

# Lightweight Encapsulation:

**Why ULE?** [draft-fair-ipdvb-req-03.txt](#)

**ULE Spec** [draft-fair-ipdvb-ule-01.txt](#)

**ULE Implementation Experience**

## **Existing Multi-Protocol Encapsulation (MPE)**

Based on MPEG-2 Control Plane (using DSM-CC, used for SI)  
Expected to continue for long time

## **New Encapsulation (ULE)**

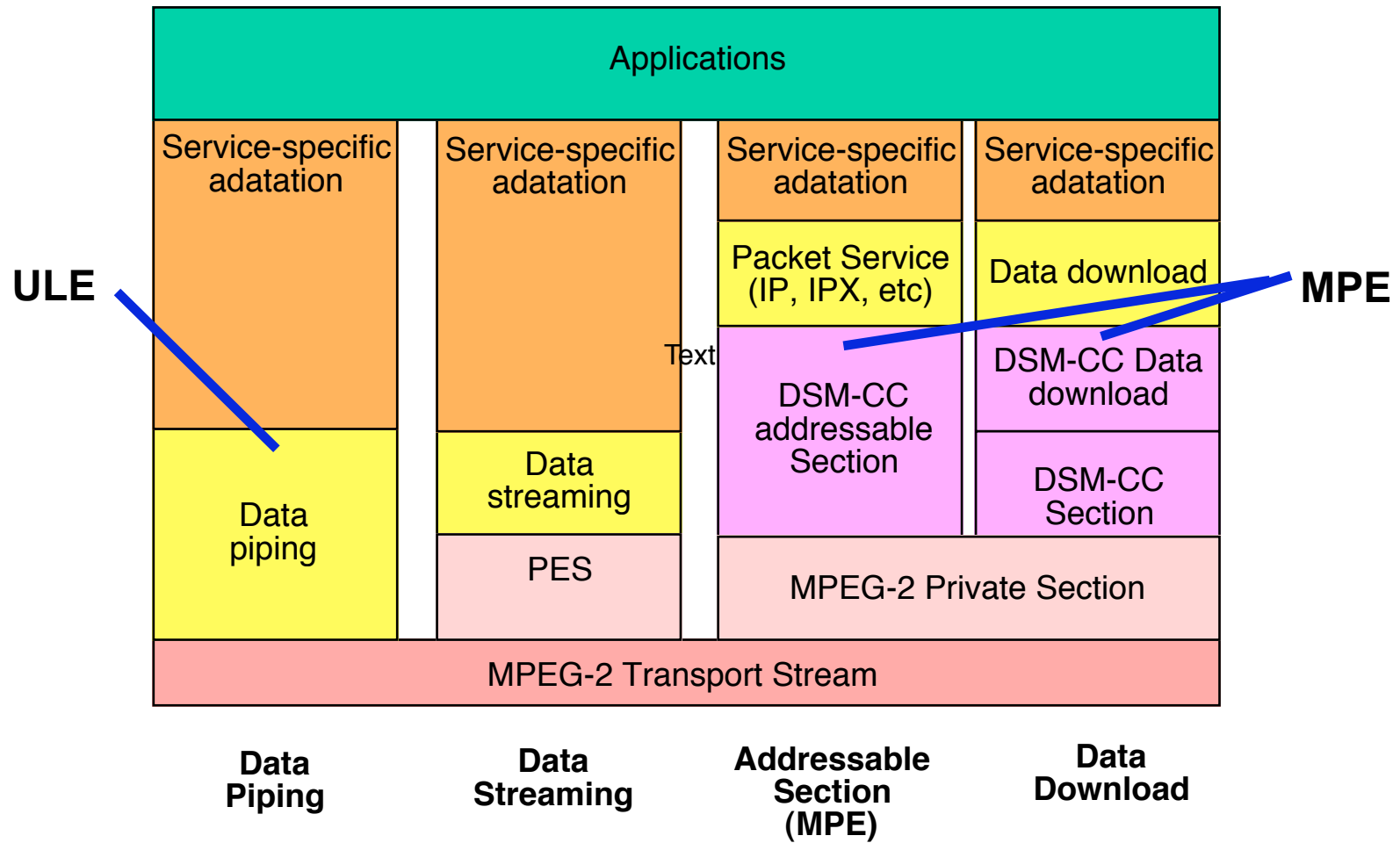
Direct on Transport Stream  
DVB & ATSC both call this “Data Piping”  
DVB & ATSC do not specify methods for *HOW* to do this

