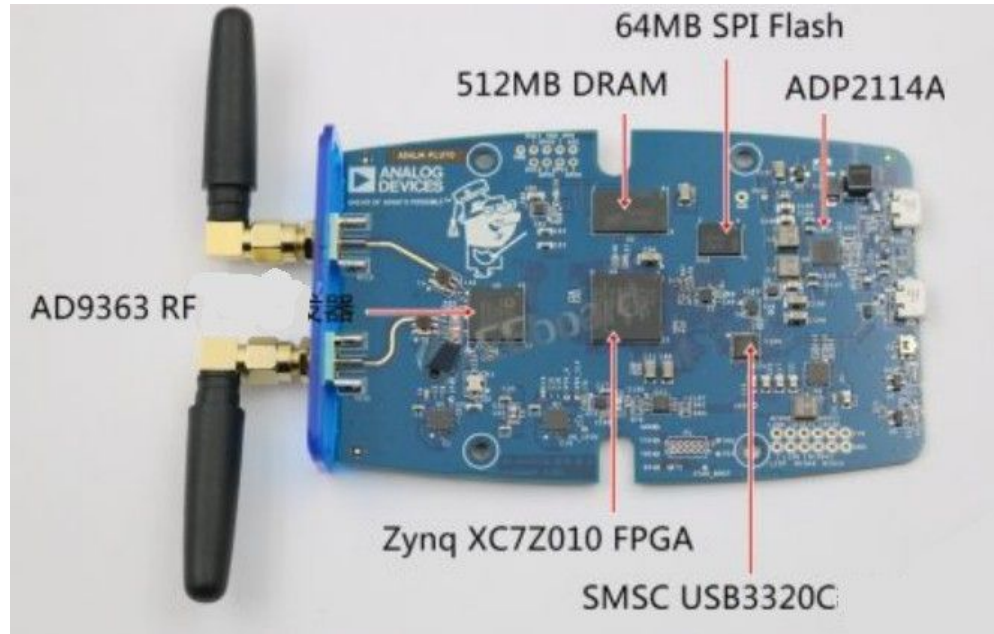
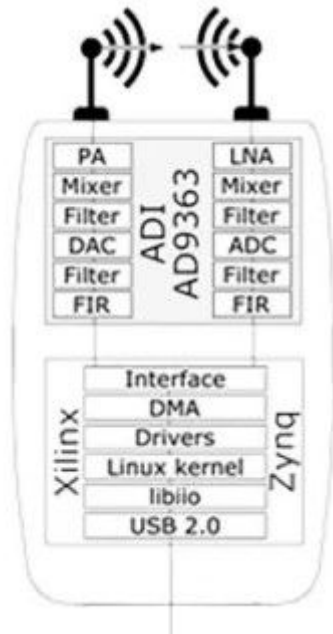


