                    RTP Payload Format for Real-Time Pointers

Status of this Memo

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Abstract

   This document describes an RTP [1] payload format for transporting
   the coordinates of a dynamic pointer that may be used during a
   presentation. Although a mouse can be used as the pointer, this
   payload format is not intended and may not have all functionalities
   needed to implement a general mouse event transmission mechanism.

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 applications. 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. In many instances, this synchronization carries vital
   information. As an example, consider a speaker pointing at two
   alternatives on a viewgraph in sequence and saying "this one is
   better than this". To satisfy both high spatial and high temporal
   resolution 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 for this purpose, 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. Although, a mouse can be used as the pointer, this payload format is not intended and may not have all functionalities needed to implement a general mouse event transmission mechanism.

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].
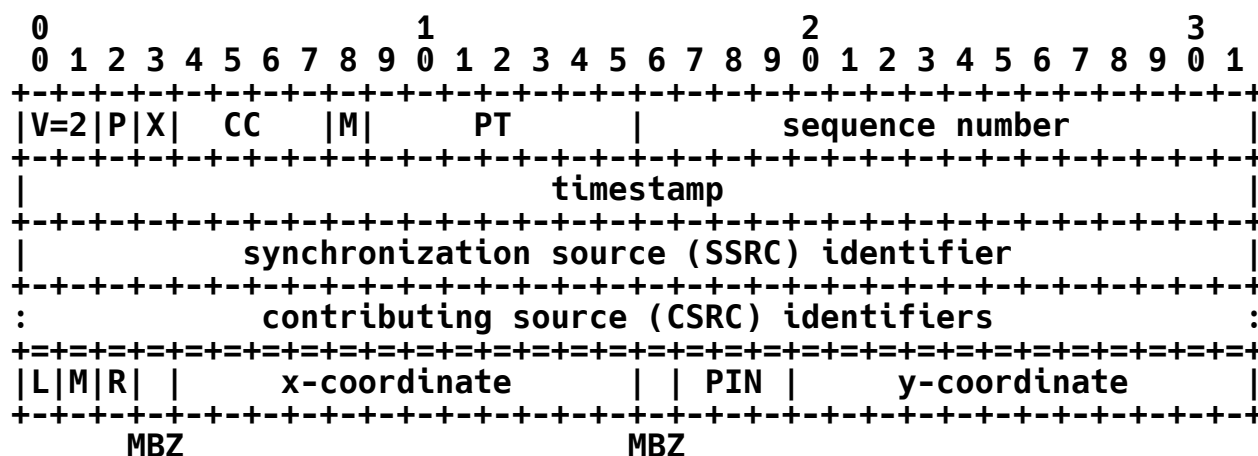
2. Payload Format

```
 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|M|R| |     x-coordinate      | | PIN |     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 pointer icon is changed in this packet.

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 90kHz 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. They are represented as a fraction of the corresponding edge length of the display window using 12 bits, positive, fixed point numbers between 0 and $(1 - 2^{-12})$.

L (left), R (right) and/or M (middle) bits are pointer special effects flags. Their use is application dependent and MUST be established out-of-band. Applications MAY ignore these bits.

PIN: Pointer Icon Number (3 bits) selects a pointer icon. The association between the PIN numbers and the icon pictures MUST be established out-of-band. PIN = 0 represents a default pointer icon. Applications which only support a single pointer icon SHOULD set the PIN field to zero. Applications MAY ignore non-zero PIN values on reception, and display a default icon.

3. MIME Media Type Registrations

This document defines a new RTP payload name, "pointer," and associated MIME subtype, "video/pointer."

3.1. Registration of MIME media type video/pointer

MIME media type name: video

MIME subtype name: pointer

Required parameters: None

Optional parameters: None

Encoding considerations: Pointer video can be transmitted with RTP as specified in this document.

Security considerations: As described in this document.

Interoperability considerations: None

Published specification: this document.

Applications which use this media type: Videoconferencing systems that transmit VUgraphs with a real-time pointer.

Additional information: None

Magic number(s): None

          File extension(s): None
          Macintosh File Type Code(s): None

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      Intended usage: COMMON Author/Change controller:
        M. Reha Civanlar
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4. 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.

5. References

   [1] Schulzrinne, H., Casner, S., Frederick, R. and V. Jacobson,
       "RTP: A Transport Protocol for Real Time Applications", RFC 1889,
       January 1996.

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

   [3] Bradner, S., "Key words for use in RFCs to Indicate Requirement
       Levels", BCP 14, RFC 2119, March 1997.

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7. Full Copyright Statement

Acknowledgement