Intel® RealSense™ SDK
Tools

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2 Introducing the SDK

The Intel® RealSense™ SDK is a library of pattern detection and recognition algorithm implementations exposed through standardized interfaces. The library aims at lowering barriers to using these algorithms and shifting the application developers' focus from coding the algorithm details to innovating on the usage of these algorithms for next generation human computer experience.

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Notice revision #20110804

This document describes the SDK tools, and their usages.

Notational Conventions

This SDK document uses the Calibri typeface for normal prose.

With the exception of section headings, captions and the table of contents, all code-related items appear in the Courier New typeface (`pxcStatus`).

Hyperlinks appear underlined in blue, such as pxcStatus.

This is a note that provides additional information to aid your understanding of the procedure or concept.

This is a tip that provides alternate methods or shortcuts.

This is a result statement which indicates what you can expect to see or happen after performing a step.

3 SDK Tools

The section describes tools for illustrating SDK features or diagnosis purposes.

Sample	Description
capture_viewer	This tool visualizes any color, depth, and audio streams from the input devices.
sdk_info	This tool shows essential SDK setup information for trouble shooting purposes.
Clip Editor	This tool visualizes and edits the SDK recorded files.
Privacy Notification	This tool monitors camera and microphone data access that might reveal personal identifiable information and save the data for user access.

3.1 Tool: capture_viewer

The `capture_viewer` tool visualizes color, depth, vertices, and audio streams from any input device. The tool presents a tree view of devices and their streams on the left panel as illustrated in Figure 1. Select any number of streams to the right panel for display by right clicking on the streams or by clicking the > button. Use the < button to remove streams from display. Use the `Start All` and `Stop All` buttons for starting and stopping display. The tool displays each stream in a separate window.

