



# **draft-ietf-ipdvb-ule-ext-01**

## **Implementation Experiences**

Christian Praehauser  
University of Salzburg

## PDU-Concat

- To be efficient, the encapsulator has to wait a certain time until enough PDUs have been aggregated
- Might use a clever scheduling strategy (with PDU re-ordering)
- Possible influences on link characteristics, mainly jitter
  - Can introduce problems with audio/video streams (e.g. VoIP)
- It may be wise to add a „Notes to Implementors“ section to address these issues

## Encapsulator

- ulext-pduconcat
- Extension module for ulegene, a modular userspace encapsulator
- Incoming PDUs are „parked“ in PDU-Lots
- PDU-Lots exist per destination NPA/payload type combination
- PDU-Lots get cleared when at least one of the following conditions hold:
  - The parking time of at least one PDU is greater than  $T_{\text{maxdelay}}$
  - The number of parked PDUs is greater than  $N_{\text{MaxPDUCount}}$
  - The total length in bytes of all parked PDUs exceeds  $N_{\text{MaxSize}}$

## Decapsulator

- Patch for Linux-2.6.18
- Reception of PDU-Concat SNDUs causes „packet bursts“ at the receiver
- These bursts may confuse some applications (e.g. jitter estimation)

## PDU-Concat

- PDU-Concat SNDUs may be more sensitive to link bit errors
- Might not be appropriate on links with relatively high bit error rates
- Problem with extensions indicated in the CONCAT-PDU-Type field?
  - One instance (at the beginning) for all PDUs
  - But some extensions may apply to a specific PDU
- Solutions
  - Ignore it
  - Use of a „T-bit“

## TS-Concat Extension

- How should TS packets be delivered at the receiver?
  - inject into the same TS packet stream where the ULE stream is received
  - allocate a virtual DVB device when using TS-Concat
- What to do at the receiver if a encapsulated TS stream interferes with an existing stream in the multiplex?
  - Is the receiver able to detect this at all?
  - Could also raise security issues
  - If possible, encapsulators should assure that this won't happen

## Timestamp Extension

- When should the timestamp be inserted or the timestamp value be filled in?
  - After PDU has been received
    - Thus including additional delays caused by TS Packing, PDU concatenation, etc.
  - When SNDU is ready to be transmitted
  - Not defined?
- Option/Extension for just allocating space in the SNDU for a timestamp and let hardware fill it in (Hardware-assisted Timestamping)