

SONY®

**Sony Network Camera / Video Network Station
5thGen series RTSP command documentation**

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2. Contents

1. REVISION HISTORY	2
2. CONTENTS	3
3. INTRODUCTION	5
3.1 Purpose	5
3.2 Scope	5
4. MEDIA FORMATS	6
4.1 Types of Media Formats	6
4.1.1 Video Codec	6
4.1.2 Audio Codec	6
4.2 Configuring Media Formats	6
4.2.1 Video Codec	6
4.2.2 Audio Codec	7
4.3 Streaming data structure of Motion JPEG bit stream	7
4.4 Streaming data structure of MPEG-4 bit stream	8
4.5 Streaming data structure of H.264 bit stream	9
4.6 Optional Properties	9
5. STREAMING PROTOCOLS	11
5.1 Types of Streaming Protocols	11
5.2 Formation of URL	11
5.3 RTSP Methods	11
5.3.1 Supported Methods	11
5.3.2 Unsupported RTSP Methods	16
5.4 Configuring Streaming Session	16
5.5 Proprietary Properties	18
5.6 RTSP and RTP tunneling over HTTP	18
5.7 Known Issues	18

6. REFERENCES	19
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3. Introduction

3.1 Purpose

The purpose of this document is to describe technical details of the media formats and streaming protocols supported by Sony Network Camera / Video Network Station 5thGen series (hereafter it is called as Sony 5thGen).

This document provides sufficient information about the Sony 5thGen so that 3rd party VMS (Video Management Software) vendors can add support in their software so as to support streaming from Sony 5thGen.

3.2 Scope

Scope of this document is to provide detailed information about the supported media formats and streaming protocols and how to configure them.

This document will cover the following items:

- Types of media formats supported by Sony 5thGen.
- Configuring a particular media format.
- Types of streaming protocols supported by Sony 5thGen.
- Formation of Media Streaming URLs
- Details of the RTSP methods/ responses supported by Sony 5thGen
- Sequence of operations to start media streaming from Sony 5thGen.
- Configuration of proprietary streaming parameters.
- Optional properties supported by Sony 5thGen.
- Known Issues.

This document will not cover the following items.

- ONVIF media service related stuff which might be handled before RTSP transaction among ONVIF conformant devices

4. Media Formats

This chapter explains about the different types of media formats supported by the Sony 5thGen and also explains how to configure them and limitations.

4.1 Types of Media Formats

Sony 5thGen supports following Audio/ Video codec

4.1.1 Video Codec

- Motion JPEG
- MPEG-4, Simple Profile (SP)
- H.264, Baseline Profile

4.1.2 Audio Codec

- G.711
- G.726

4.2 Configuring Media Formats

4.2.1 Video Codec

Sony 5thGen (SNC-RS44/RS46/RS84/RS86) supports up to 3 video codec instances namely ImageCodec1, ImageCodec2, and ImageCodec3. Other models support up to 2 instances.

Each instance can be configured with any of the above mentioned video codec using CGI commands.

For example, to set up the first instance to generate MPEG-4 720P video stream with 30 fps frame rate, the sample configuration command will be as follows.

```
http://<ip_address>/command/camera.cgi?ImageCodec1=mpeg4&ImageSize1=1280,720&FrameRate1=30
```

Similar mechanism can be used to configure other instances as well.

Limitations:

Following are some limitations regarding Video codec instances in Sony 5thGen.

- Default configuration for the Instance 2 and 3 are disabled. (ImageCodec2=off, ImageCodec3=off)
- Please be sure that when you enable multiple instances, it requires much more computation power toward Sony 5thGen, which might have some impact on bit streaming, local storage functionality, command responsiveness and so on.
- First instance cannot be disabled at any time.
- When the second instance is disabled, third instance cannot be enabled as well.

4.2.2 Audio Codec

Sony 5thGen supports one instance of audio and by default it is disabled.
It can be enabled using the following CGI command

```
http://<ip_address>/command/camera.cgi?AudioIn=on
```

And this instance can be configured to any of the audio codec using the following CGI command.

```
http://<ip_address>/command/camera.cgi?AudInCodec=<g711_64/g726_40/g726_3/g726_24/g726_16>
```