## **How much effort required to implement?**

Not usually a hardware change  
MPE driver implementors won't find this hard  
Deployment issues for existing networks

# IP over MPEG-2/DVB Transport BOF (ip-dvb)

# Stack



IP over MPEG-2/DVB Transport BOF

(ip-dvb)

## Differences between ULE & MPE

---

Packing, CRC (MUST be supported)

EtherType Field

Extension headers for  
Efficient Bridging  
LLC (via Bridging)  
others possible

Large MTU Permitted (<32 KB)

PMTUD friendly :-)

Transport performance gains (for some apps)

May reduce need for TCP-PEP!

## Efficiency of ULE

**Efficiency ~ 10% higher for *some specific apps***

Bridging

Unicast VoIP [RFC3267] AMR@4.75kbps 54 B)

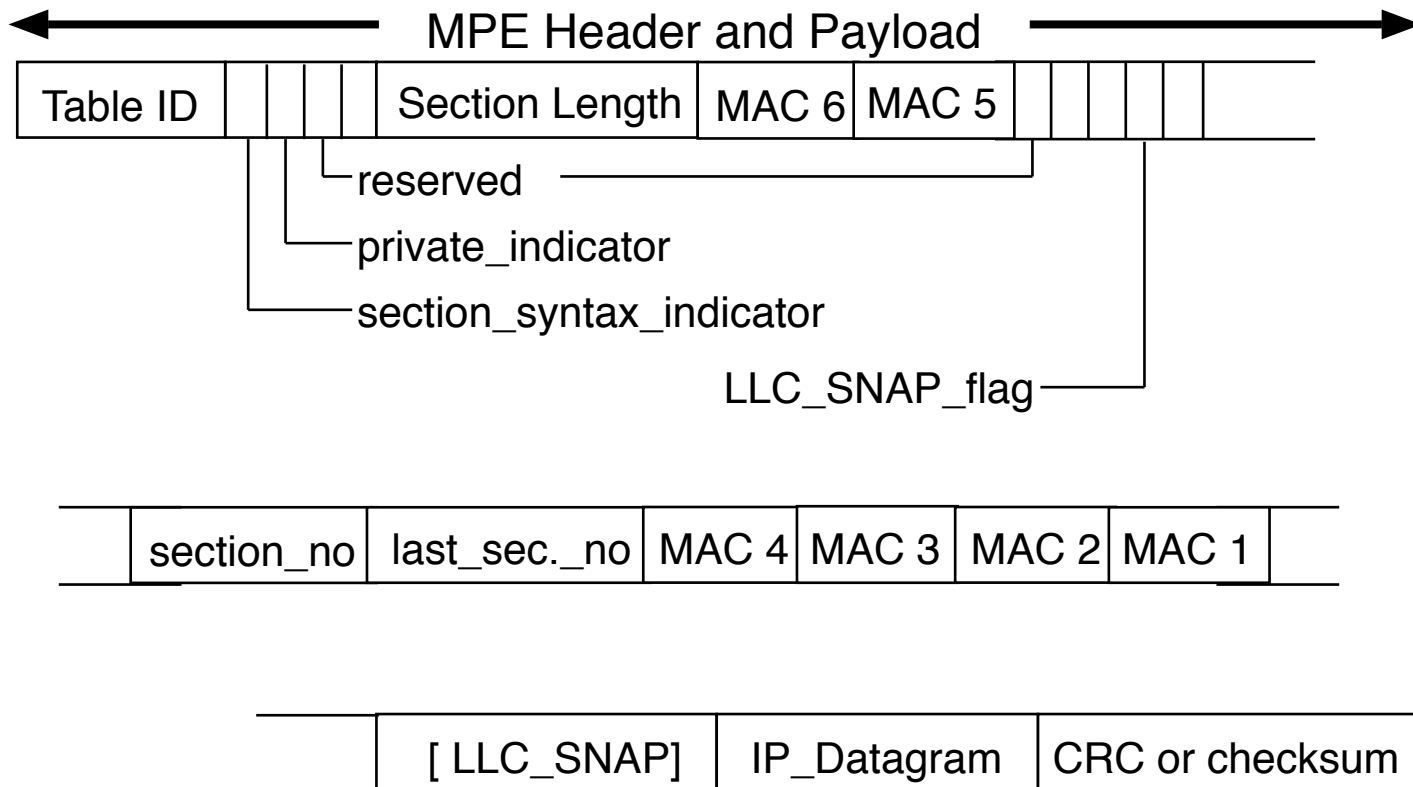
*Comparable* for larger PDUs

### RTP/AMR Overhead

MPE Padded	71%
MPE Packed	23%
MPE/LLC	31%
ULE+D	21%
ULE	13%
Bridged MPE	41%
Bridged ULE	29%