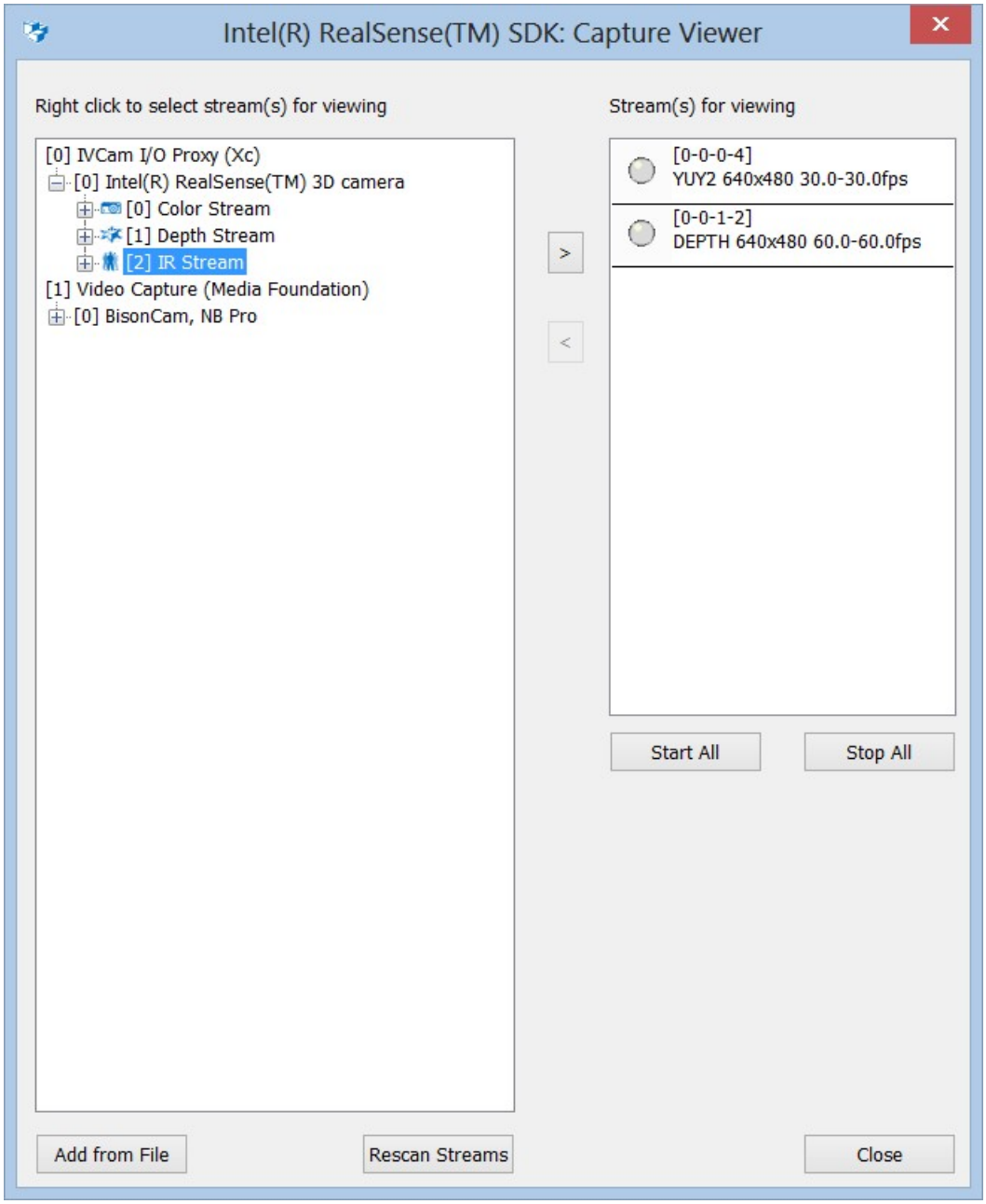


Figure 1: Tool capture_viewer

Use the `Add from File` button to add an existing recorded file or multiple files to the playback list, and then select certain streams in the files for playback.

If, for any reason, the device list changes, the application can use the `Rescan Streams` button to rescan the devices.

The following are specific actions available on depth streams:

- **F1**: X coordinates in color
- **F2**: Y coordinates in color
- **F3**: Z coordinates in color
- **F4**: Depth map
- **F5**: Depth map with edge detection
- **F7**: UV Map

2D and 3D Visualization

When visualizing a depth stream, you can right click and select the 2D viewer or the 3D viewer, as illustrated in Figure 2. The "`Start`" menu item starts a 2D viewer, and the "`Start 3D Viewer`" menu item starts a 3D viewer. See Figure 3 and Figure 4 for example screens. In the 3D visualization case, you can use the mouse to rotate the viewing angle.