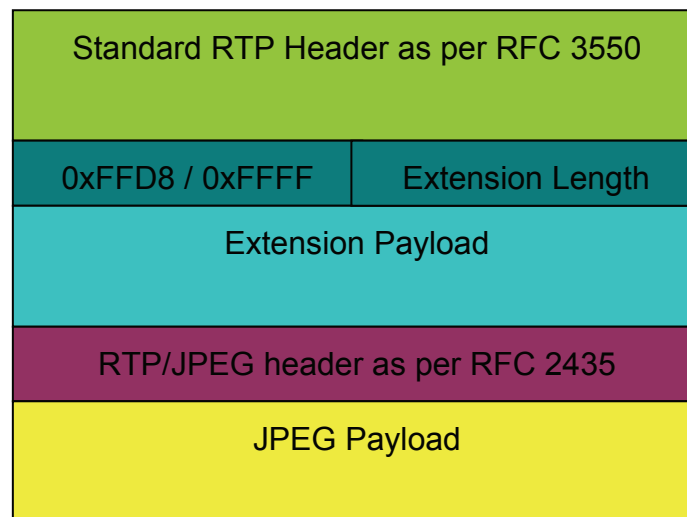
Note: Please refer to the CGI command manual for more details on using CGI commands to configure codec.

4.3 Streaming data structure of Motion JPEG bit stream

JPEG data stream follows RFC 2435 for transmission over RTP.

Each RTP packet consists of RTP header, JPEG header, JPEG payload and optional extension header information (if enabled) as shown below.

JPEG RTP Packet Structure:



In order to distinguish an optional RTP header extension from possible other header extensions, the first 16 bits (the first two octets of the four-octet extension header) of an RTP SHALL have the value 0xFFD8 (JPEG SOI marker) for the initial packet and 0xFFFF for other RTP packets within a frame. This is followed by the length of the extension header and the corresponding extension payload. For the details

of this extension header, please refer to ONVIF Core Specification v1.01 section 11.1.3 [JPEG over RTP].

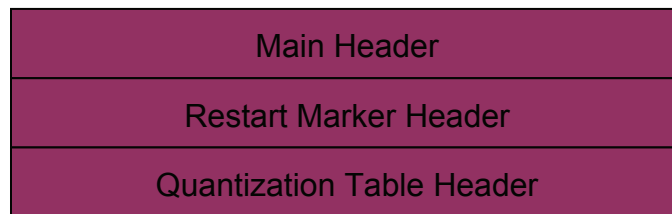
The above optional RTP header extension is disabled to be put in the bitstream as default in Sony 5thGen, although it is helpful to reconstruct a complete JPEG file. If you would like to enable it, perform the following CGI command beforehand.

```
http://<ip_address>/command/camera.cgi?RTPMJPEGEtnHeader=on
```

If you would like to disable it, CGI command to be issued will be as follows.

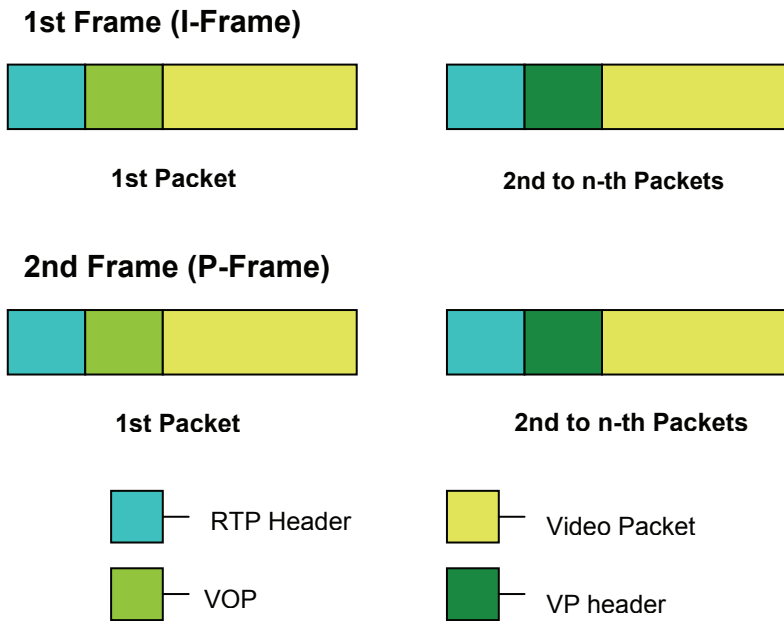
```
http://<ip_address>/command/camera.cgi?RTPMJPEGEtnHeader=off
```

RTP/JPEG header field in the above figure is further explained as shown below:



