



APP NOTES

Low Bandwidth Media Configuration

May 2017

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Name of Librestream Software Onsight Connect

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1. Overview

Onsight Connect works with wireless (802.11 a/b/g/n), LAN/WAN (Ethernet), cellular and satellite networks. Due to the sometimes scarce and variable nature of bandwidth, Onsight Connect includes a number of bandwidth management features and configuration options to optimize the collaboration experience.

This document provides instructions on manually configuring a media configuration on an Onsight endpoints. To apply media configurations through an Onsight Platform Manager client policy, please refer to the OPM Admin guide.

1.1 Network Overview

There are many factors that can affect bandwidth and the impact of these factors differs across the network types. Onsight devices are often connected through Wireless (802.11 a/b/g/n) networks, but there are a growing number of use cases where Onsight devices are connected through cellular and satellite networks. While all networks share bandwidth limitations, cellular and satellite networks introduce additional management requirements.

1.1.1 Wireless Wide Area Networks (Cellular)

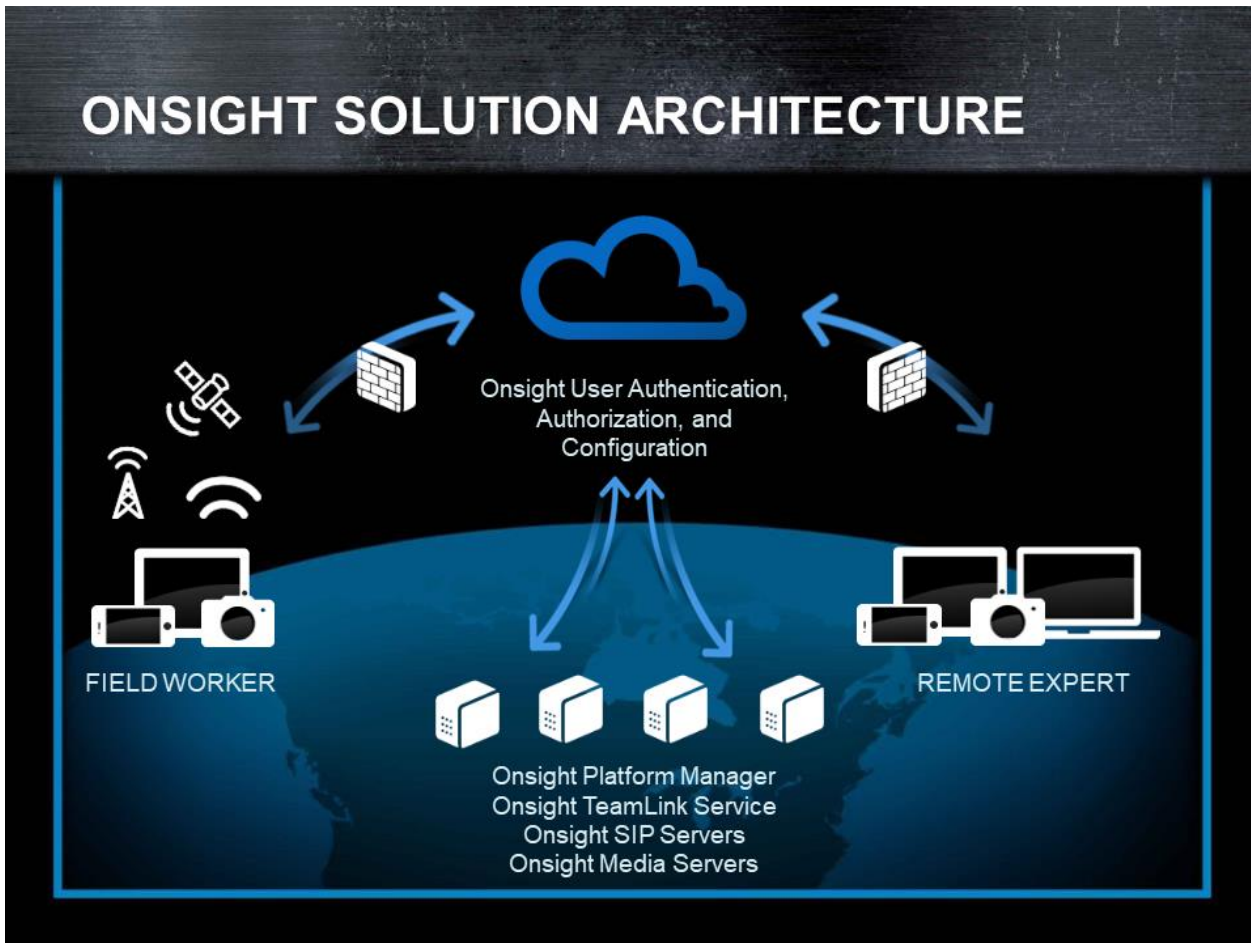
Onsight Connect can operate in cellular environments when running on smartphones or by using wireless wide area network (WWAN) router products. An Onsight Device can connect to a WWAN router using 802.11 protocols; the router connects to the network using WWAN technologies such as 3G or 4G-LTE.

When connected to a cellular network, Onsight devices can encounter both low and variable network bandwidth. Issues such as signal strength and the number of users connected to a particular cell tower will impact both the amount and variability of available bandwidth. To provide a high quality live video collaboration session, this variability must be managed.

1.1.2 Satellite

Satellite networks through BGAN and VSAT terminals introduce additional requirements to limit bandwidth usage. These networks typically have less bandwidth available for Onsight video sessions and can also incur substantial costs if usage exceeds contracted levels. For this environment, Onsight provides many options that can reduce bandwidth requirements and also ensure that bandwidth consumption stays within the required levels.

Onsight Solution Architecture



2. Onsight Bandwidth Configuration Options

There are many features built-in to Onsight that enhance performance on low or variable bandwidth networks. These features include:

2.1 Bandwidth Control

Maximum Video Bit Rate (Kbps) – set the maximum video bit rate users are allowed to use during a call.

Enable BAS (Bandwidth Adaptive Streaming) – provides adaptive response to bandwidth fluctuation on cellular networks.

Media Configuration on Connection – sets the default media configuration for users when a call is established.

Preferred Voice Code – sets the audio codec for voice.

Preferred Subject Audio Codec – set the audio codec for video-synced audio from external audio sources e.g. USB mic.

Audio Efficiency – sets the method used to send audio packets to minimize network overhead.