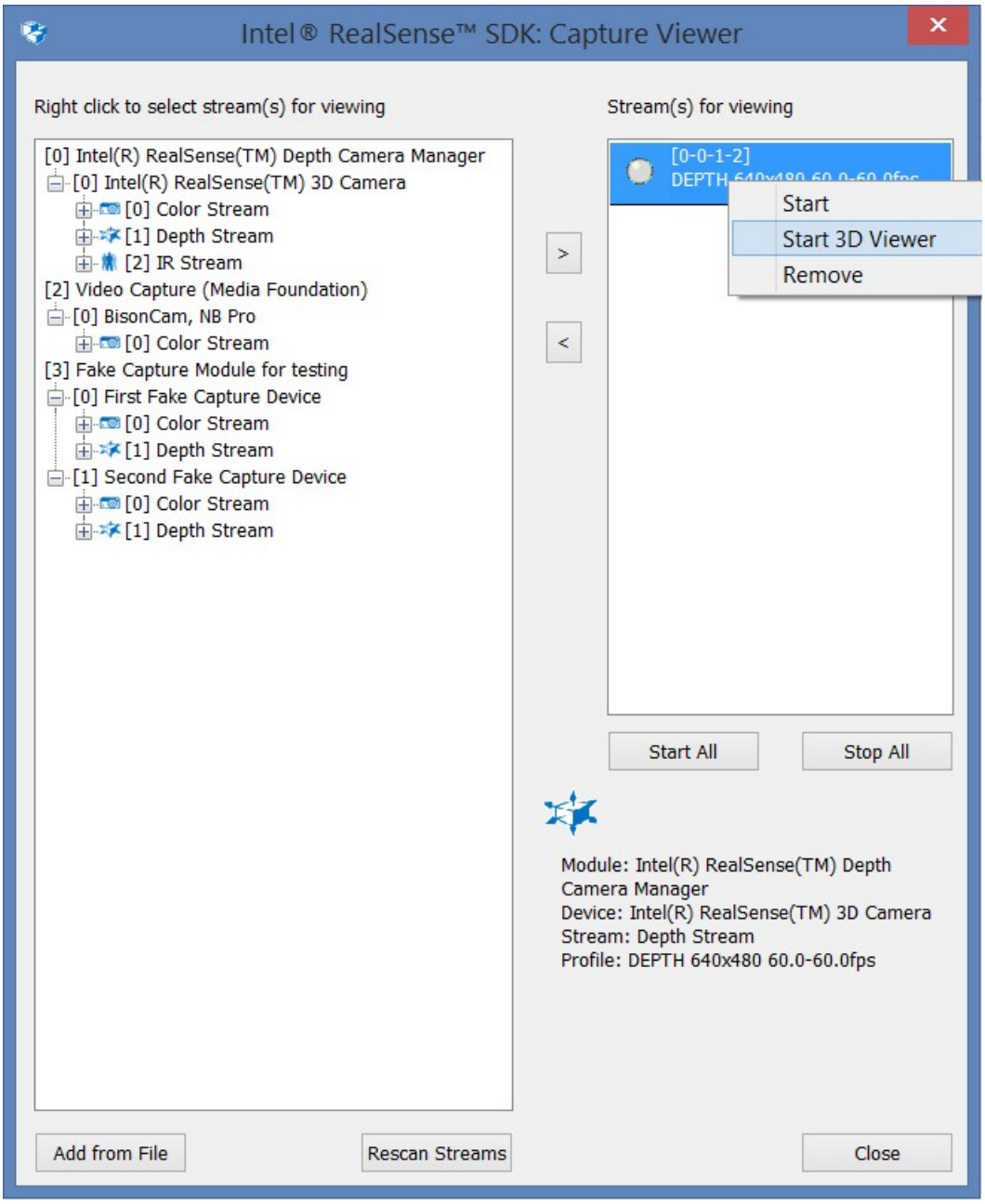


Figure 2: 2D/3D Viewer Selection

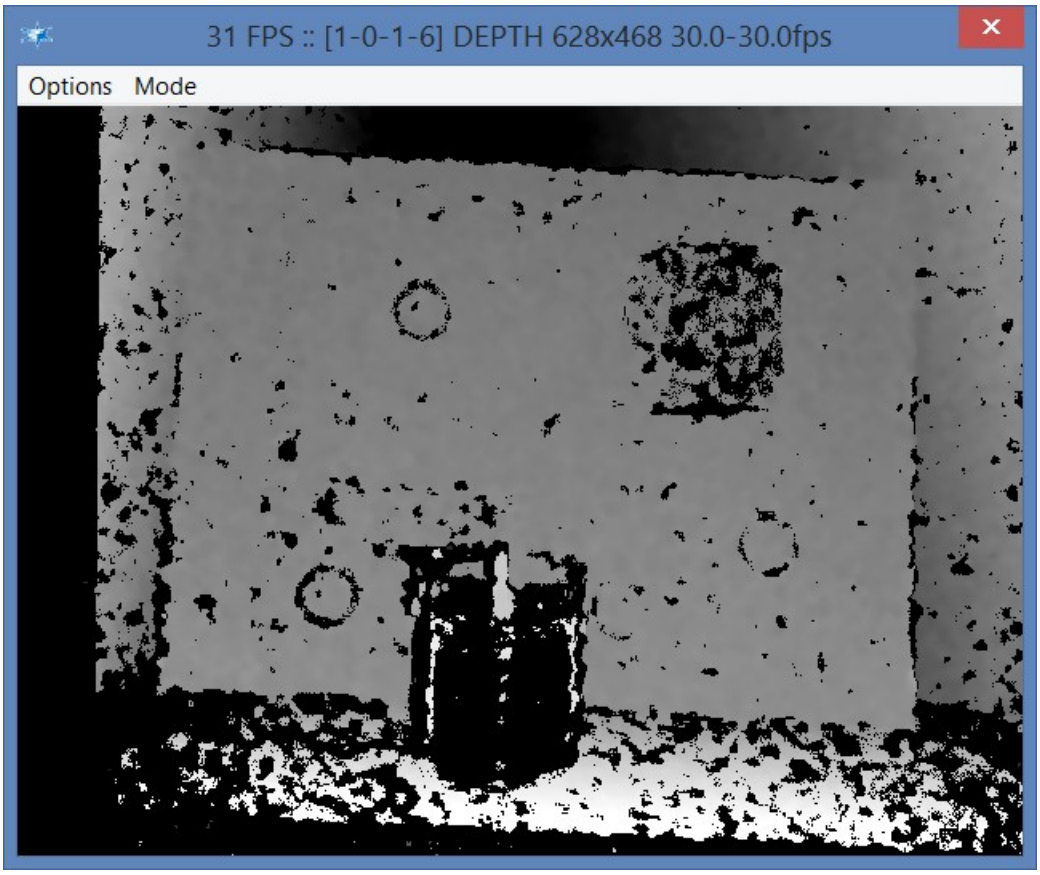


Figure 3: Depth Image 2D Visualization

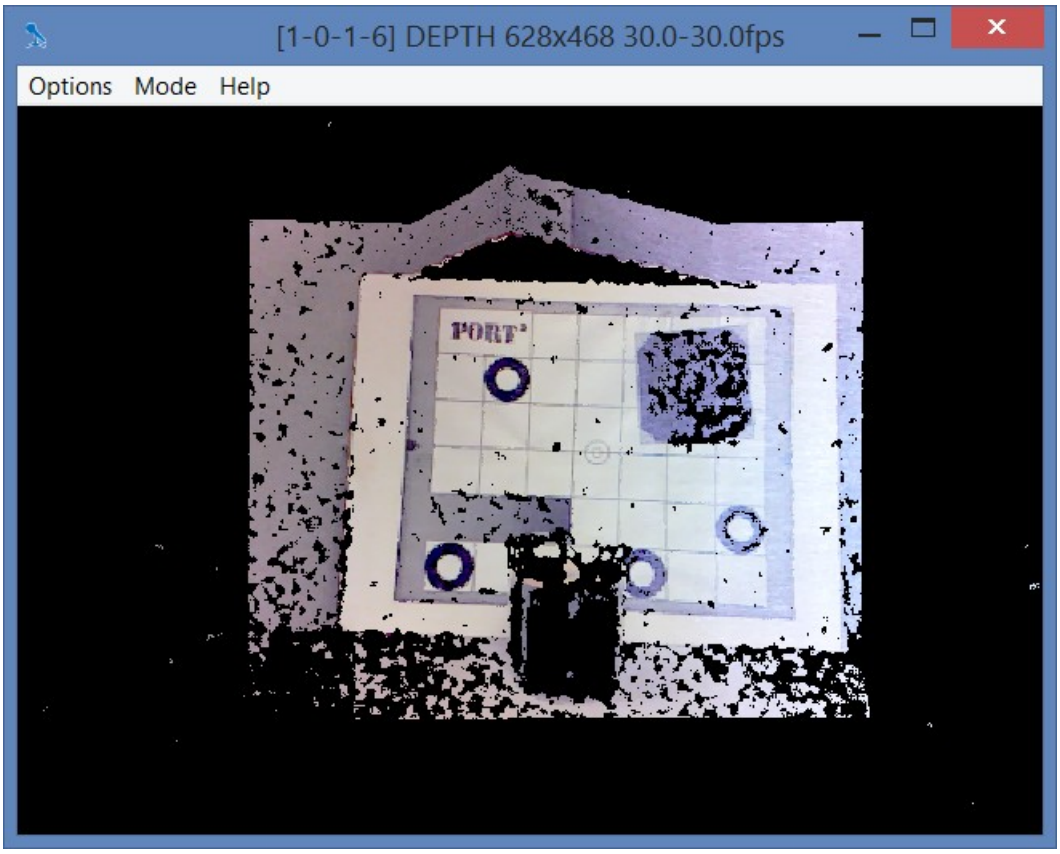


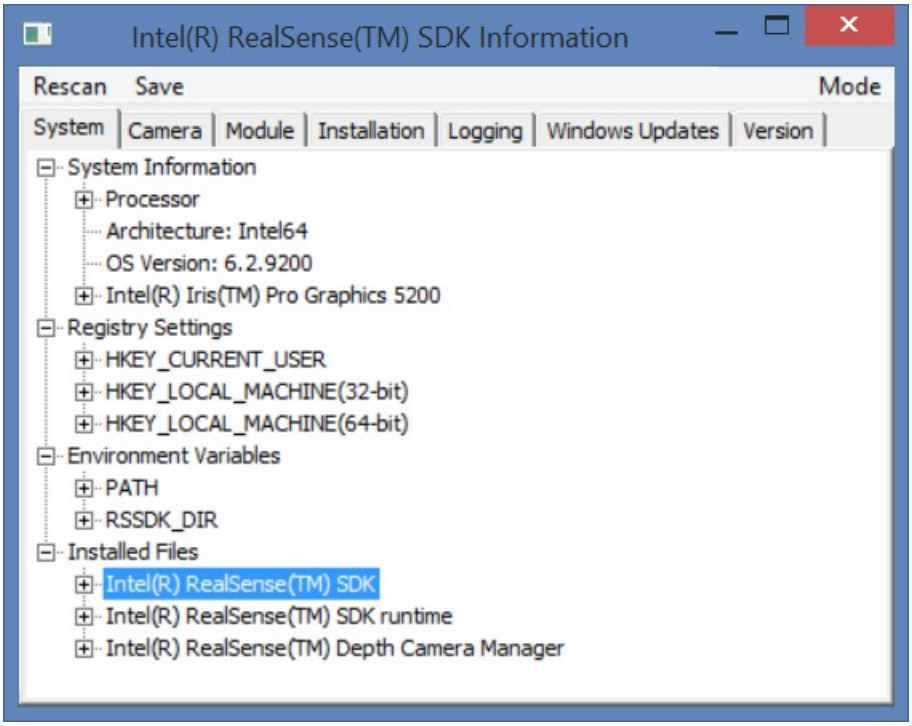
Figure 4: Depth Image 3D Visualization

3.2 Tool: sdk_info

The `sdk_info` tool displays the SDK setup information for trouble shooting purposes. You can review the SDK setup information on the local machine or save the information for remote diagnosis. The `sdk_info` tool organizes the setup information into multiple tabs as follows:

The System Tab

The **`System`** tab displays the system related information: OS, processor, graphic driver, registry settings, and environment variables etc.



System Information

Click on any line that has a plus icon in front to expand the line into more details. For example, expanding the `PATH` environment variable will show the value of the `PATH` environment variable. Similarly, click on any line that has a minus icon in front to close the details.

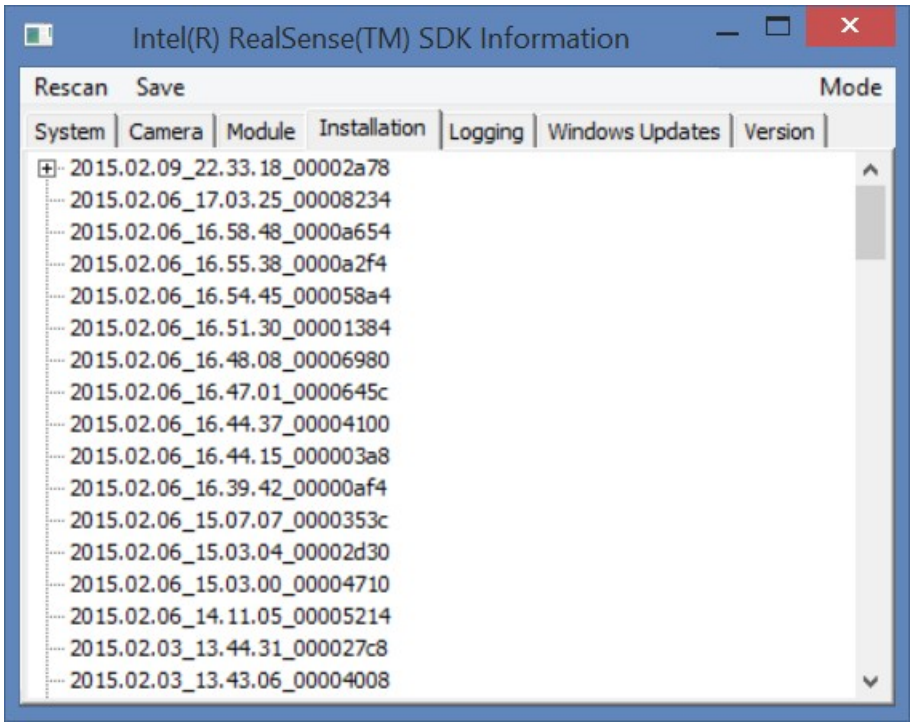
Click the `Mode` menu to select between the `Basic` mode or the `Advanced` mode. The `Advanced` mode lists a bit more debugging information: for

example, the list of all installed files.

Click the `Save` menu to save the information to a text file for remote diagnosis. The saved file includes information from all tabs.

The Installation Tab

The **`Installation`** tab shows the SDK installer logs. Multiple installer logs are named and ordered after their creation date and time. For example, the log `2015.02.09_22.33.18_00002a78` is an SDK installation at 10:33 pm on Sep 2nd, 2015.