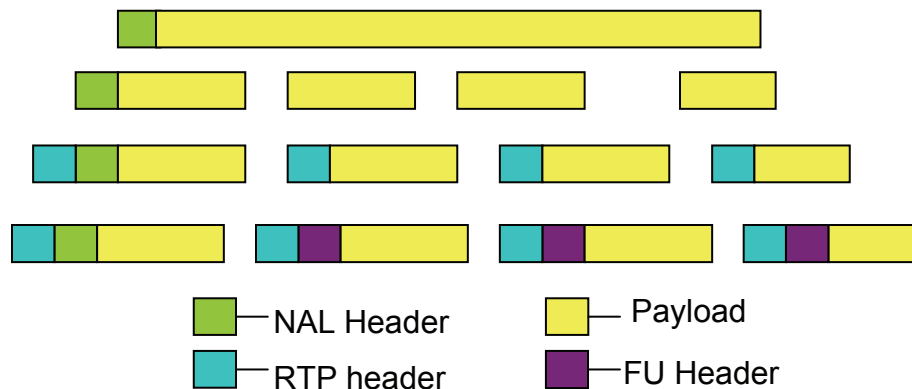
4.4 Streaming data structure of MPEG-4 bit stream

MPEG-4 data stream follows RFC 3016 for transmission over RTP. RTP packetized structure of MPEG-4 data stream is shown as below.



4.5 Streaming data structure of H.264 bit stream

H.264 data stream follows RFC 3984 for transmission over RTP. RTP packetized structure of H.264 stream is as shown below.



Top row in the figure represents H.264 single frame with NAL header, which is divided into multiple MTUs as shown in second row. RTP headers are added to each MTU as shown in third row. Finally FU headers are added to each packet following the first packet of the frame as shown in last row, and are sent to client.

4.6 Optional Properties

This section explains some optional properties supported by Sony 5thGen.

Motion JPEG restart marker insertion

- MJPEG stream available in Sony5thGen supports so-called Restart marker whose interval is determined by DRI(Define Restart Interval) marker. Although almost all JPEG decoder module can handle it properly, there might be some case that some JPEG decoder may require additional change so as to correctly handle JPEG data.

5. Streaming Protocols

This chapter explains about the different types of streaming protocols supported by Sony 5thGen and explains how to configure them to start media streaming.

5.1 Types of Streaming Protocols

Sony 5thGen supports following network protocols for media streaming:

- RTSP for controlling the media streaming over TCP.
- RTP for Audio/ Video data transmission over UDP.
- RTCP for synchronization.
- RTSP and RTP tunneling over HTTP.

5.2 Formation of URL

As mentioned above in 4.2, Sony 5thGen supports up to 3 video codec instances and 1 audio codec instance. The corresponding URL for each instance can be formed by using the IP address of the Sony 5thGen as shown below.

[URL for getting 1st video codec instance presentation]

```
rtsp://<ip_address>/media/video1
```

[URL for getting 2nd video codec instance presentation]

```
rtsp://<ip_address>/media/video2
```

[URL for getting 3rd video codec instance presentation]

```
rtsp://<ip_address>/media/video3
```

Note: This is available only in the case of SNC-RS44, SNC-RS46, SNC-RS84 and SNC-RS86.

[URL for getting audio codec instance presentation]

```
rtsp://<ip_address>/media/audio
```

5.3 RTSP Methods

This section contains the various RTSP methods supported by Sony 5thGen as well as the unsupported RTSP methods that are not supported.

5.3.1 Supported Methods

5.3.1.1 OPTIONS:

OPTIONS request can be used by the client to know about the RTSP methods accepted by Sony 5thGen

server.

Following is the sample request and response for “OPTIONS” method

Request:

```
OPTIONS rtsp://<ip_address> 6/video1 RTSP/1.0\r\n
CSeq: 1\r\n
User-Agent: <Client software name>\r\n
\r\n
```

Response:

```
RTSP/1.0 200 OK\r\n
CSeq: 1\r\n
Date: Tue, Sep 01 2009 09:52:54 GMT\r\n
Public: OPTIONS, DESCRIBE, SETUP, TEARDOWN, PLAY\r\n
\r\n
```

5.3.1.2 DESCRIBE:

DESCRIBE request can be used by the client to get the description of the media stream.

Sony 5thGen responds to DESCRIBE request with the presentation description in Session Description Protocol (SDP) format.