# IP over MPEG-2/DVB Transport BOF (ip-dvb)

# MPE



# Lightweight Encapsulation:

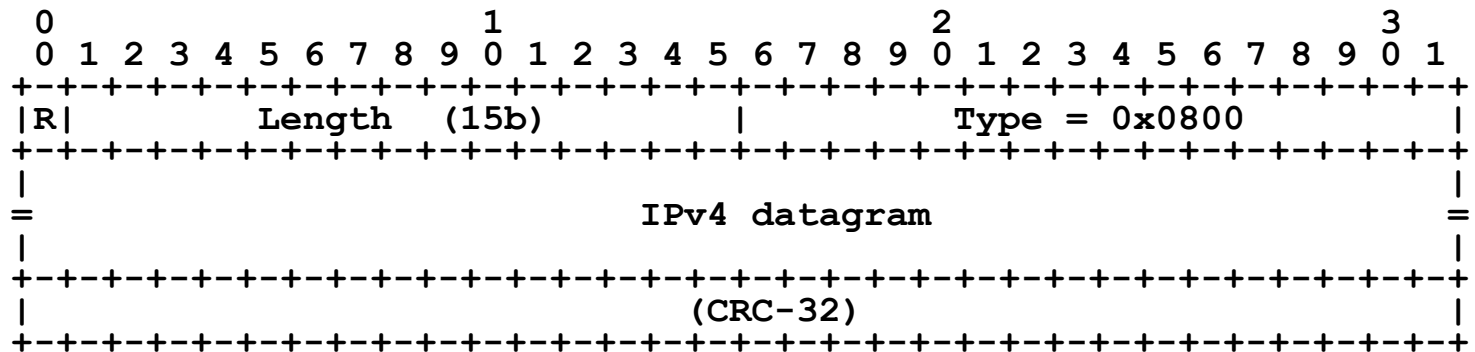
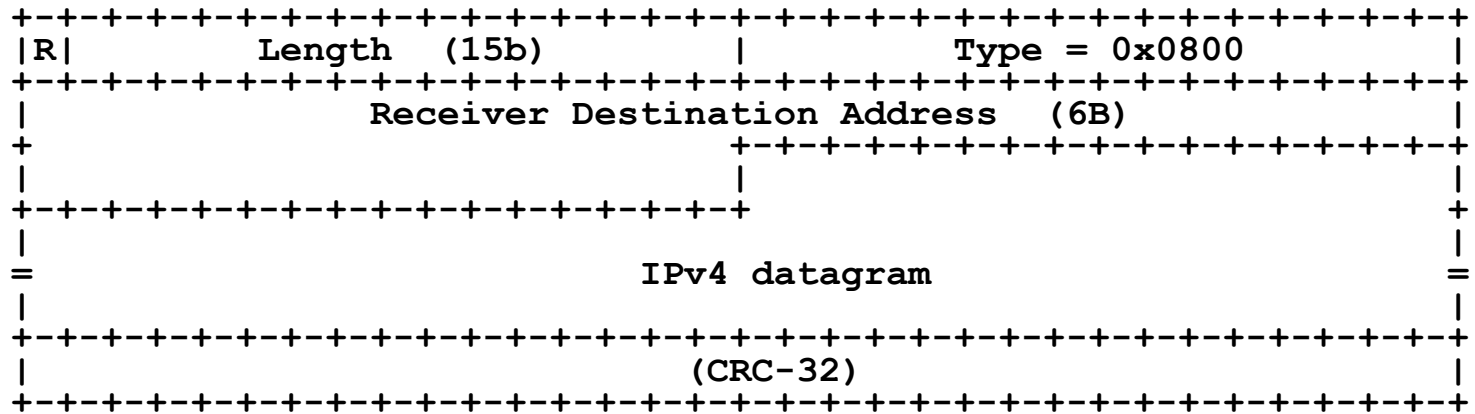
**Why ULE?** [draft-fair-ipdvb-req-03.txt](#)