Bandwidth Test Tool – determines the instantaneous bandwidth available during a call.

2.2 QoS Networking

Diffserv DSCP (Differentiated Services Code Point) - Quality of Service (QoS) can be managed by applying packet priority using the DiffServ values for the type of packet. The types include Voice, Video, Subject Audio and Data Stream.

2.3 Use Cases

Image Sharing Collaboration – When bandwidth is not sufficient enough to stream video, high resolution still images can be shared by Onsight users.

Deferred Collaboration – When a network connection is not available an Onsight user can record and capture still images that can be shared at a later date in an Onsight collaboration session when a network connection is available.

3. Manage Media Configurations

Media configurations let you define the communication channel between endpoints by allowing configuration of audio bit rate, resolution, target video bit rate, fps, and GOP for the media streams. They can be managed as part of your Onsight Platform Manager Client Policy. Once the Onsight Administrator creates media configurations and includes them in a Client policy, they then become available for selection during an Onsight call.

Your Onsight Administrator can also set client permissions to allow users to create their own media configurations when bandwidth conditions are not addressed by the pre-defined media configurations.

The default 'Low' Bandwidth configuration that ships with Onsight (i.e. 320x240 – QVGA) uses approximately 250-300 Kbps for video. This may be suitable for most low bandwidth situations.

3.1 Video Parameters

Custom video and audio media configurations can be defined that use as little as 32 Kbps all the way up to 6.0MB for HD video enabled endpoints. However, HD video is not recommended for Low Bandwidth networks. The required minimum bitrates for HD video exceed Low Bandwidth network capacity.

The video parameters for media configurations include:

Device Type: NTSC or PAL

Resolution e.g. “Viewfinder video” – 160 x 112

Frame Rate: 1 – 30 frames per second

GOP (Group of Pictures) settings

Video Bit Rate: 8 Kbps – 6000 Kbps

Limit: Hard (bitrate will not be exceeded) or Soft (best effort to maintain limit but may be exceeded) Limit Bit rate control.

3.2 Onsight Connect Media Configuration

To manually create or edit a Media configuration:

- Go to Settings-Media Configurations.
- Press ‘+’ to add a new media configuration or press the arrow key to edit an existing one or press the copy button to clone an existing configuration.

Cancel

CONFIGURATION

OK

Configuration

Name

Device Type

NTSC

PAL

Resolution

640 x 480 - VGA

Optimize For

Frame Rate

10 FPS

Detail

Smooth Motion

GOP

5

Reliability

Quality

Video Bit Rate

Target

400 Kbps

8

2500

Limit

Hard

Soft

Bit Rate Distribution

Video

Data

Voice

Audio

Details

1. Enter a **Name** for the new configuration.
2. Select the **Device Type**. For North America select NTSC or for Europe select PAL.
3. Set the **Resolution** e.g. 640x480
4. Set the **Frame Rate** – smaller frame rates will help minimize bandwidth. E.g. 5 fps.
5. **GOP** – in most cases a GOP of 5 is acceptable. Increasing the GOP will improve Image quality on reliable networks (guaranteed bandwidth) connections such as a BGAN service, but may decrease image quality on unreliable networks (non-guaranteed bandwidth) such as Cellular (4G).
6. Set the **target** for the **Video Bit Rate** – in this example it's set to 400Kbps. The target should be below the maximum bandwidth available on your network to allow for network overhead, if you do not know your available bandwidth run the [Bandwidth Test Tool](#).
7. Click **Details** to view the bandwidth distribution of your media configuration. The **Bit Rate Details** will be displayed. Note the Total bit rate for the media configuration in the where the Total row intersects the Total column. In the example below, the total bit rate is 565 Kbps even though the set target for Video Bit Rate was set to 400Kbps.

Config BIT RATE DETAILS				
Stream	Data	Overhead	Total	Percent
Video	400 K	23.0 K	423 K	74.8 %
Voice	64.0 K	4.13 K	68.1 K	12.1 %
Data	4.00 K	2.00 K	6.00 K	1.1 %
Audio	64.0 K	4.13 K	68.1 K	12.1 %
Total	532 K	33.3 K	565 K	

8. Press **Config** to return to the previous page.
9. Press **OK** to save.

3.3 Onsight Rugged Smart Camera Media Configuration

The best way to manage Media Configurations is through Onsight Platform Manager Client Policies. However, users who are granted permission may create their own custom media configurations when logged into Onsight endpoints such as the Onsight 5000HD.

3.3.3 Onsight 5000HD

To create a custom media configuration, go to Settings-Media Configurations. Follow the instructions for Onsight Connect media configuration.

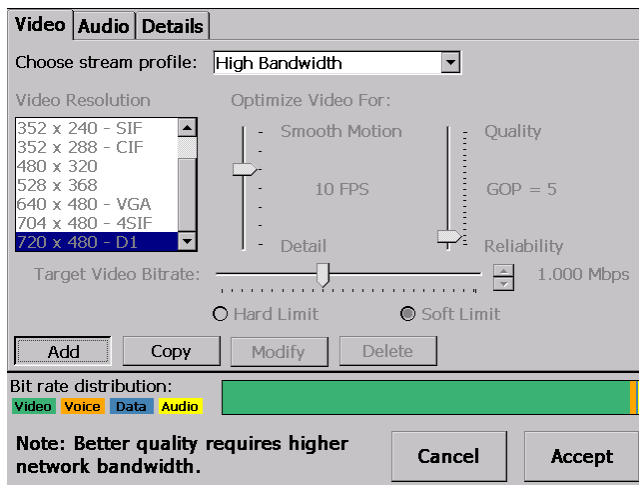
3.3.1 Onsight 2500

The Onsight 2500 (includes the 2000 and 1000) also supports custom Media Configurations, HD video is not supported on the Onsight 2500. To create a custom configuration:

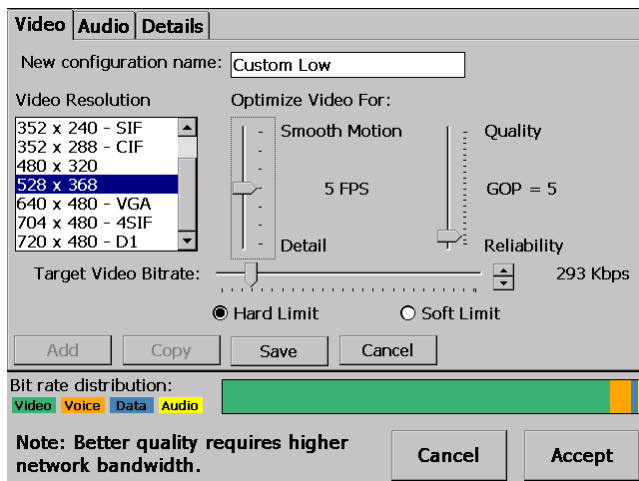
Go to the Onsight device main menu.