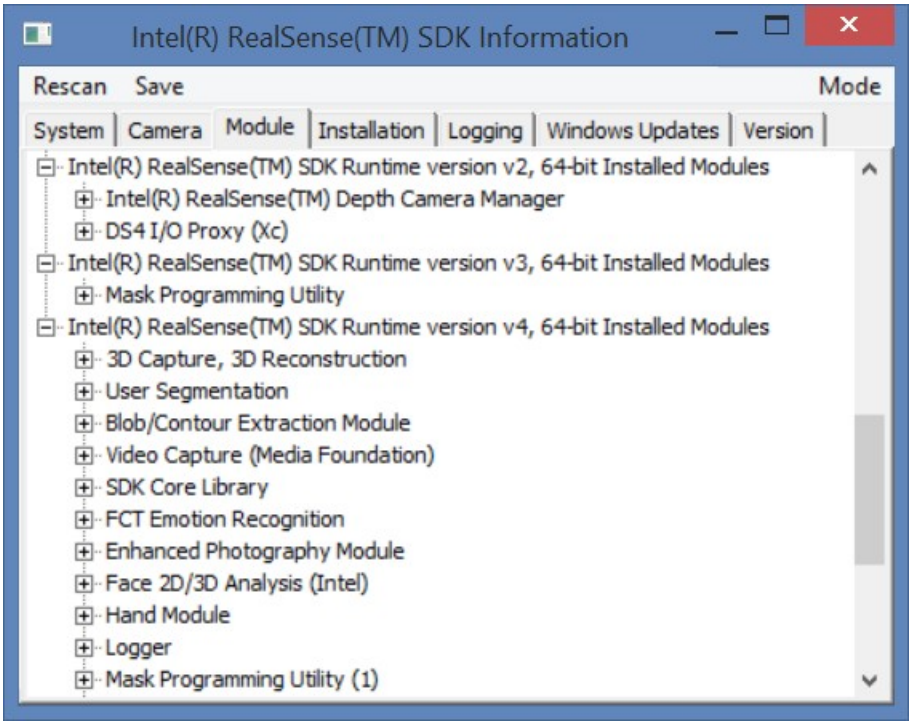


Installation Information

By default, the `sdk_info` tool shows the details of the most recent installation log. You can load and unload any installer log by right clicking on the line (which pops up a context menu) and then choose `Load`/ `Unload` in the

context menu.

The Module Tab



Module Information

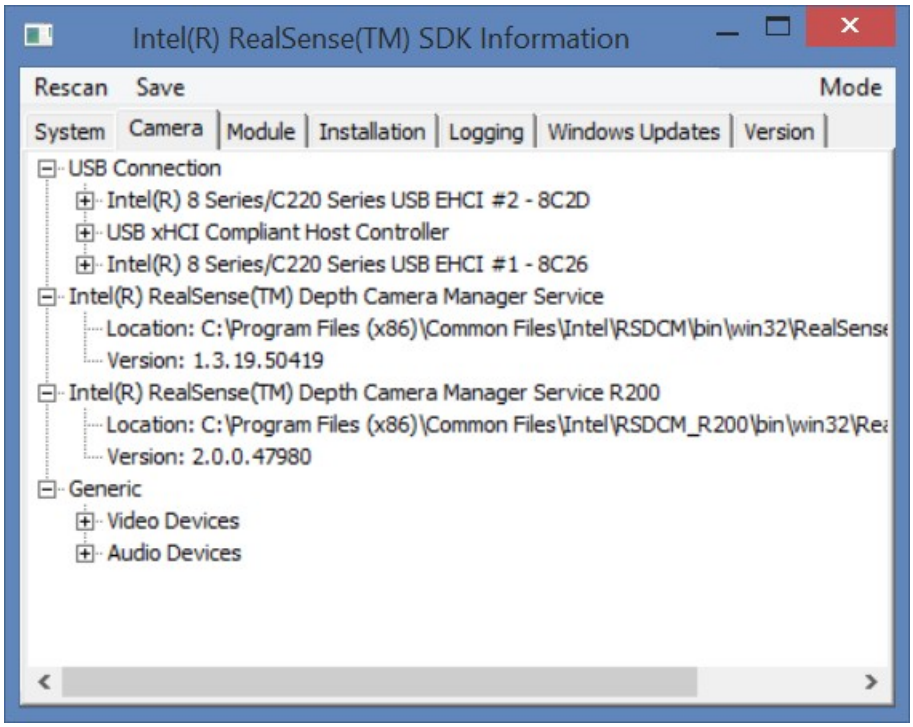
The **`Module`** tab shows the details of installed SDK runtime libraries. Click on each line to review the details of each module installation.

Click on the `Mode` menu to select between the `Basic` mode and `Advanced` mode. The `Basic` mode lists all installed module names, while the `Advanced` mode additionally shows the module descriptor details.

