

Uncompressed high quality video over IP

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Uncompressed high quality video over IP

Two drafts in the work:

1. Circuit emulation

“RTP Payload Format for SMPTE 292M Video”

draft-ietf-avt-smpte292-video-06

Ladan Gharai, Colin Perkins, Gary Goncher, Allison Mankin

2. Native Packetization

“RTP Payload Format for Uncompressed Video”

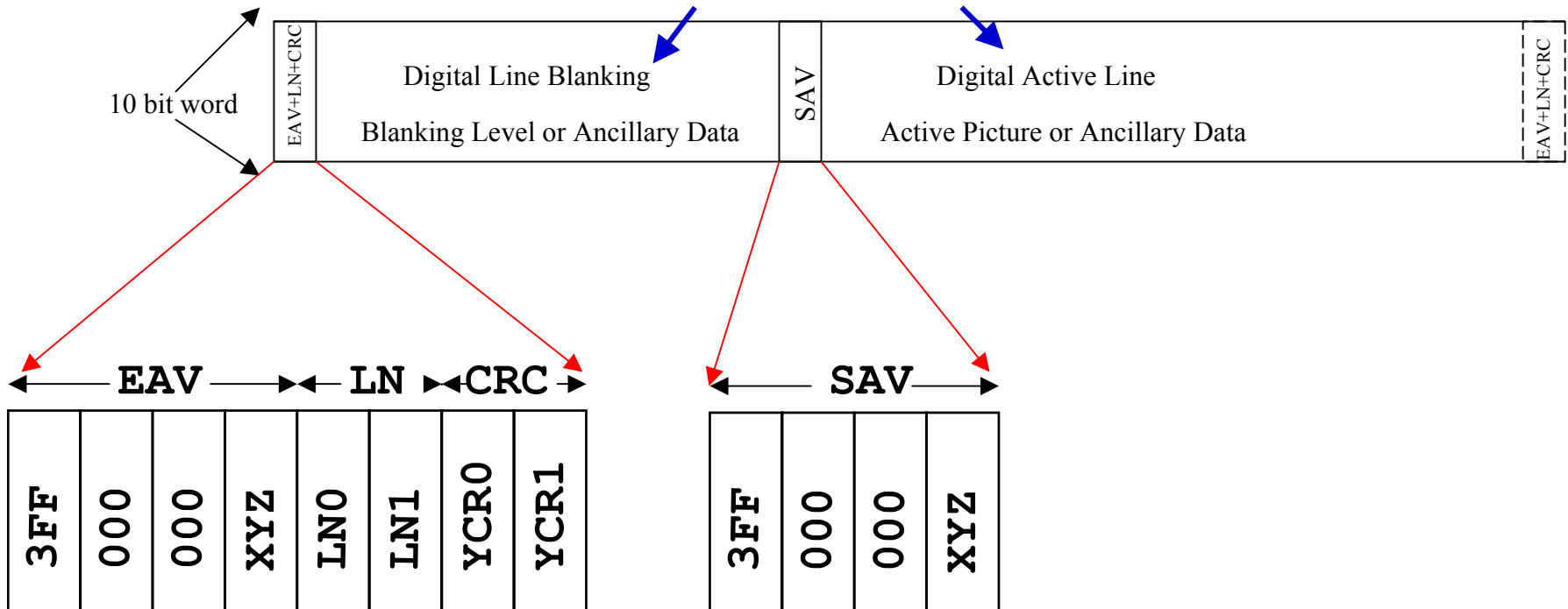
draft-gharai-avt-uncomp-video-00.txt

Ladan Gharai, Colin Perkins

SMPTE292M Line Format

SMPTE292M is the universal transport format for uncompressed High Definition TV (HDTV) at 1.485Gbps and 1.485/1.001Gbps.

source formats: 260M, 295M, 274M, 296M, ...