Select 'Stream Setup'.

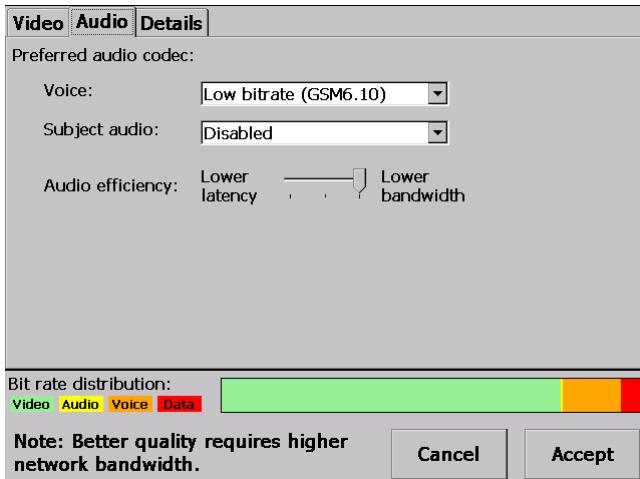
Press the 'Add' button.



Name the Configuration E.g. Custom Low.



1. Select the Custom Stream Configuration settings for low bandwidth. E.g. 160x112, 3 FPS, Target Bit Rate: 96 Kbps, Target Video Bitrate: 96 Kbps, Hard Limit.
2. Press the 'Save' button.
3. To set the Audio profile tap on the 'Audio' tab.
4. Set the Preferred audio codecs. E.G. Voice: Low bitrate (GSM6.10), Subject audio: Disabled, Audio efficiency: Lower bandwidth



Video **Audio** Details

Preferred audio codec:

Voice: Low bitrate (GSM6.10)

Subject audio: Disabled

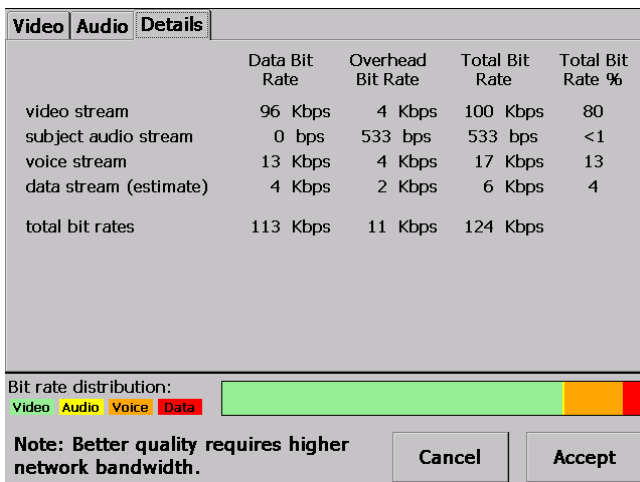
Audio efficiency: Lower latency Lower bandwidth

Bit rate distribution: Video Audio Voice Data

Note: Better quality requires higher network bandwidth.

Cancel Accept

5. Tap on the 'Details' tab.
 - a. The current bandwidth details are displayed based on the current Custom stream configuration.



Video **Audio** **Details**

	Data Bit Rate	Overhead Bit Rate	Total Bit Rate	Total Bit Rate %
video stream	96 Kbps	4 Kbps	100 Kbps	80
subject audio stream	0 bps	533 bps	533 bps	<1
voice stream	13 Kbps	4 Kbps	17 Kbps	13
data stream (estimate)	4 Kbps	2 Kbps	6 Kbps	4
total bit rates	113 Kbps	11 Kbps	124 Kbps	

Bit rate distribution: Video Audio Voice Data

Note: Better quality requires higher network bandwidth.

Cancel Accept

Note: Subject Audio is disabled, 0 bps is displayed for the data bit rate, however there is still some Overhead traffic (533 bps) associated with Subject Audio to keep the channel available when in a call.

Note: The Audio settings are global and will be used regardless of which Video profile is selected.

6. Press **Accept**.

3.4 Media Configuration Best Practice Tips

1. Setting a 'Hard Limit' for the Video Bit Rate will constrain bandwidth used for the video stream. Don't set a resolution and frame rate too high for the specified Video Bit Rate.
2. When setting the Video Bit Rate use the table below to **approximate** the required bit rate for the video parameters. The bit rate required to stream video is associated with the amount of motion in the video, a lot of motion means more information is sent therefore a higher bit rate is required, less motion requires less bit rate. The following table represents an average bit rate assuming moderate motion in the video, i.e. walking while streaming video or scanning the surface of an object during inspection e.g. a pipe or circuit board.

Approximate Target Video Bitrates

	Resolution	160x112	320x240	352x240	352x288	480x320	528x368	640x480	704x480	720x480
Frame rate	MPEG4 CODEC									
3		30	50	45	55	70	80	145	150	240
5		40	60	62	66	105	115	200	235	330
10		NA*	120	130	120	200	240	420	370	600
15		NA*	180	170	200	315	335	500	700	825
30		NA*	320	330	360	625	680	1000	1000	1500
	Resolution	160x112	320x240	352x240	352x288	480x320	528x368	640x480	704x480	720x480
Frame rate	H.264 CODEC									
1		<10	<25	<25	<25	<50	<60	<90	<100	<140
2		<15	<30	<30	<30	<60	<70	<100	<120	<150
3		15	30	30	30	60	70	100	120	150
5		20	40	40	40	80	100	120	170	220
10		NA*	90	90	90	140	190	250	300	350
15		NA*	130	130	130	190	270	350	400	450
30		NA*	190	190	190	300	350	550	600	620

NA* - 160 x 112 viewfinder video is not recommended as higher resolutions are preferred.

Note: High Definition Resolutions (720p, 1080p) are not recommended for Low Bandwidth networks.

Note: All bitrates are based on a GOP setting of 5.

