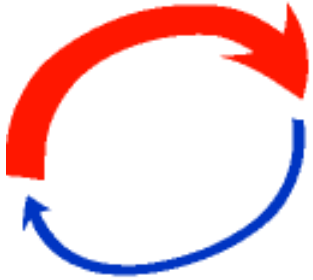


UDcast

Full IP over Broadcast Media

IP/DVB, 52nd IETF meeting
12th December 2001, Salt Lake City

www.udcast.com patrick.cipiere@udcast.com

UDcast

Where are we so far?

UDcast

Layer 1

- Antennas
  - DVB-S
    - 0.6 to 0.8m dish
    - Needs to be focused G10°
  - DVB-T
    - Standard roof top aerial
    - Focus is not much an issue (mobility can be achieved)

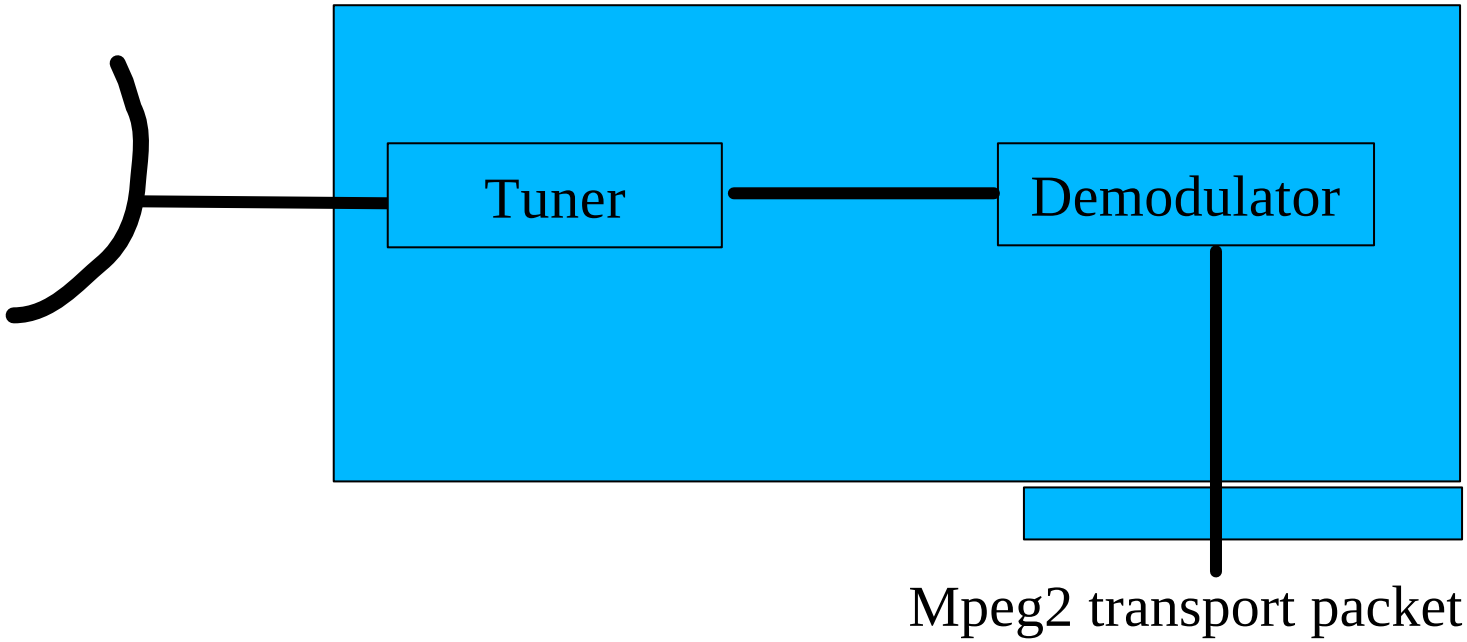
UDcast

Layer 1

- Radio Frequency
  - DVB-S
    - See www.lyngsat.com
    - modulation, symbol rate, satellite/tuner frequency, FEC, spectrum inversion
  - DVB-T
    - Modulation, bandwidth, frequency, FEC, spectrum inversion

