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RTP Payload Format for Real-Time Pointers

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Abstract

This document describes a payload format for transporting the coordinates of a pointer that may be used during a presentation in real-time using RTP [1].

1. Introduction

In most presentations, significant information is conveyed through the use of viewgraphs and a pointer. This makes accurate transmission of them vital in remote conferencing. Using regular video of a presenter’s display for this purpose is problematic because, while the viewgraphs require a high spatial resolution, the pointer movements need to be sampled and transmitted at a high temporal resolution so that the presenter’s pointing actions can be displayed synchronously with the corresponding audio and video signals, e.g. when a speaker points at two alternatives in sequence and says "this one is better than this." To satisfy both of these requirements, at least S-VHS quality video may need to be used. Codecs that can compress S-VHS video effectively in real-time are expensive, and transmitting such video uncompressed requires very high bandwidths.

A much simpler and economical system can be designed by capturing and transmitting the pointer coordinates separately [2]. The pointer coordinates with respect to a displayed viewgraph can easily be obtained in electronic presentation systems. For presentations prepared for optical systems, such as transparencies for overhead projectors, an arrangement where the viewgraph is captured in a frame buffer on a computer can be used to associate the pointer coordinates with the displayed viewgraph. For capturing transparencies, printed material, or even three dimensional objects, a document camera and a personal computer or workstation based video capture card can be used. This arrangement can handle electronic viewgraphs by feeding the video output of the computer that displays them to the video capture card through an appropriate converter also. (A side benefit of this is that it allows using a presenter’s own computer to transmit electronic viewgraphs without connecting it to, for example, an intranet.) The captured image is then displayed along with the capturing computer's mouse pointer on the presenter’s display using a projector. The presenter moves the pointer on the display using a regular or maybe a wireless mouse whose location can easily be captured by appropriate software running on the capturing computer.

This document describes an RTP payload format to transmit the pointer coordinates captured in one of the ways described above using RTP.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [3].

2. Payload Format

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|V=2|P|X|  CC   |M|     PT      |       sequence number         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           timestamp                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           synchronization source (SSRC) identifier            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
:            contributing source (CSRC) identifiers             :
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|L| |      x coordinate         |R| |      y coordinate         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  MBZ                             MBZ
```

Figure 1 - An RTP packet for Real-Time Pointer

Fig. 1 shows an RTP packet carrying real-time pointer coordinates. This payload format does not have a payload specific header.

2.1. RTP Header Usage:

Payload Type (PT): The assignment of an RTP payload type for this new packet format is outside the scope of this document, and will not be specified here. It is expected that the RTP profile for a particular class of applications will assign a payload type for this encoding, or if that is not done then a payload type in the dynamic range shall be chosen.

Marker (M) bit: Set to one if the payload carries information about mouse buttons.

Extension (X) bit: Defined by the RTP profile used.

Sequence Number: Set as described in RFC1889 [1].

Timestamp: The sampling time for the pointer location measured by a 1KHz clock.

SSRC: Set as described in RFC1889 [1].

CC and CSRC fields are used as described in RFC 1889 [1].

RTCP SHOULD be used as defined in RFC 1889 [1].

2.2. Payload:

The pointer’s x and y coordinates are measured from the upper left corner of the associated display window in pixels. The associated window SHOULD be specified out-of-band. The coordinates are represented as 14 bit, unsigned integers.

When the M bit is set to one, L (left) and/or R (right) bits are set to one if their respective mouse buttons are down at the sampling time.

3. Security Considerations

RTP packets using the payload format defined in this specification are subject to the security considerations discussed in the RTP specification [1].

This payload type does not exhibit any significant non-uniformity in the receiver side computational complexity for packet processing to cause a potential denial-of-service threat.

4. References

[1] Schulzrinne, Casner, Frederick, Jacobson RTP: A
Transport Protocol for Real Time Applications RFC 1889,
Internet Engineering Task Force, January 1996.

[2] M. R. Civanlar, G. L. Cash, "Networked Viewgraphs - NetVG" Proceedings
of The 9th Int. Workshop on Packet Video,
http://www.reseach.att.com/~mrc/PacketVideo99.html.

[3] S. Bradner, Key words for use in RFCs to Indicate
Requirement Levels, RFC 2119, March 1997.

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