3. When you are using low-resolution video such as 160x112 viewfinder video, we recommend that you take high quality image snapshots when you are ready to 'collaborate in detail'. To do this, the OnSight camera operator simply holds down the image capture button to automatically send the still image to the remote participant. "Image Sharing Started" is displayed on the device.

3.5 Preferred Audio Codec Management

There are two audio channels associated with OnSight calls, Voice audio and Subject audio. The choice of which audio codec to use for the audio channels affects bandwidth usage. The best way to manage Audio Codecs are through OPM Client Policy. However, you may need to adjust your Audio Codec options when logged in to an OnSight endpoint, to conserve bandwidth. Changes can be made under Settings-Bandwidth Control-Preferred Codecs:

Preferred Voice Codec: The default Voice codec is G7.11 (requires 64 Kbps). Enable the Low Bitrate option of GSM 6.10 (requires 13.5 Kbps) to decrease bandwidth usage. The Low Bitrate audio codec, GSM, saves considerable bandwidth approx. 50kbps.

Preferred Subject Audio Codec: The default Subject audio codec for is G7.11 (requires 64 Kbps). Enable the Low Bitrate option of GSM 6.10 (requires 13.5 Kbps) to decrease bandwidth usage. The Subject Audio Codec also includes an option to disable it. Unless you require Subject audio to be included in the video, you should disable Subject Audio for low bandwidth environments. Voice audio is always included when streaming or recording video (unless the mics are muted).

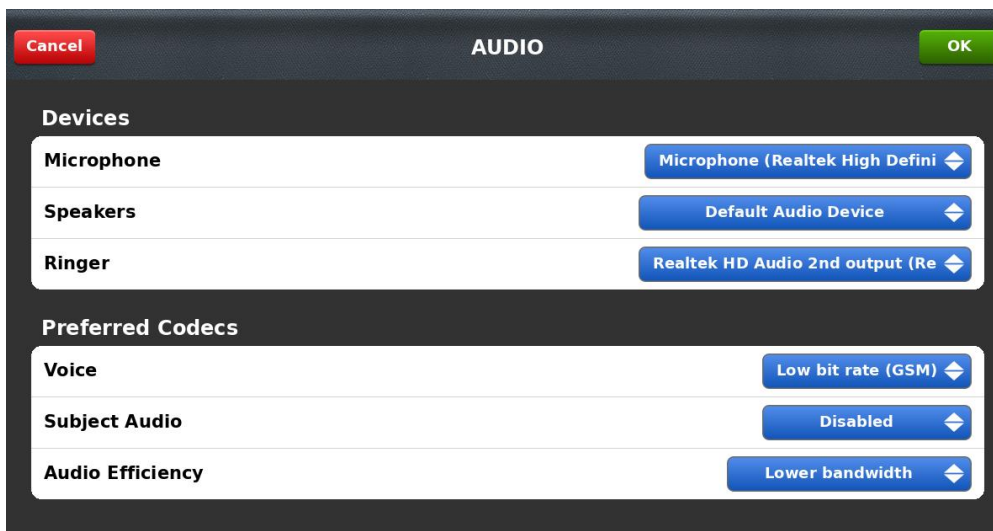
Onsight 2500: 'Enable voice silence suppression' minimizes the voice audio traffic sent from the device when 'silence' is detected. Voice silence suppression means that the device will NOT send 'empty' audio packets to indicate silence. To further reduce Voice traffic (with silence suppression enabled), mute the Voice audio. Subject audio will still be sent from the Onsight Device provided it has not been disabled.

3.5.1 Preferred Audio Codec Configuration

These steps are applicable for Onsight Connect for Windows, iOS, Android, and Onsight 5000HD.

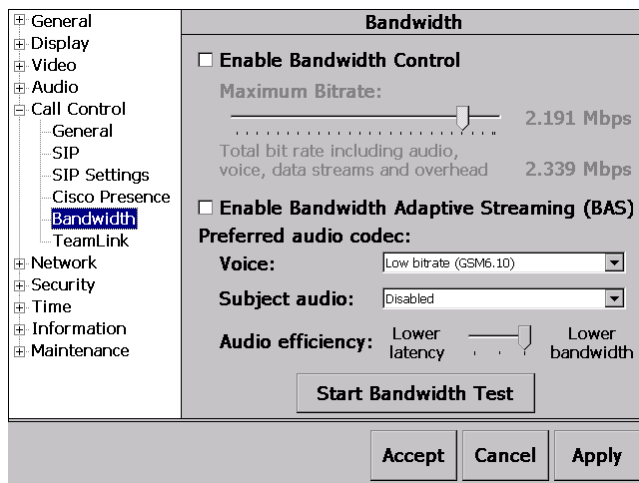
- To configure low bandwidth Audio, go to the Settings-Bandwidth Control-Preferred Codecs
- Select Voice Codec: Low bit rate (GSM)
- Select Subject Audio Codec: Disabled (or Low bit rate, if you require video synced audio)
- Select the Audio Efficiency: Lower bandwidth
- Click OK

Note: The Audio settings are global for each collaboration setting



3.5.2 Onsight 2500 Configuration

- Go to the Onsight device Main menu.
- Tap the 'Configuration' button on the Main menu
- Go to Call Control-Bandwidth
- Select the following Preferred audio codecs:
 - Voice: Low Bitrate (GSM6.10)
 - Subject audio: Disabled
 - Audio efficiency: Lower Bandwidth
- Press **Accept**



When the OnSight Connect endpoint that initiates the call has these audio settings the current call will be set to minimize the bandwidth used for audio.

3.5.1 Best Practice Tips

Use the GSM audio Codec when you are in low bandwidth environments. The quality is still very good and it saves 40 Kbps of bandwidth.

If your use case does not include the use of the Subject Audio, the secondary audio channel (i.e. Audio synced with the Video), Disable Subject Audio to achieve an immediate 20 – 25 Kbps savings in bandwidth.

3.6 Image Sharing Collaboration

1. The ability to share high quality images is an important part of low bandwidth configuration. You can capture high quality 720 x 480 images from any of the OnSight Connect devices to share in a live session at anytime even if the video resolution is set to less than 720 x 480. This means even though you're streaming at a lower video resolution you can still share higher resolution still images for greater image detail.

Note: When you are sharing an image within an extremely low bandwidth environment (i.e. less than 80 Kbps), the audio may stop to conserve bandwidth. As soon as the image is received, audio will begin again.