# PlutoDVB2 Firmware

# PlutoSDR

quick overview

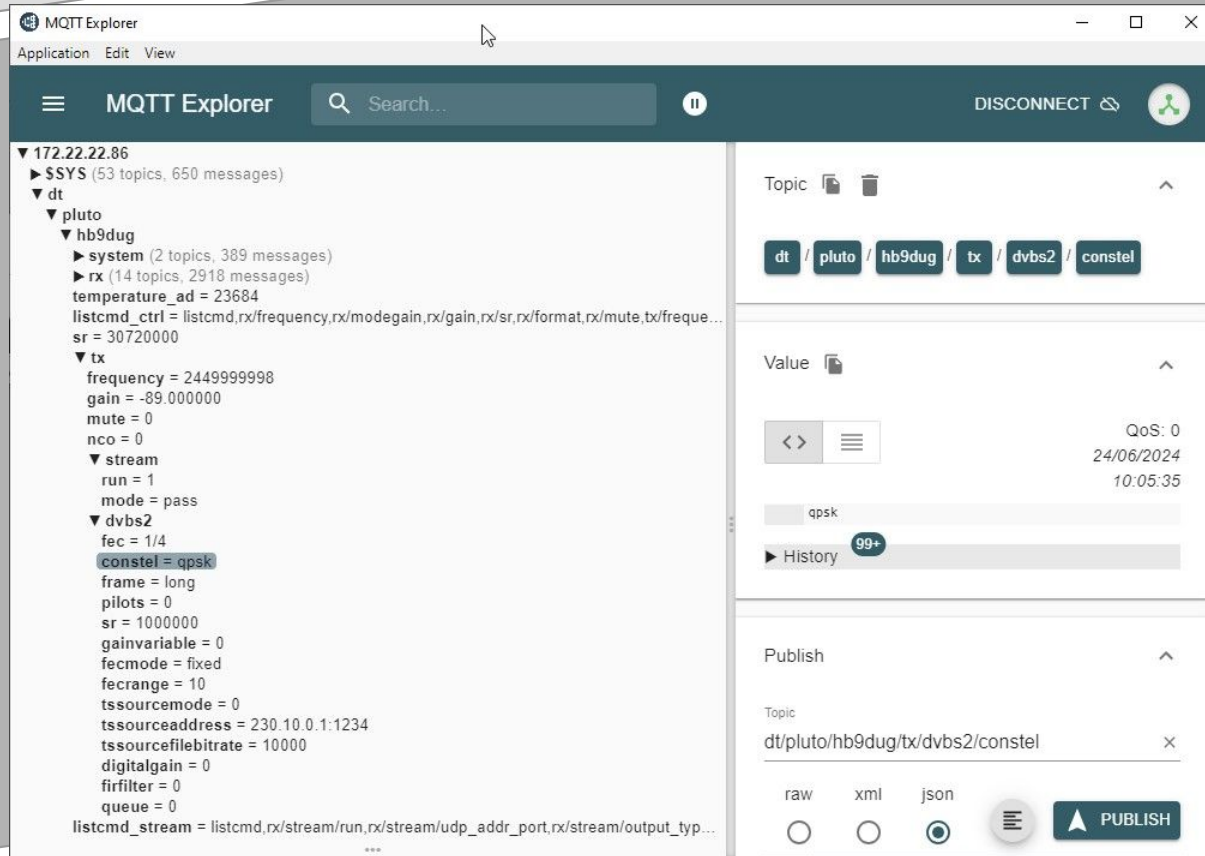


# MQTT ?



- Message Queuing Telemetry Transport ([MQTT](#))
- The Standard for IoT Messaging
- It is designed as an extremely lightweight publish/subscribe messaging transport that is ideal for connecting remote devices with a small code footprint and minimal network bandwidth

# MQTT ?

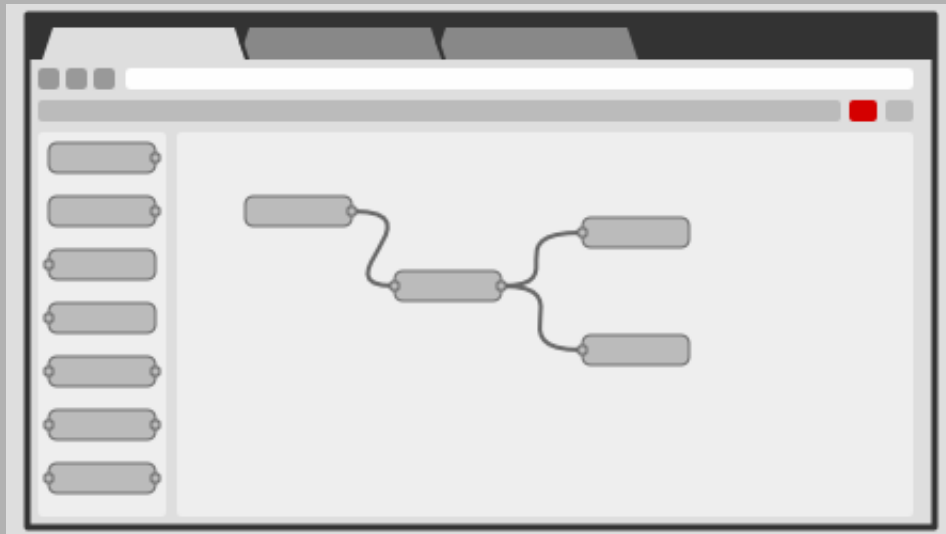


The screenshot shows the MQTT Explorer application window. The left pane displays a tree view of the MQTT broker structure:

- 172.22.22.86
  - SSYS (53 topics, 650 messages)
    - dt
      - pluto
        - hb9dug
          - system (2 topics, 389 messages)
          - rx (14 topics, 2918 messages)
            - temperature\_ad = 23684
            - listcmd\_ctrl = listcmd,rx/frequency,rx/modegain,rx/gain,rx/sr,rx/format,rx/mute,tx/freque...
              - sr = 30720000
            - tx
              - frequency = 244999998
              - gain = -89.000000
              - mute = 0
              - nco = 0
              - stream
                - run = 1
                - mode = pass
              - dvbs2
                - fec = 1/4
                - constel = qpsk**
                - frame = long
                - pilots = 0
                - sr = 1000000
                - gainvariable = 0
                - fecmode = fixed
                - fecrange = 10
                - tssourcemode = 0
                - tssourceaddress = 230.10.0.1:1234
                - tssourcefilebrate = 10000
                - digitalgain = 0
                - firfilter = 0
                - queue = 0