**ULE Spec** [draft-fair-ipdvb-ule-01.txt](#)

**ULE Implementation Experience**

IP over MPEG-2/DVB Transport BOF  
(ip-dvb)

# Ultra Light Encapsulation





**Changes from rev 00**

End of TS Packet text (new text on list)

Type field split:

<1500 Extension header type

>1500 IANA Ether type

One bit reserved from length - propose to use this for D-bit

**NiTs and Clarity fixes:**

Address Field clarified

Payload Pointer usage clarified

CRC specified

Security considerations added

Examples added (based on those supplied by Alain)

**NiTs list:-)**

**Harmonise with ISO MPEG-2**

CRC-32 same as ISO DSM-CC CRC Spec

Stuff/PAD MUST be 0xFF

Set CC as in MPEG2 Spec; May ignore at Receiver

**Minor changes to protocol**

Delete Type == 2 (LLC) superset of bridging

Presence of dest MAC address indicated by D-bit - use the R-bit

**ID Organisation & Clarity**

Separate Encapsulator and Receiver Operation (see list)

Clearer rules for Encapsulator

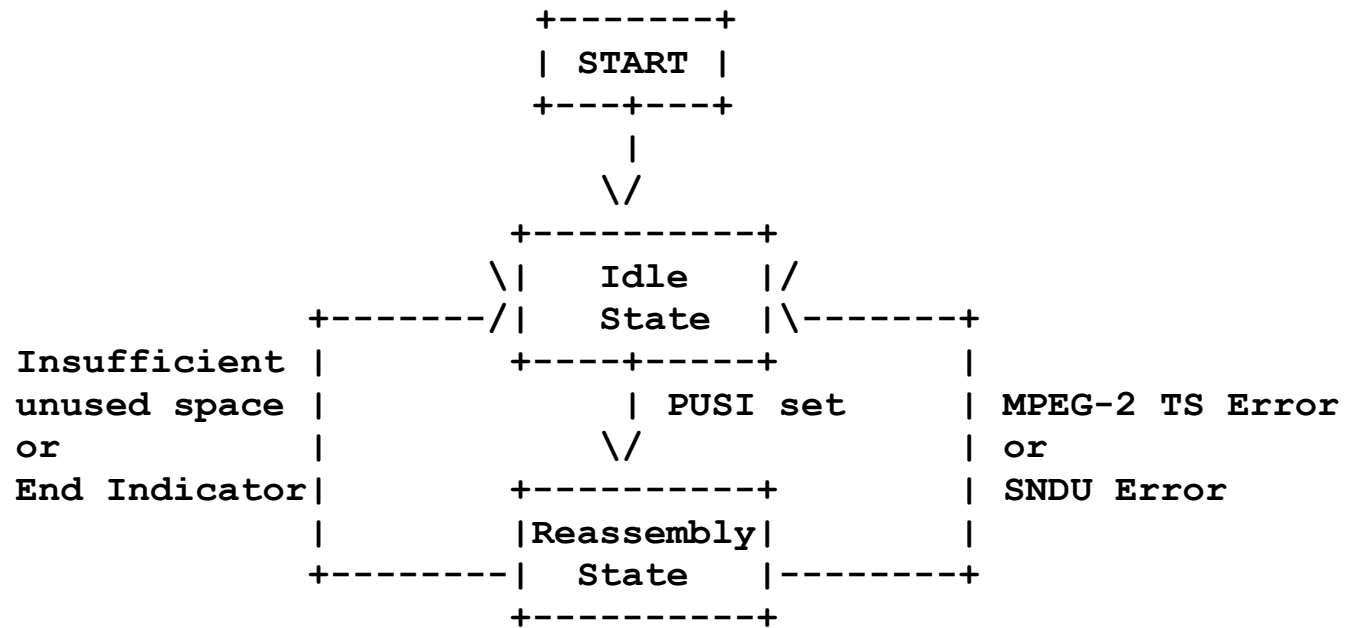
Clearer rules for Receiver (see list)

    Add "Idle" and "Reassembly" States

Redraw diagrams

IP over MPEG-2/DVB Transport BOF  
(ip-dvb)

# Receiver State Machine



# Lightweight Encapsulation:

**Why ULE?** [draft-fair-ipdvb-req-03.txt](#)

**ULE Spec** [draft-fair-ipdvb-ule-01.txt](#)

# ULE Implementation Experience