F: field type
V: field blanking

The two approaches:

1. Circuit Emulation:

- Very specific to SMPTE 292M
- Has been designed to be interoperable with existing broadcast equipment
- Not flexible at all, constant rate of 1.485Gbps

2. Native packetization:

- Very flexible, can packetize any uncompressed video
- Only sends active video lines (no line blanking)

RTP Payload Format for SMPTE 292M Video

draft-ietf-avt-smpte292-video-06

Ladan Gharai.....ISI
Colin Perkins.....ISI
Gary Goncher.....Tektronix
Allison Mankin.....ISI

Changes since -04:

Packetization:

1. lines not be fragmented across related Y and Cb and Cr values
2. video content be byte aligned

→ pgroup: smallest octet count which satisfies both criteria

"The content of a digital active line SHOULD NOT be fragmented within a pgroup"

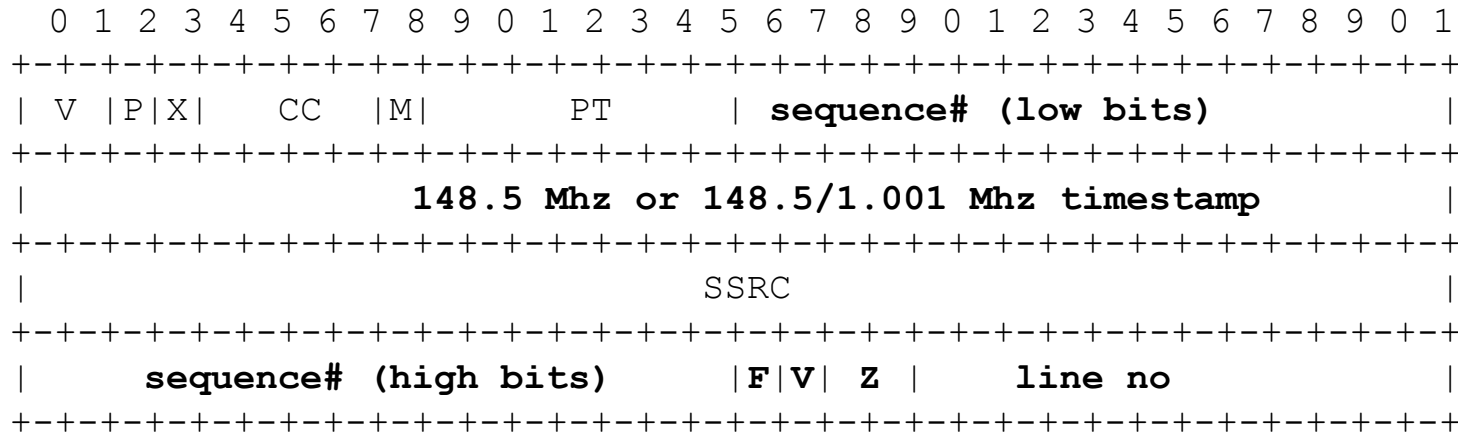
sampling	Pixels	10 bit words	Aligned on octet	pgroup
4:2:0	4	$6*10$	$2*60/8=15$	15
4:2:2	2	$4*10$	$40/8=5$	5
4:4:4	1	$3*10$	$4*30/8=15$	15

m=video 30000 RTP/AVP 111

a=rtpmap:111 SMPTE292M/148351000

a=fmtp:111 pgroup=5

RTP Payload Header



- M bit : marks end of frame
- 32 bit sequence number: ~ 6hr roll-around time at 1.485Gbits/sec (with packet size of at least 1k)
- 148500Hz or 148500/1.001Hz timestamp
- 11bit line number
- F indicates field number
- V indicates field blanking

Status

Draft is now stable, we do not expect any major technical changes.

Time line:

August 15:

Add technical rational, submit --07

Seek comments from the community

Last call?

RTP Payload Format for Uncompressed Video

draft-gharai-avt-uncomp-video-00

Ladan Gharai.....ISI

Colin Perkins.....ISI

Goal

Define a native RTP packetization scheme for uncompressed, studio-quality video streams, for example (but not limited to):

BT.601:

- 525 or 625 lines at 720 active pixels per line, 8 or 10 bit samples

SMPTE 296M:

- 720p: progressive, 60 fps, 1280x720, 20 bits/sample
⇒ 1.054 Gbps

SMPTE 274M:

- 1080i: interlaced, 30 fps, 1920x1080, 20 bits/sample
⇒ 1.185 Gbps

Future Digital Cinema formats: ex: 4K*4K frame sizes!

