draft-ietf-ipdwb-ule-ext-01
Implementation Experiences

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PDU-Concat

• To be efficiently, 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)