UDcast

Overview of receiving card



UDcast

Mpeg2 transport packet

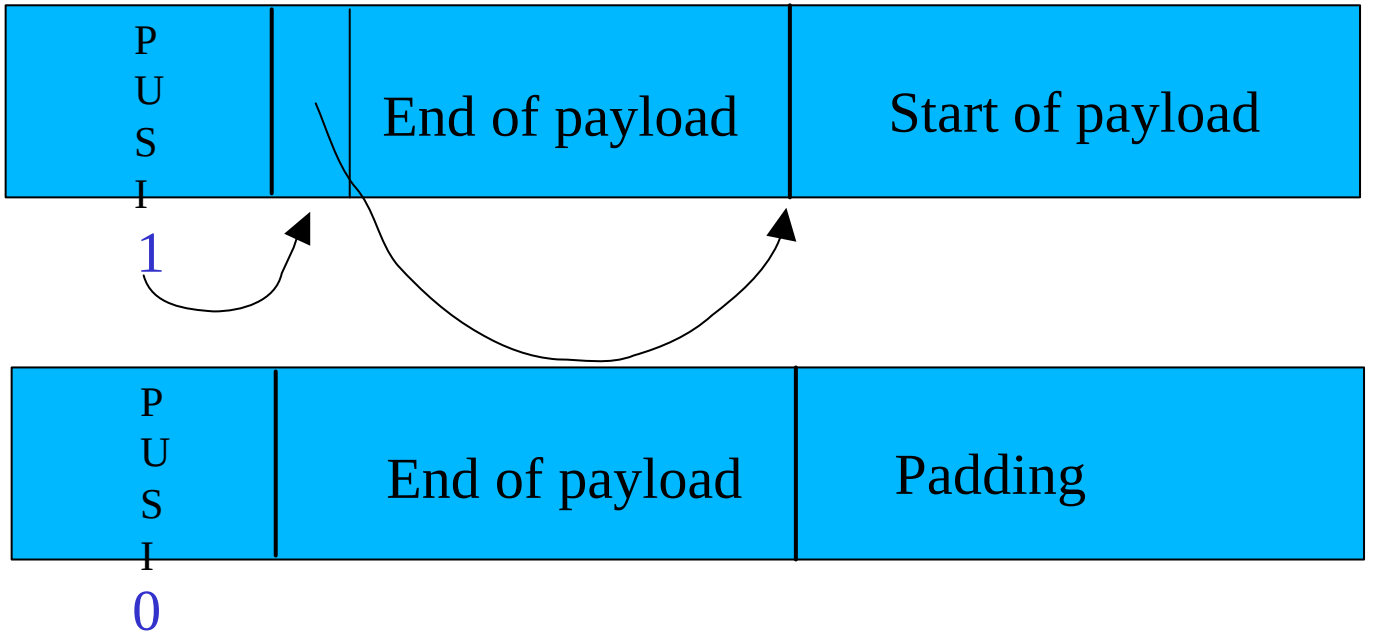
- Cell of 188 bytes
  - 4 bytes header
  - 184 bytes payload

SYNC: 0x47
PID: 13 bits [0,8191]
PUSI: 1 bit
CC: 4 bits [0,15]

UDcast

Mpeg2 transport packet

- Payload Unit Start Indicator
- If PUSI == 1, first byte of payload is an offset



UDcast

Mpeg2 transport packet

- PID
  - 13 bits [0,8911]
  - 0x1fff is NULL packet
  - First level of filtering
- Countinuity Counter
  - 4 bits [0,15]
  - Increment by one for each tp within a PID

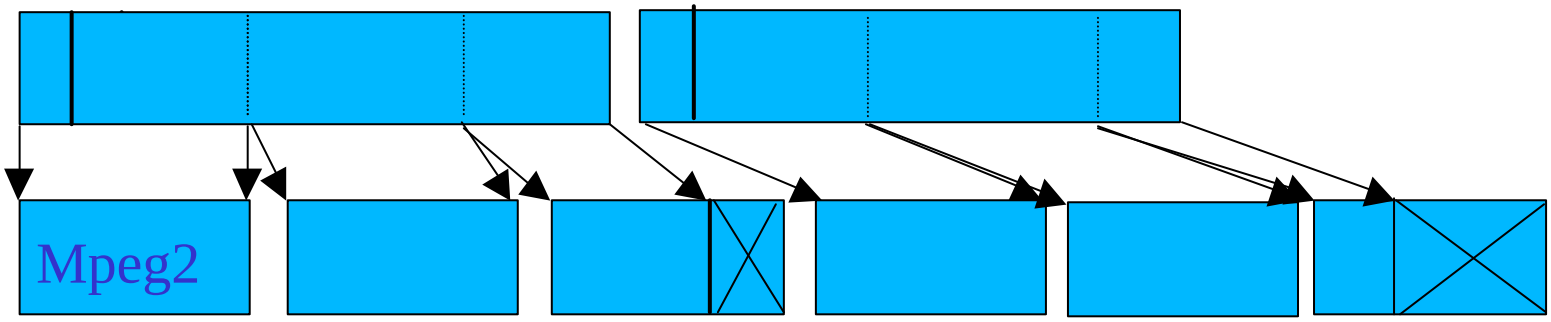
UDcast

MPE: layer 1 or layer 2?