RTP Payload Header

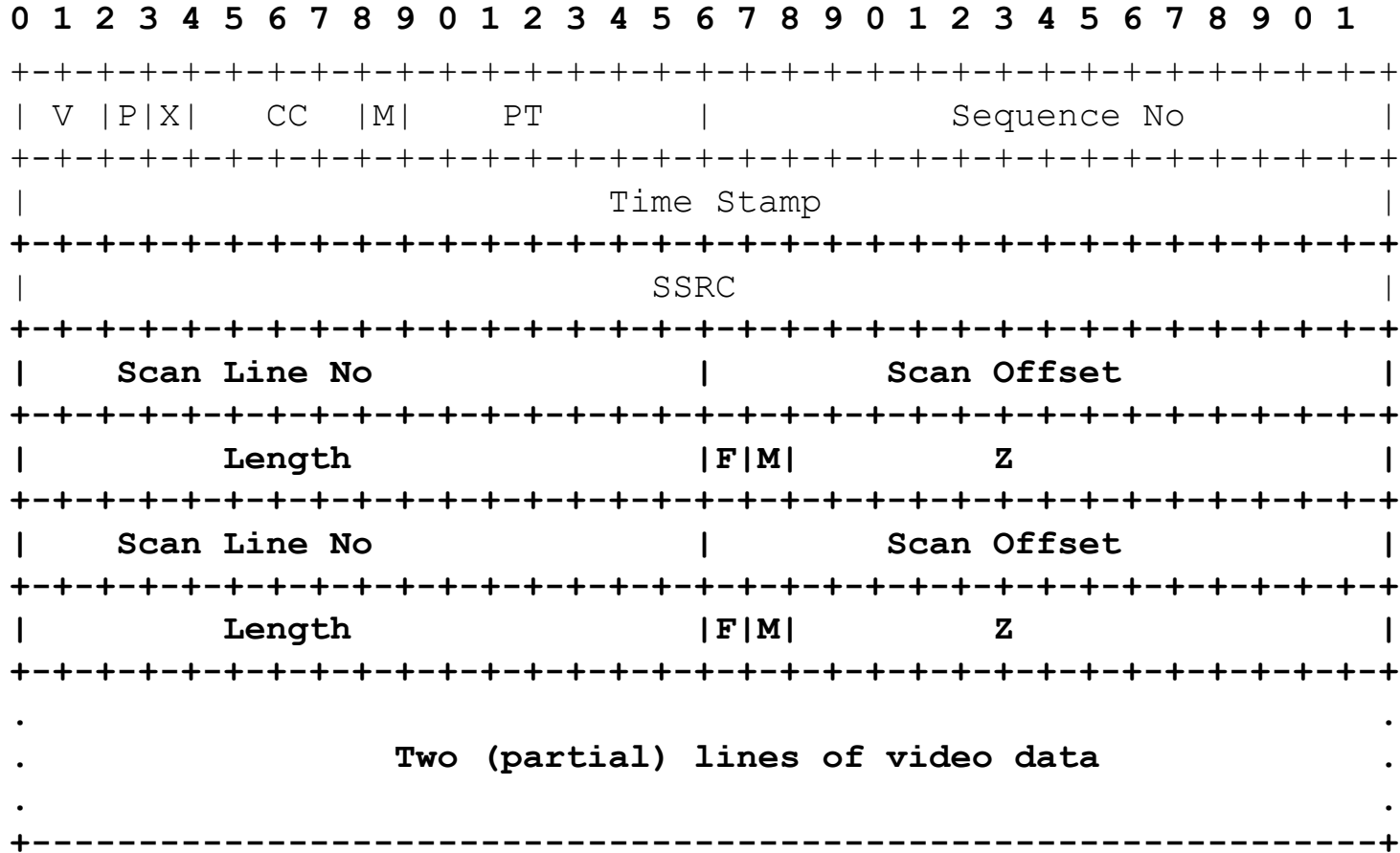
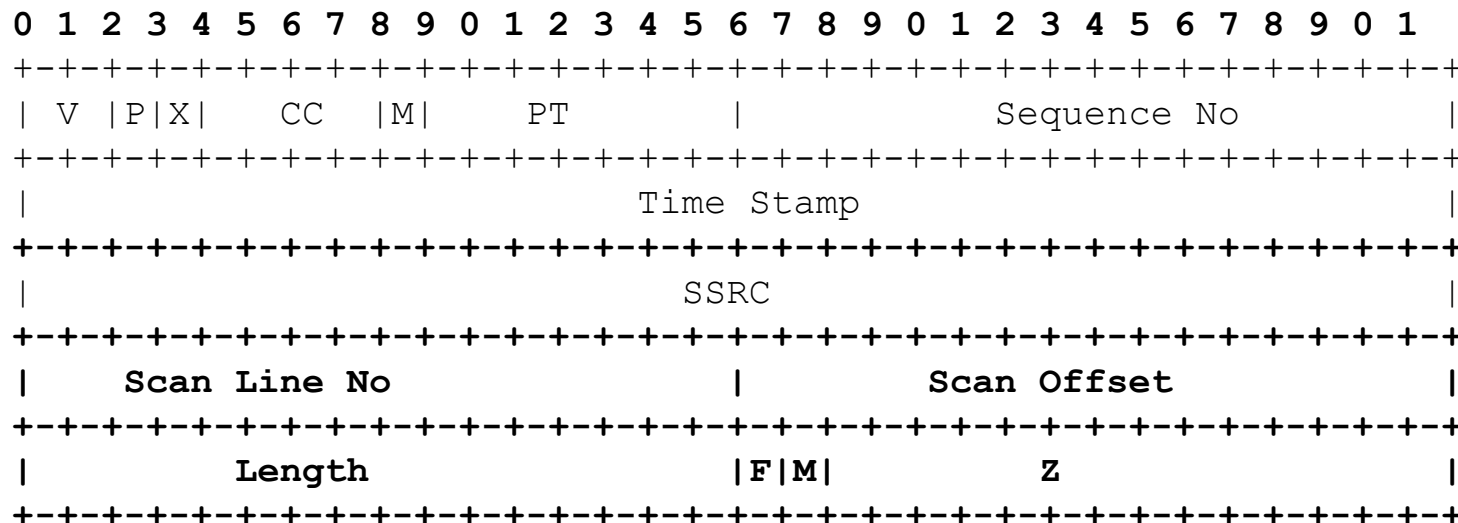