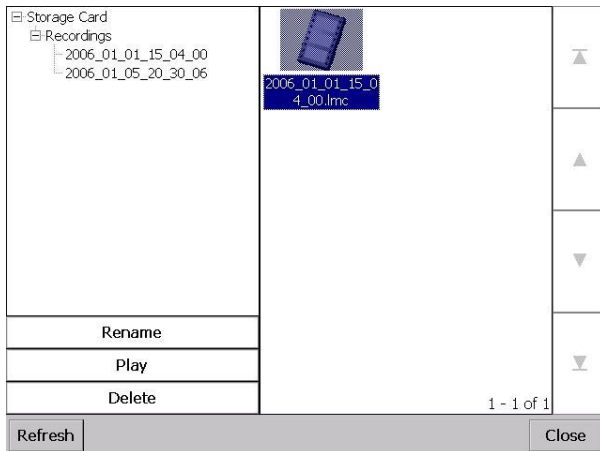
3.7 Deferred Collaboration

In situations where the available bandwidth is not sufficient to support voice, image sharing or video, the OnSight Device's recording function can be used instead for a deferred collaboration session. The OnSight Device must have an SD card installed to record an offline session.

The OnSight recording will contain voice, video, still images and telestration. This recording can be streamed to an OnSight endpoint at a later time when sufficient bandwidth is available e.g. at a remote office location. When the recording is streamed to another OnSight endpoint the recorded video will play back all content including still images and telestration in sequence.

3.8 Onsight Device Recording Playback

As soon as the Onsight device operator and the other Onsight participant(s) are in a live Onsight session, the Onsight device operator simply selects the recording from the 'File Browser' menu (as below) and selects 'Play' to share it with the Onsight participant(s).



While sharing the recording, all the Onsight participants can telestrate, share images, and talk just like they would during any live session.

3.9 Bandwidth Adaptive Streaming

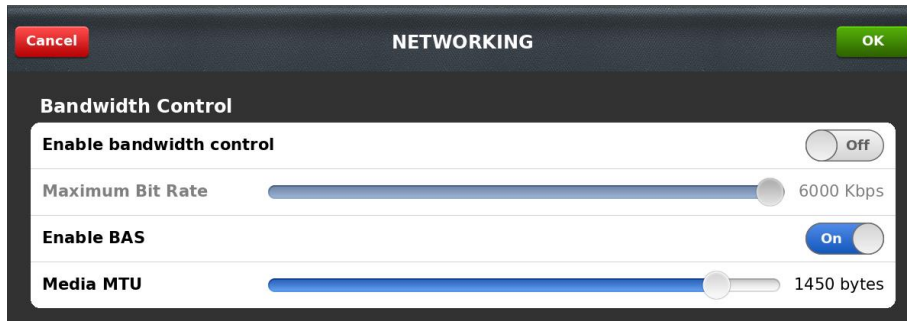
Bandwidth Adaptive Streaming (BAS) can be enabled to automatically adapt video parameters for variable networks. BAS monitors network conditions and dynamically adjusts video parameters in order to improve overall call quality and stability.

BAS will reduce the video frame rate when the available bandwidth decreases. While this may reduce video quality, in many situations it is preferable to the loss of audio quality caused by an overloaded pipe (increasing latency, lost packets which show up as video breakup, etc).

BAS will detect when the available bandwidth returns to its normal level and will use the preferred video frame rate that was previously configured.

3.10 Onsight Connect for Windows Configuration

- Go to the Settings-Networking-Bandwidth Control
- Select 'BAS (Bandwidth Adaptive Streaming)'

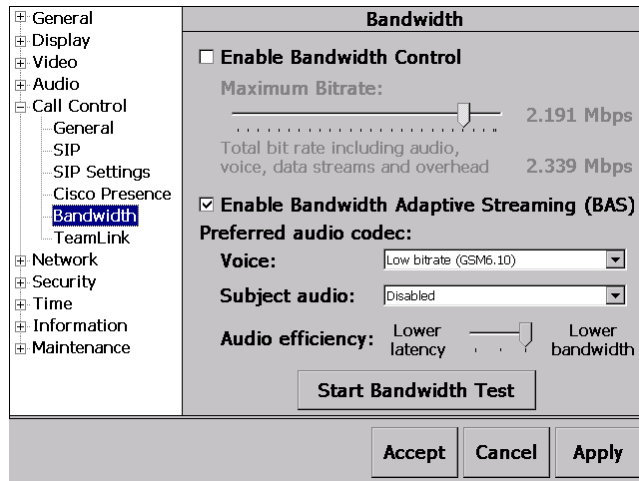


3.11 Onsight Device Configuration

Go to the Onsight device Main menu.

Tap the 'Configuration' button on the Main menu

- Go to Call Control\Bandwidth. Select 'Enable Bandwidth Adaptive Streaming (BAS)'



3.12 Best Practice Tip


- BAS is not recommended for all situations. The default setting is disabled because in some cases it does not improve video delivery over the link. Librestream recommends that users only enable BAS if they are experiencing poor performance (either voice issues that make communication difficult or frequent video issues). It shouldn't be relied upon to operate with higher bandwidth settings than the link can normally support.
- BAS is **ONLY** recommended for Unreliable Networks such as Wireless WAN (3G/4G/LTE) cellular networks due to the highly variable nature of bandwidth on these networks.
- BAS is **NOT** recommended for use on Reliable Networks e.g. BGAN streaming service or LAN/WAN.

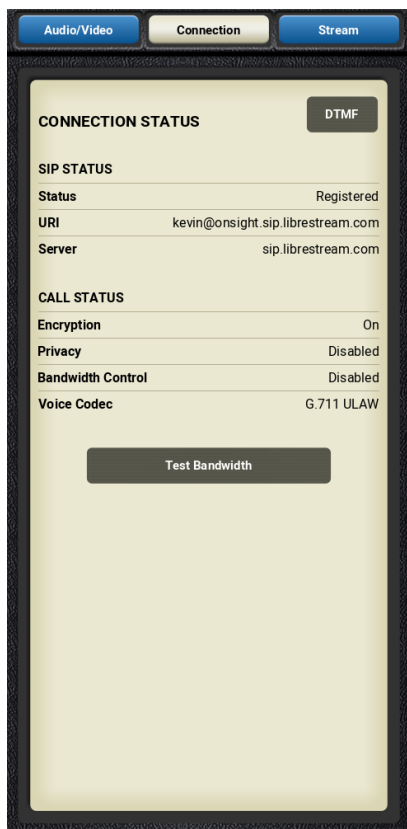
3.13 Bandwidth Test Tool

The Onsight Collaboration System provides a Bandwidth test tool that can be used at the start of the session to determine the available bandwidth between the Onsight Device and Onsight Connect for Windows (or any other Onsight endpoint). Once a call has been established, either Onsight endpoint can start the Bandwidth test using the tool.