- Following is the sample request and response for “DESCRIBE” method

Request:

```
DESCRIBE rtsp://<ip_address> /video1 RTSP/1.0\r\n
CSeq: 2\r\n
Accept: application/sdp\r\n
User-Agent: <Client software name>\r\n
\r\n
```

Response:

```
RTSP/1.0 200 OK\r\n
CSeq: 2\r\n
Date: Tue, Sep 01 2009 09:52:55 GMT\r\n
Content-Base: rtsp://<ip_address> /video1\r\n
Content-Type: application/sdp\r\n
Content-Length: 381\r\n
\r\n
v=0\r\n
o=- 1251758002617160 1 IN <ip_address>\r\n
s=Sony RTSP Server\r\n
i=video1\r\n
```

```
t=0 0\r\n
a=tool:LIVE555 Streaming Media v2008.07.24\r\n
a=range:npt=now-\r\n
a=source-filter: incl IN IP4 * <ip_address>\r\n
a=rtcp-unicast: reflection\r\n
a=range:npt=now-\r\n
c=IN IP4 0.0.0.0\r\n
a=x-qt-text-nam:Sony RTSP Server\r\n
a=x-qt-text-inf:video1\r\n
m=video 0 RTP/AVP 26\r\n
a=rtpmap:26 JPEG/90000\r\n
a=control:track1\r\n
```

Following are the details about the SDP response shown above.

‘v’ refers to SDP version

‘o’ refers to Owner details

‘s’ refers to Session Name

‘i’ refers to Session Information

‘t’ refers to Time Description

‘c’ refers to Connection Information

‘tool’, ‘range’, ‘source-filter’, ‘rtcp-unicast’, ‘x-qt-text-nam’, ‘x-qt-text-inf’ are various session attributes.

‘rtpmap’, ‘control’ are different media attributes of SDP.

‘m’ refers to media description which have following sub-fields

Media Type: video

Media Port: 0

Media Proto: RTP/AVP

Media Format: JPEG-compressed video

- When audio is also enabled the response from Sony 5thGen will be as shown below:

Response with Audio:

```
RTSP/1.0 200 OK\r\n
CSeq: 2\r\n
Date: Sun, Sep 01 2013 22:57:54 GMT\r\n
Content-Base: rtsp://<ip_address> /video1/\r\n
Content-Type: application/sdp\r\n
Content-Length: 442\r\n
\r\n
v=0\r\n
o=- 1378076126740393 1 IN IP4 <ip_address>\r\n
s=Sony RTSP Server\r\n
```

```
i=video1\r\n
t=0 0\r\n
a=tool:LIVE555 Streaming Media v2008.07.24\r\n
a=range:npt=now-\r\n
a=source-filter: incl IN IP4 * <ip_address>\r\n
a=rtcp-unicast: reflection\r\n
a=range:npt=now-\r\n
c=IN IP4 0.0.0.0\r\n
a=x-qt-text-nam:Sony RTSP Server\r\n
a=x-qt-text-inf:video1\r\n
m=audio 0 RTP/AVP 0\r\n
a=rtpmap:0 PCMU/8000\r\n
a=control:track1\r\n
m=video 0 RTP/AVP\r\n
a=rtpmap:26 JPEG/90000\r\n
a=control:track2\r\n
```

5.3.1.3 SETUP:

SETUP request can be used by the client to specify how the media stream must be transported.

This request includes RTSP URL and transport specifier, which will have local ports for receiving RTP and RTCP data.

The response includes the local ports chosen by the server as well as the **RTSP session time out** value.

Client must send SETUP request before sending PLAY request.

Following is the sample request and response for “SETUP” method

Request:

```
SETUP rtsp://<ip_address> /video1/track1 RTSP/1.0\r\n
CSeq: 3\r\n
Transport: RTP/AVP;unicast;client_port=1666-1667\r\n
User-Agent: <Client software name>\r\n
\r\n
```

Response:

```
RTSP/1.0 200 OK\r\n
CSeq: 3\r\n
Date: Tue, Sep 01 2009 09:52:55 GMT\r\n
Transport:
RTP/AVP;unicast;destination=<client_ip_address>;source=<ip_address>;client_port=4000
0-40001;server_port=6970-6971\r\n
Session: 1\r\n
\r\n
```

5.3.1.4 PLAY:

PLAY request can be used by the client to start the media streaming.

Upon receiving this request, the streaming server will invoke the actual media streaming such as audio and video.

Following is the sample request and response for PLAY method.