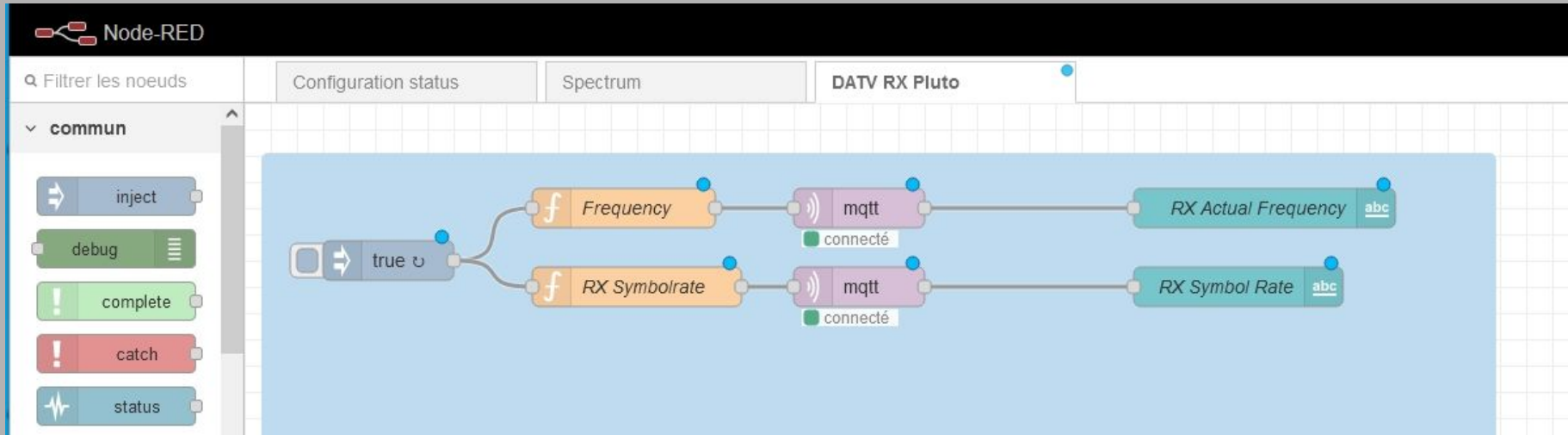
The right pane shows the details for the selected topic: `dt/pluto/hb9dug/tx/dvbs2/constel`. It includes a breadcrumb trail, a value field containing `qpsk`, and a history section with 99+ entries. At the bottom, there is a 'Publish' section with a topic input field containing the same topic name and radio buttons for 'raw', 'xml', and 'json' (selected), along with a 'PUBLISH' button.

# Node-RED?



Node-RED provides a browser-based flow editor that makes it easy to wire together flows using the wide range of nodes in the palette

# Node-RED?



# Késako ?

- PlutoDVB2 firmware is a DVB dedicated firmware developed by F5OEO Evariste for the Adalm-Pluto, Pluto+ and AntSDR E200
- It uses a DVB-S/S2 modulator in FPGA (Open Research Institute - ORI)
- It can handle transport stream for video and also IP using Generic Stream Encapsulation (DVB-GSE) Data link layer protocol
- F5OEO is using MQTT messages to control the Pluto DVB-S/S2 modulator, the spectrum display and the Minitiouner with longmynd
- It could also be used as a standard Pluto

# Hardware

- Pluto Rev B and D are supported
- The recommended setup is to use Pluto over Ethernet
- For easy GSE operation, a Minitiouner plugged on a hub USB Ethernet adapter is recommended
- 2 CPUs enable by default
- Frequency extension Tx/Rx : 46.875Mhz-6Ghz
- Symbol Rate between 20KS and 4MS



# Hardware



+5V



# Stream mode

- test : generate a test card and tone
- pass : (default mode at reboot); pass-through mode, Pluto could be used with third party software (gnuradio ...)
- dvbs2-ts : dvbs2 with transport stream
- dvbs2-gse : dvbs2 with generic encapsulation (ip over dvb)
- dvbs : dvb-s (only ts input)

# DVB-S2 setting

- FEC {1/4,1/3,2/5,3/5,4/5,8/9,9/10}
- Constellation {qpsk,8psk,16apsk,32apsk}
- Frame type {short,long}
- Pilots {0,1}
- Symbol rate {25000..4000000}
- Roll-off {0.20, 0.15}
- FEC mode : {fixed,variable}
- Dynamic gain regarding to FEC {0,1}

# DVB-S2 setting

- Transport stream source
  - UDP
  - file
  - internal pattern
- Stream status
  - complete status is reported every second