3.14 Onsight Connect for Windows

From the Viewer:

- Press the Videos Settings & Stats button, .
- Select the Connection tab
- Press Test Bandwidth.



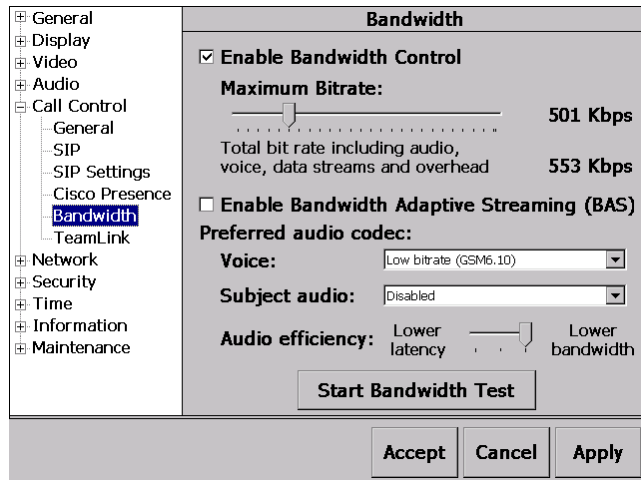
3.15 Onsight Rugged Smart Cameras

From the Viewer:

Go to the Onsight device Main menu.

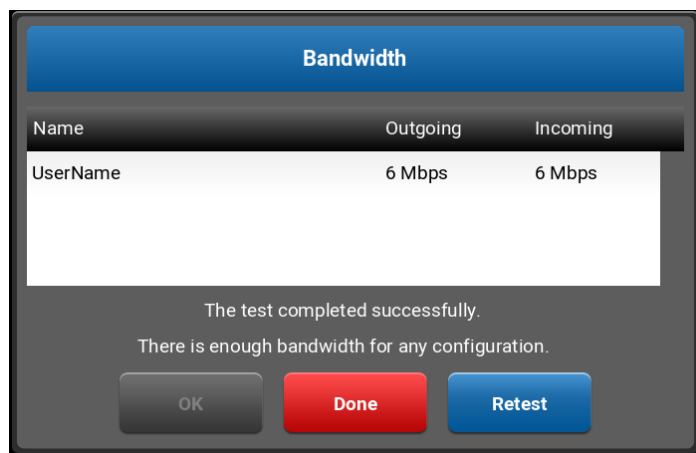
Tap the 'Configuration' button on the Main menu

- Go to Call Control-Bandwidth
- Press 'Start Bandwidth Test'



During the test, voice audio is not available between the two OnSight endpoints. Once the test is completed, voice audio is restored and the results of the test are displayed.

If efficient bandwidth is available you will see a message similar to this:

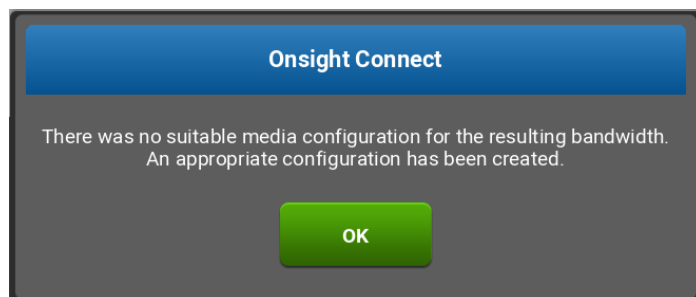


Name	Outgoing	Incoming
UserName	6 Mbps	6 Mbps

The test completed successfully.
There is enough bandwidth for any configuration.

OK Done Retest

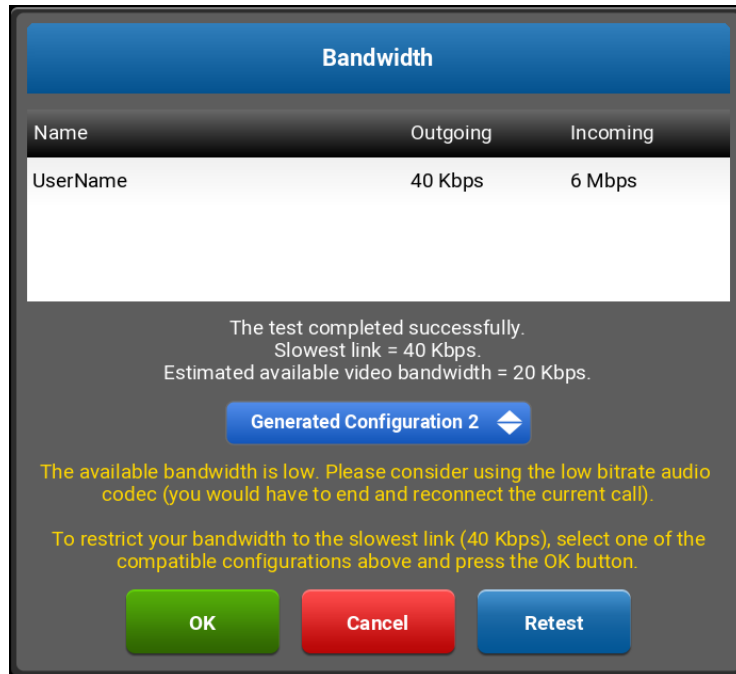
If insufficient bandwidth is available you will see a message similar to this:



OnSight Connect

There was no suitable media configuration for the resulting bandwidth.
An appropriate configuration has been created.

OK



If the user accepts the test results by pressing 'OK' only the bandwidth configurations that are equal to or less than the measured results will be selectable for the duration of the call. If there is no media configuration that works within the bandwidth constraints, OnSight will create a new recommended configuration for you.

The user can choose to select 'Done' so that all bandwidth configurations will remain selectable for the current call. Or press 'Retest' to run the test to confirm the results are consistent.