Request:

```
PLAY rtsp://<ip_address> /video1/ RTSP/1.0\r\n
CSeq: 4\r\n
Session: 1\r\n
Range: npt=0.000-\r\n
User-Agent: <Client software name>\r\n
\r\n
```

Response:

```
RTSP/1.0 200 OK\r\n
CSeq: 4\r\n
Date: Thu, Sep 03 2009 10:00:36 GMT\r\n
Range: npt=0.000-\r\n
Session: 1\r\n
Content-Length: 0\r\n
\r\n
```

5.3.1.5 TEARDOWN:

TEARDOWN request can be used by the client to terminate the session. It will also end up in the termination for the actual media streaming via RTP/RTCP.

Following is the sample request and response for TEARDOWN method.

Request:

```
TEARDOWN rtsp://<ip_address> /video1/ RTSP/1.0\r\n
CSeq: 5\r\n
Session: 1\r\n
User-Agent: <Client software name>\r\n
\r\n
```

Response:

```
RTSP/1.0 200 OK\r\n
CSeq: 5\r\n
Date: Thu, Sep 03 2009 10:00:44 GMT\r\n
\r\n
```

5.3.1.6 SET_PARAMETER:

SET_PARAMETER can be used by the client to keep the session alive. Client must send this request periodically before the time out period as mentioned in SETUP response. If server doesn't receive any RTSP request within the timeout period, server will terminate the streaming session.

Note: By default, server uses time out value as '0' which indicates the RTSP server does not consider time out for the RTSP session. This can be configured by the client using CGI, please refer to section: 5.5 for more details.

5.3.2 Unsupported RTSP Methods

5.3.2.1 PAUSE:

Sony 5thGen doesn't support PAUSE request since it only support Real-time streaming. There is no way to once pause the current bit streaming. Please use "TEARDOWN" request on behalf of this request.

5.3.2.2 RECORD:

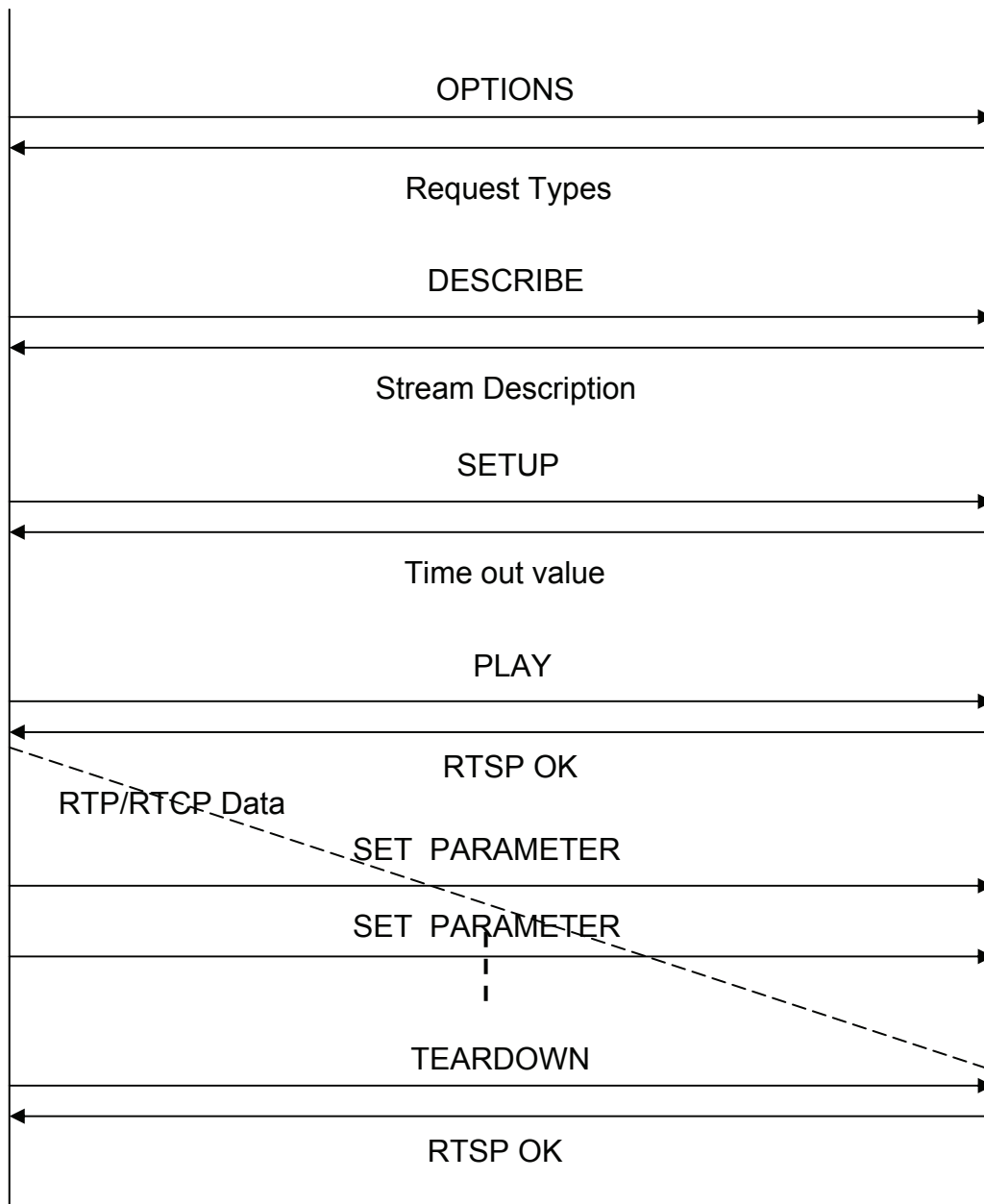
Sony 5thGen doesn't support RECORD method.