The Camera Tab

The `Camera` tab shows the following information about any cameras on the system:

- **USB Connection Topology**: The data includes the USB controllers, hubs, and devices on the system, and how they are connected to the system.
- **Intel® RealSense™ 3D Camera**: The data includes the 3D camera, model F200, as well as the `Depth Camera Management` (DCM) service information.
- **Intel® RealSense™ 3D Camera R200**: The data includes the 3D camera, model R200, as well as the `Depth Camera Management` (DCM) service information.
- **Generic Audio and video Devices**: The data includes a scanning of all audio and video

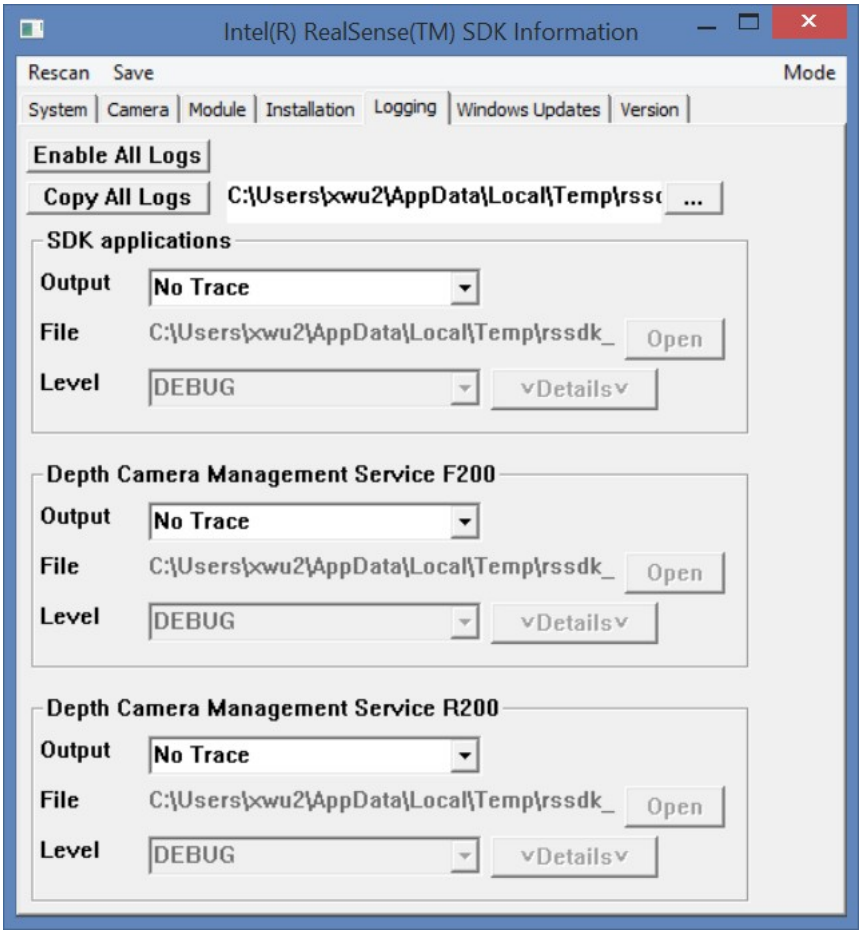


Camera Information

devices on the system.

Click the `Rescan` menu to rescan the USB bus if a device is newly plugged into the system.

The Logging Tab



Logging Control

The **`Logging`** tab configures the SDK logging and tracing feature. You must run the `sdk_info` tool with the administrator privilege to show this tab.

Complete the following steps to enable the SDK logging feature:

1. Run the sdk_info tool with the administrator privilege.
2. Click on the **`Logging`** tab.
3. There are multiple sections of configurations for different SDK components: SDK application and the DCM services. Set the logging destination using the `Output` selection box and the logging level using