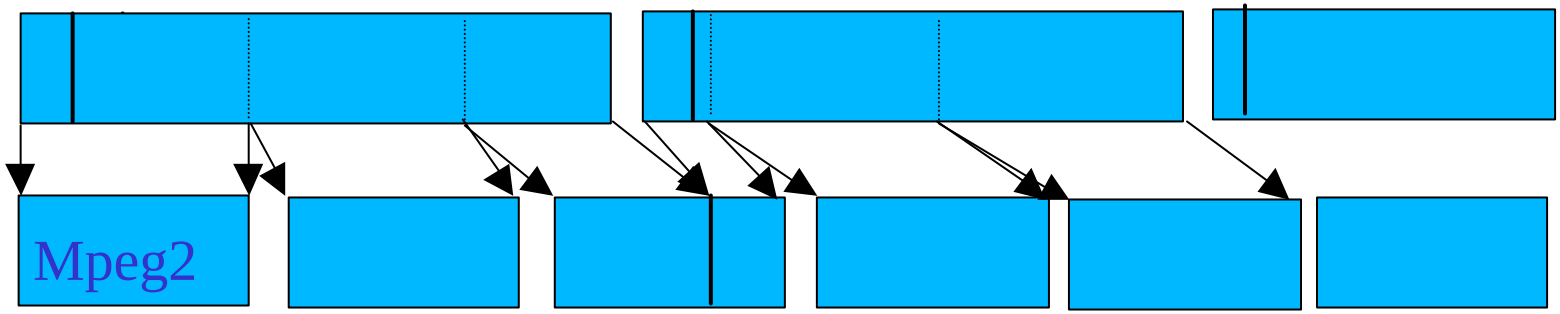
- Frame up to 4096 bytes
  - 12 bytes header
    - Magic byte 0x3e
    - Length is coded on 12 bits [0,4096]
    - IEEE 48 bits MAC destination address
    - NO MAC source address
    - LLC_SNAP flag
  - Up to 4082 bytes payload
    - With crc32

MPE frame

MPE frame in mpeg2 tp



Section packing



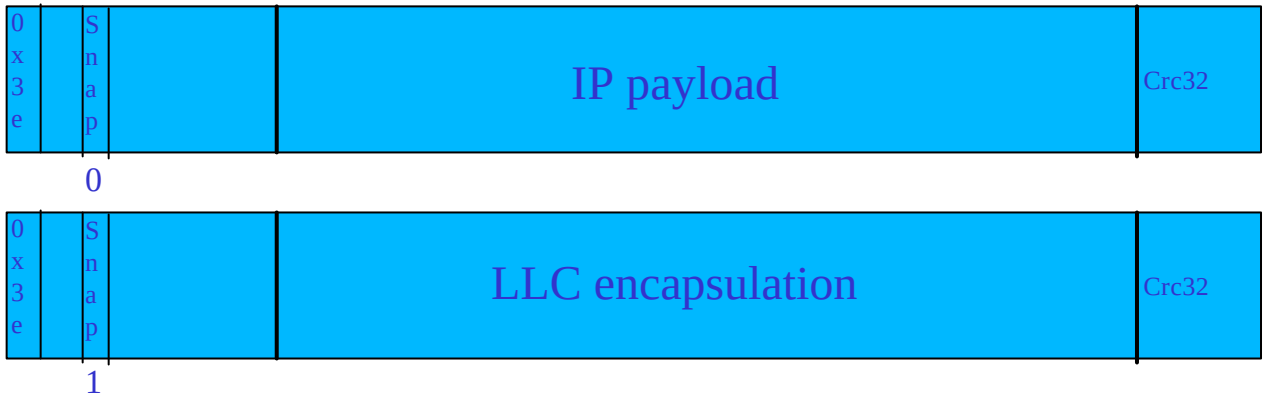
UDcast

MPE frame in mpeg2 tp

- Section packing
  - PUSI bit in mpeg2 header
  - Offset byte in mpeg2 payload
- Some hardware/drivers do not support section packing