About Video Rates: The bitrate for the video stream is shown in various places throughout the OnSight product. However, the audio and data streams also contribute to the total bandwidth consumption. The Bandwidth Test Tool takes all of these components into account when measuring the current available bandwidth and recommending the range of useable stream settings.

3.16 Best Practice Tips

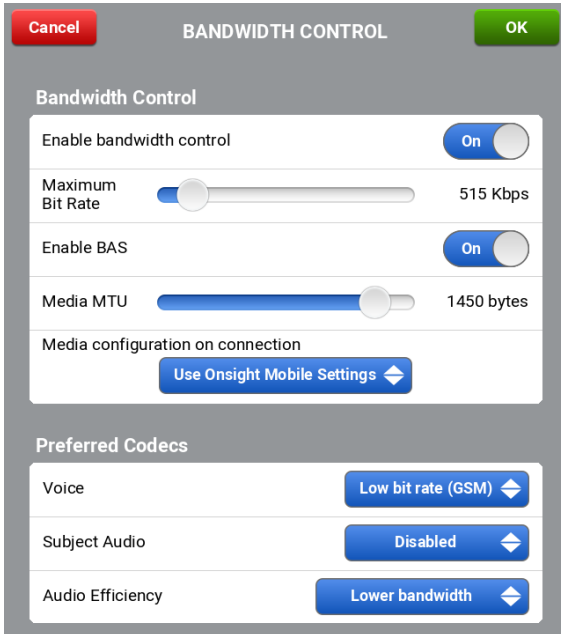
- If the bandwidth environment is unknown or variable, OnSight users should run the Bandwidth Test Tool prior to streaming video to select the most effective media configuration.
- In variable networks such as Cellular, it can also be useful to run this tool multiple times, especially if there are any voice quality issues.

3.17 Bandwidth Control

3.17.1 Bandwidth Control

OnSight Platform Manager Administrators can restrict the maximum bandwidth available for video within an OnSight session through Client Policy. By using the 'Enable Bandwidth Control' option, only media configurations that are below the set Maximum Bit Rate will be available for selection.

For example, if the Maximum Bitrate is set to 500 Kbps, only media configurations that have a Target Video bitrate between 8 to 500 Kbps will be available. It will not allow any configuration with a Target Video bitrate greater than 500 Kbps. This restriction is displayed within Onsight Connect as shown below.



3.17.2 Audio Settings

- Audio Efficiency: selecting Lower bandwidth increases audio delay because it groups more audio packets into each RTP packet thus lowering overhead. For example, if audio packets are changed from 40ms to 120ms, then you will cut down the packet ratio 3:1 since you only need to send a packet 1/3 as often.
- Audio overhead bitrate for both GSM and G.711 is 11 Kbps.
- Data bitrate:
 - G.711 is 64 Kbps.
 - GSM is 13 Kbps.
- 40ms packets:
 - G.711 is about $64(\text{data}) + 11(\text{overhead}) = 75$ Kbps.
 - GSM is about $13 + 11 = 24$ Kbps.
- 80ms packets:
 - G.711 is about $64 + 5.5 = 69.5$ Kbps.
 - GSM is about $13 + 5.5 = 18.5$ Kbps
- 120ms packets:
 - G.711 is about $64 + 3.7 = 67.7$ Kbps.
 - GSM is about $13 + 3.7 = 16.7$ Kbps
- So, as audio packets are grouped you can see that the overhead part of the audio bitrate shrinks. Going from 40 to 80 halves you packet overhead. Going from 40 to 120 reduces overhead to a third.

3.18 Quality of Service (QoS)

Network QoS support through Differentiated Services (DiffServ) was added to allow network administrators the ability to set the priority for the various OnSight media components. Diffserv DSCP values can be set for the 4 streams that are normally running during an OnSight collaboration session including:

- Video
- Voice audio
- Subject Audio
- Data (includes telestration and remote control commands from OnSight Connect)

The DSCP Values are used to classify the network packets and are used to determine which packets should be given priority over the network link. The QoS settings may improve link performance in an environment where a low bandwidth network is being shared by multiple users.

The QoS levels can also be managed remotely using the OnSight Management Suite tool or locally in the OnSight Connect application.

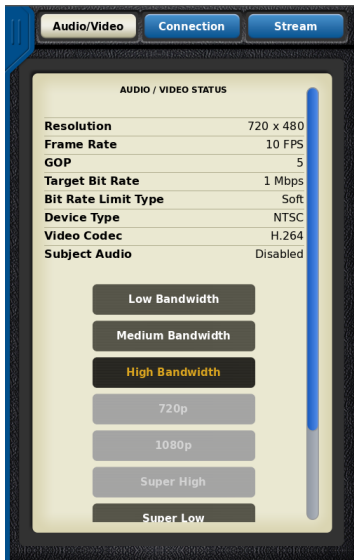
4. Additional Best Practice Recommendations

4.1 Onsight Configuration

1. Register directly to the SIP Server; use TeamLink only when necessary as it adds overhead to the network traffic which may impact low bandwidth situations.
2. Use Client Policy to create custom Media Configurations that will allow users to operate in various low bandwidth environments such as:
 - a. '128K' Media Configuration
 - i. Resolution: 320 x 240
 - ii. FPS: 5
 - iii. GOP: 5
 - iv. Hard limit: 90 Kbps
 - b. Audio settings: GSM audio, 'Disable' subject audio
 - c. '64K' Media Configuration
 - v. Resolution: 160 x 112
 - vi. FPS: between 3-5
 - vii. GOP: 5
 - viii. Hard limit: 41 Kbps
 - i. Audio Settings: GSM audio, 'Disable' subject audio

NOTE: In low bandwidth areas consider using the smallest size, lowest frame rate to provide "Viewfinder" video. Share high quality snapshots to collaborate more fully on a specific area.

3. Configure low bandwidth Audio as described in section Audio Codec Management Options
 - a. When an Onsight endpoint has Low Bitrate (GSM) or Disabled Subject audio configured, audio bandwidth is minimized.
4. When you initiate an Onsight session from a new location, run the Bandwidth Test Tool to determine the available bandwidth and identify which media configurations to use.
 - a. The test results will list the Media Configurations that will work within the current available bandwidth. It will also create a new media configuration, if required.
 - b. Note: You may want to run this tool more than once during an active session if you are experiencing voice quality problems due to a variable network.
5. Start calls using a lower bitrate media configuration. Switch to a higher bitrate media configuration if the connection seems like it can support the higher bandwidth.
 - a. can change the media configuration during an active Onsight session by selecting it on the Audio/Video Status tab of the Viewer, as below.



