Sender Target Address	192.168.1.1

6. Send or receive only

These features are limited versions of the presented features. The example is similar to point-to-point.



SATELLAR A is having Tun0 IP 10.10.32.1 and SATELLAR B Tun0 IP 10.10.32.2. SATELLAR A is configured to send to SATELLAR B and SATELLAR B is configured to listen the defined port.

Parameter	SATELLAR A	SATELLAR B
Mode	Send only	Receive only
Protocol	UDP	UDP
Listening Port	Irrelevant in this mode	2006
Sending Port	2006	Irrelevant in this mode
Sender Target Address	10.10.32.2	Irrelevant in this mode

The User device DTE A can only send and the User device DTE B can only listen the messages.