Figure 1: RTP Payload Format showing two (partial) lines of video

RTP Payload Header (cont.)



- **M bit** : marks end of frame
- **Timestamp: 90 kHz** → denotes sampling instant of frame
- **Scan line no:** scan line number of first byte in packet
- **Scan offset:** sample number of pixel where data line is fragmented
- **Length:** Number of octets of data included in packet (multiple of pgroup)
- **F bit:** indicates which interlaced field data belongs to
- **M bit (follow on bit):** set to one if additional payload header follows

Comparison to RFC 2431 (BT.656 payload format):

```
+++++  
|F|V| type |P| Z |          scan Line          |          scan offset          |  
+++++
```

RFC 2431:

[draft-gharai-avt-uncomp-video](#)

Limited to 4096 scan lines and 2048 pixels per line.

Support for up to 64K scan lines and pixels per line.

RFC is specific to 4:2:2 color sub-sampling and YUV data.

Covers 4:4:4, 4:2:2, 4:2:0, both YUV and RGB.

In band signaling for sample size and data type.

Use of out-of-band signaling.

A single scan line is packed into one or more RTP packets.

Flexible support for multiple lines per packet

Open Issues?

- Defining SDP parameters for out-of-band signaling of:
 - Color mode: YUV, RGB
 - Color sub-sampling: 4:4:4, 4:2:2, 4:2:0
 - Lines per frame
 - Pixels per line
 - Scan mode
- Transport of 4:2:0
- Accept as work item?