6. If you are using an alternate Voice communication method such as a cell phone, you can mute the Voice Audio on the OnSight Device while video is streaming. This will minimize the amount of Voice audio traffic sent over the link.
 - a. Note: You must have 'voice silence suppression' enabled on the device for this to be effective otherwise empty 'silence' packets will still be sent.

4.2 Wireless Wide Area Network (WWAN) Network Best Practices

1. Do not connect your laptop to the WWAN router when streaming video from the OnSight Device. The laptop may consume available bandwidth resulting in less available bandwidth for the OnSight Device.
2. Use an external antenna for the WWAN router if available. Contact the WWAN router vendor for more information.

4.3 WWAN Router (Access Point) Location

The placement of the WWAN Router is important when trying to get the best possible connection to the local cellular service tower. Placement should consider both the cell tower connection and the 802.11 wireless connection to the OnSight Device.

1. Outdoors: place the WWAN router away from any large structures.
2. Indoors: place the WWAN router close to a window to improve cellular reception.

***Never place the WWAN router in a basement or inside a metal enclosure.

3. Operate the OnSight Device within 50 feet of the WWAN router with clear line of sight to the device. Obstructions will diminish this range. (Note: the 802.11 wireless range of the WWAN may not be limited to 50 feet; however this guideline will ensure a good connection when operating the device.)
4. Elevate the WWAN router off the floor or ground.

4.4 Using a Cell Phone for Audio

When using an Onsight Rugged Smart Camera (2500n) in areas with very poor cellular coverage you may restrict the Onsight Device to video-only, and use a separate cell phone with a Bluetooth headset to speak to the Onsight participant over a conventional telephone connection. Mute the Onsight Device microphone if using a cell phone for audio using the Mic Mute button. See Configuration\Audio – enable ‘use Voice Silence Suppression’.

When using Onsight Connect for Smartphones (iOS or Android) the software has a feature called ‘Call Continuity’. This allows you to make a cellular phone call and then start an Onsight Video session without interrupting the cellular phone call. You may continue talking over your cellular phone call while streaming video over Onsight Connect. Audio will not be available to the Onsight Connect call while using Call Continuity.

Interference & Signal Strength

2.4GHz home telephones or microwave ovens can interfere with the 802.11b/g connection between the Onsight Device and the WWAN Router. Avoid operating the WWAN router in the proximity of these devices or use 802.11n.

The 802.11 wireless signal strength can be affected by structures such as walls, steel beams, etc. The placement of the WWAN router should be such that it is line of sight with the Onsight Device to optimize signal strength.

Placement of the WWAN router should be such that obstructions are minimized. When connecting from inside a building try to stay close to windows.

5. Appendix

5.5 Bandwidth – Hard and Soft Limit

Hard Limit and Soft Limit control the way the Target Video Bitrate is managed when streaming from the device. When Hard Limit is selected the Video Bitrate will not be allowed to exceed the set value and the frame rate will be reduced in order to stay below the set Target Video Bitrate. When Soft Limit is selected, the Video Bitrate will be maintained in a Best Effort fashion however the set Bitrate may be exceeded in order to maintain the set Resolution, Frame rate and the GOP size.

5.6 Group of Pictures - GOP

- GOP is a video encoding structure used to increase efficiency when sending video over a network.
- Video is a series of images sent at a particular frame rate e.g. 10 fps
- GOP allows partial images to be sent rather than full images for each frame sent.
- GOP uses the terms I-Frame and P-Frame to distinguish between full images and partial images.
- Imagine rather than sending a full jpeg image (Intra-coded Frame, I-Frame) for each frame that you are sending only part of the image (Predicted Frame, P-Frame) for a frame being sent. What part of the image is sent? You’re sending only the part of the image that changed from the previous full frame that was sent.

E.g. For a GOP of 4 the frame sequence would look like: I, P, P, P, I, P, P, P, I, P, P, P. Here the I-Frame is followed by 3 P-Frames.

What impact does losing the I-Frame packet have during streaming?

The I-Frame contains the full image data for the video frame being displayed. When an I-Frame packet is lost on the network the video stream must wait for the next complete I-Frame to arrive before it can update the image on the screen. The amount of time before the next I-Frame arrives can cause the video to freeze on the display.

What impact does adjusting GOP have on Image Quality?

In General:

- The lower the GOP, the more I-Frames will be sent and therefore the network bandwidth efficiency will be **reduced**. The Image Quality will be poorer on a stable network but may be better on a lossy network. **Thus, lower GOP should be considered when operating on unreliable networks. The result is a more robust* video stream at the expense of video detail.**
- The higher the GOP, the less I-Frames will be sent and therefore the network bandwidth efficiency will be **greater**. The Image Quality will be better on a stable network but may be poorer on a lossy network. **Thus, higher GOP should be considered when operating on reliable networks. The result is a less robust* video stream but the benefit is that image detail will be improved.**

*'Robust video stream' refers to the resiliency towards packet loss. The more robust, the less affected by packet loss.

How does Frame Rate and GOP impact Image Quality?

The combination of the Frame rate and the GOP setting can affect the video image quality dramatically on a low bandwidth network connection. For Example a frame rate of 3 fps in combination with a GOP of 30 would result in a video stream that is sending an I-frame once every 10 seconds.

$$\text{GOP/Frames per Second} = \text{frequency of I-frames in seconds}$$

E.g. GOP 30 / 3 fps = One I-Frame every 10 seconds

On an unreliable network, such as a WWAN (cellular) network, this could result in poor image quality at the receiving end e.g. OnSight Connect for PC. The loss of an I-Frame would result in video that would have long periods of frozen images, in the example given the periods could last at least 10 seconds. The video would not be updated until the next I-Frame is received. Lowering the GOP would decrease any periods of video freeze due to lost I-Frame packets.

In General:

- On an unreliable network, try to match the GOP with the Frame rate (fps) so that one I-Frame is received at an interval no greater than once every 2-3 seconds.
- On a reliable network a higher GOP can be used regardless of the set frame rate.
- If unsure of how to set GOP leave it set at 5. That is usually sufficient for most networks when packet loss is not excessive.

6. End User License Agreement

This software is licensed under the terms of an End User License Agreement (EULA). The latest version of which can be found at: <http://www.librestream.com/products/termsofuse.html>

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