MPE LLC

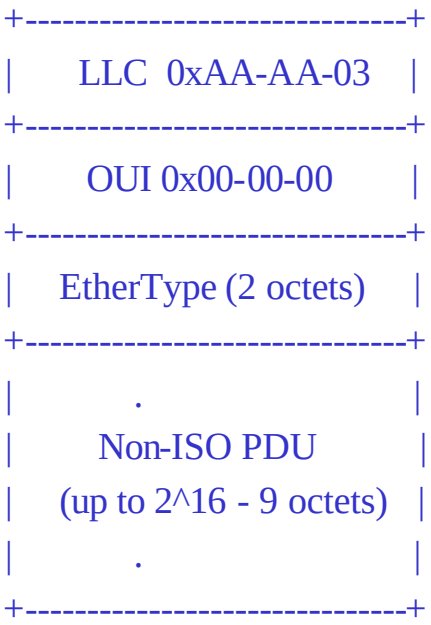
- LLC_SNAP
  - 0: means IP (no indication of version: v4 vs v6)
  - 1: means payload is LLC encapsulation
    - See RFC1483



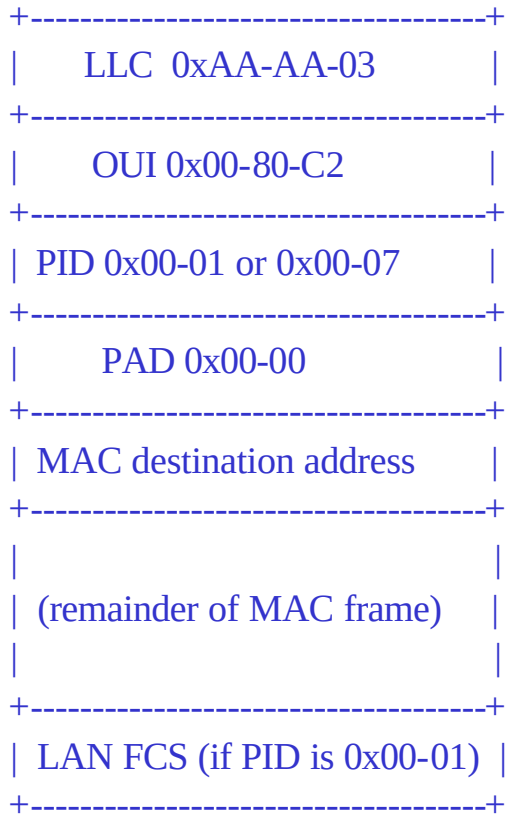
UDcast

LLC encapsulation (RFC 1483)

Payload Format for Routed non-ISO PDUs



Payload Format for Bridged Ethernet/802.3 PDUs



UDcast

LLC encapsulation

- We can move to ethernet as the layer 2
  - With Ethertype == 0x6558
    - Transparent Ethernet Bridging
    - Overhead is 8(LLC)+14(Ether header)=22 bytes
  - With bridged ethernet
    - Overhead is 10(LLC)+14(Ether header)=24 bytes
- MPE could be considerer layer 1
  - or at least below layer 2 (with RF and mpeg2)
- Solves the source MAC address problem

UDcast

Overhead

- There is a lot of overhead in the satellite chain
  - Layer 1 FEC
    - 1/2, 2/3, 3/4, 5/6, 7/8
      - 3/4: sending 4 bits for 3 bits of data
    - Broadcasters want an error free link
      - CBER < 10E-6 and VBER == 0
  - Non use of section packing
  - Non use of NULL mpeg2 transport packets
  - So MPE overhead is not the first issue

Hardware

- Low end cards
  - Listen to the whole transponder
    - All the mpeg2 packets (even NULL) are passed from the card to the RAM
    - PID filtering is done by the driver (software)
    - MPE reassembly is done by the driver (software)
      - No problem with section packing
      - This is nice for experimenting a new encapsulation
  - With 40Mbps transponders, and today's of the shelf hardware performance is not an issue.

Hardware

- High end cards
  - PID filtering done in hardware
    - Usually around 8 simultaneous PIDs
  - MPE reassembly is done in hardware
    - MPE packets are passed by the card to the RAM
    - Might introduce problems with section packing
    - Hard to experiment with a new encapsulation

UDcast

Conclusion

- In order to reuse the existing ethernet code most of the drivers simulates ethernet
  - The drivers extracts whatever is in the MPE payload
  - Reconstruct an ethernet frame
    - with a fake source IEEE 48 bits MAC address
    - with a computed ethertype
      - (0x800, if LLC_SNAP == 0)
      - Extracted from the LLC encapsulation
  - Pass the frame to the ethernet layer
- So think about ethernet being layer 2

UDcast

UDcast