# Spectrum

- A live spectrum is available through a websocket and a webpage
- rx/stream/mode : webfft to enable the spectrum
- rx/webfft/frequency : set the central rx frequency
- rx/webfft/span : set desired span
- rx/webfft/average : number of averaging
- rx/webfft/rangemin : set the min range
- rx/webfft/rangemax : set the max range
- rx/webfft/autoscale : try to autoscale depending on the current spectrum

# Longmynd

- Longmynd software to control a MiniTiouner is included in the PlutoDVB2 firmware
- Longmynd is controlled by MQTT messages
- Special version supporting DVB-GSE
- MiniTiouner is connected to an USB port on the Pluto

# GUI...

- The firmware is focused on a robust dvbs2 kernel
- Human interface is out of scope

Helpers/GUI are already available from contributors:

- F4HSL: batch files for windows, Quickstart documentation
- ZS1SCI: DATV-Red 4.x (Node-Red implementation)
- F1EJP: DATV-Easy 3.x
- DL5OCD: DATV-NotSoEasy V1.x

# GUI...

The screenshot displays the Pluto DVB2 GUI interface, which is organized into several functional sections:

- Top Bar:** Shows the device status as 'CONNECTED' and lists various control buttons: Callsign, ZS1SCI, SET CALL, RESTORE, REBOOT, and seven PROFILE buttons (PROFILE 1 to PROFILE 7), along with a SAVER icon.
- Tuner Section:** Displays 'Tuner 26.32°C', 'Buffer underflow', 'Queue 0', and 'TS 192.168.1.111:8282'. It also shows 'TS RX stream IP 230.0.0.1234' and playback options for VLC and FFPLAY.
- Frequency Section:** Shows 'Frequency 2407749888', 'RX 746.75 MHz', 'Channel CH19.333/250/125KS', and 'NCO -18750 Hz'. It includes '-HZ' and '+HZ' buttons for frequency adjustment.
- Modulator controls:** Features 'RF ON' and 'RF OFF' buttons, a 'Gain' slider set to -16.25, and dropdown menus for 'Mode' (dvbs2-ts), 'RX Mode' (webfft), 'FEC' (3/4), 'MOD' (32apsk), 'SR' (333 KS), 'Pilots' (off), 'TS Source' (TS...), 'FecMod' (fixed), 'VarGain' (off), and 'Frame' (long). A 'FEC Range' slider is set to 10.
- Encoder controls:** Includes 'START ENCODER' and 'STOP' buttons, and dropdown menus for 'Codec' (SW - libx265), 'Image' (1920x1080), 'Audio channels' (Stereo), 'Audio bit rate' (48), 'Audio sample rate' (48 kHz), 'Frames per' (25 fps), 'TS bitrate' (1233.20 kb/s), and 'Video bitrate' (988.93 kb/s).
- Signal Analysis:** A central 'ffmpeg output' graph shows a spectrum plot with a prominent peak at 10.491 MHz. Below it, a detailed view of the 'A71A DATV Beacon' at 10491.500 MHz (1.5MS/s QPSK, 4/5) is shown. A 'Click to tune wide & narrow channels' button is present.
- Bottom Section:** Contains a wide spectrum plot from 740.95M to 751.61M. Below it are controls for 'Symbol rates' (10655999), 'Rx 746.28 MHz', and 'Gain 37.00 dB'. The 'RX Longmynd' section includes 'Tuner on/off', 'Carrier', 'Pilots', and 'Short Frame' indicators, along with 'Rx time' (8s) and 'Tuner port' settings. The 'RX Longmynd' section also shows 'Set Frequency' and 'Symbol Rate' dropdowns, and five circular gauges for 'MER' (10.5), 'LDPC Errors' (32), 'Null packets' (4.5%), 'BCH errors' (0), and 'Margin' (5.9).





# GUI...

The screenshot shows the DATV-Easy V3.08 software interface. It features a top menu bar with 'DVB', 'Configuration', 'DVB Tables', 'PTT / Output', and 'Monitoring +'. The main area is divided into several sections: 'Target bitrate' (580.33 kb/s), 'Video bitrate' (451 kb/s), and 'Frequency MHz' (440.250). Below these are 'MODE' (DVB-S2 QPSK), 'VIDEO / AUDIO' (H266 VVC SOFT), and a 'Transmission' section with 'START +', 'STOP', 'PTT', and 'EXIT' buttons. A vertical frequency scale on the right ranges from 0 to 100 MHz. The interface is titled 'F1EJP' and 'DATV-Easy V3.08'.



IAPC - ATV Technical Group

# Source

- All the information of this presentation are from F5OEO github here:  
<https://github.com/F5OEO/pluto-ori-ps/wiki>
- by the QR-Code