5.4 Configuring Streaming Session

Following sequence of operations should be carried out by the client to start media streaming from Sony 5thGen media server.

Client

Camera



5.5 Proprietary Properties

- Sony 5thGen has a capability to add extension headers in RTP data in case of Motion JPEG streaming, so necessary care should be taken in client while processing.
- By default Sony 5thGen uses 'RTSP Session time out' value as '0', which means RTSP doesn't consider time out. This value can be configured by the client using CGI command.

```
http://<ip_address>/command/camera.cgi?RTSPTimeout=<value>
```

where <value> should be within the range of 0 to 600 [secs]

5.6 RTSP and RTP tunneling over HTTP

Sony 5thGen follows QuickTime player's implementation for the tunneling of RTSP and RTP data over HTTP to traverse firewalls. HTTP URI for this type of streaming is

```
http://<ip_address>/media/<video1 | video2 | video3>
```

Sony 5thGen uses http port number '8080' for this type of streaming other than the conventional HTTP port 80. This port number can be configured by the client using following CGI

```
http://<ip_address>/command/camera.cgi?RTSPoverHTTPPort=<value>
```

Note: Please be sure that the HTTP tunneling port number cannot be same as the conventional HTTP port number whose default number is 80.

In case of handling RTSP and RTP tunneling over HTTP, RTSP URI will also be necessary to invoke bit streaming. RTSP URI for composing RTSP requests is as follows.

```
rtsp://<ip_address>/media/<video1 | video2 | video3>
```

Please refer to the QuickTime's documentation of "Tunneling RTSP and RTP through HTTP" for technical details of this type of streaming.

5.7 Known Issues

5.7.1 JPEG Streaming issue

The following issue has been identified in the firmware version 1.10.0x or earlier.

- RTSP session initiated streaming for JPEG has a chance not to work properly if the either of the following condition is met.
 - RTSP User-Agent header string doesn't start with the string "Qui"
 - The codec configuration such as ImageSize<n> or Quality<n> is configured to generate pretty large frame data size which is something like 70 KB

The above mentioned issue will be fixed in the next release of the firmware.

6. References

[IETF RFC 2326] Real Time Streaming Protocol (RTSP)

<http://www.ietf.org/rfc/rfc2326.txt>

[IETF RFC4566] SDP: Session Description Protocol

<http://www.ietf.org/rfc/rfc4566.txt>

[IETF RFC 3550] RTP: A Transport Protocol for Real-Time Applications

<http://www.ietf.org/rfc/rfc3550.txt>

[IETF RFC2435] RTP Payload Format for JPEG-compressed Video

<http://www.ietf.org/rfc/rfc2435.txt>

[IETF RFC 3016] RTP Payload Format for MPEG-4 Audio/Visual Streams

<http://www.ietf.org/rfc/rfc3016.txt>

[IETF RFC 3984] RTP Payload Format for H.264 Video

<http://www.ietf.org/rfc/rfc3984.txt>

[ONVIF Core] ONVIF Core Specification Version 1.01

<http://www.onvif.org/imwp/download.asp?ContentID=16154>

[RTSP and RTP tunneling over HTTP] Tunneling RTSP and RTP through HTTP

<http://developer.apple.com/quicktime/icefloe/dispatch028.html>