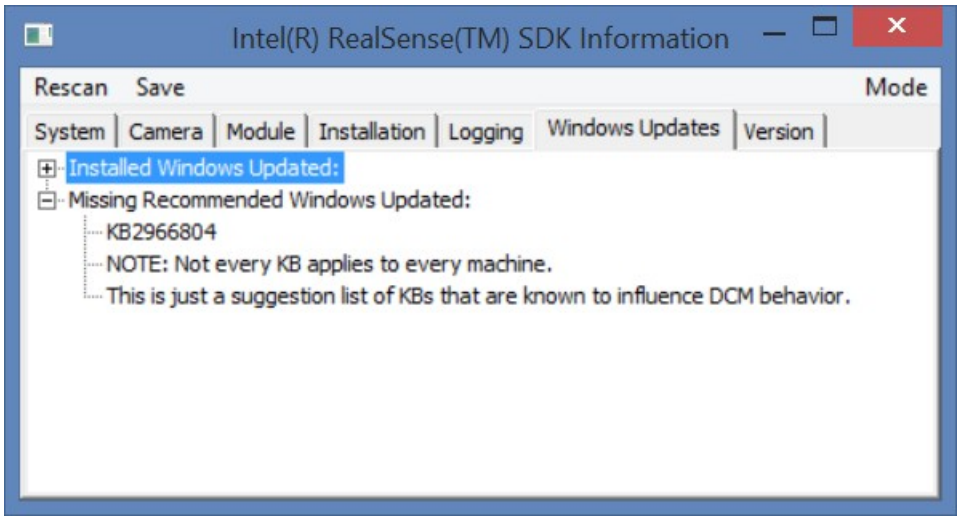
the `Level` selection, in the respective SDK component section.

It is not recommended to log to a file or log realtime to `DebugView`. Doing so slows down the SDK application or the system significantly.

4. Run the SDK application. The SDK sends the logging information to the specified destination at the specified level.
5. Reset the logging configuration or simply close the `sdk_info` tool to disable the logging feature.

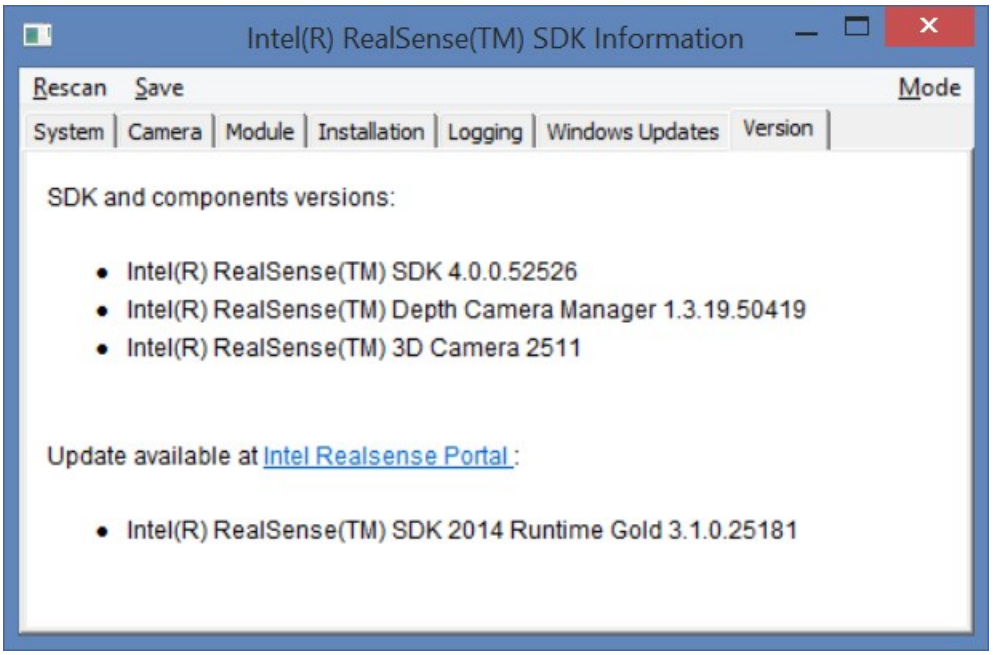
The Windows Update Tab

The **`Windows Update`** tab lists the installed windows updates on the system as well as suggested ones.



Windows Updates Information

The Version Tab



Version Information

The **`Version`** tab lists the SDK installed components and their versions. The tab also shows any available updates and the corresponding URLs. You can click on the URLs to get the updates.

3.3 Tool: ClipEditor

The `ClipEditor` tool analyzes, visualizes and edits SDK recorded files. To start working with a recorded file, use the `File->Open` menu option and select the file.

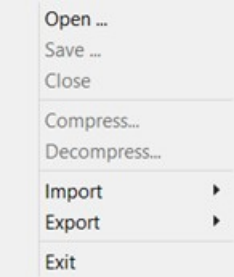


Figure 5: The ClipEditor File Menu

This file menu (see Figure 5) provides the following operations:

- **Open** – Open an SDK recorded file.
- **Close** – Close the currently opened file. The tool prompts if there are unsaved changes.
- **Save** – Save the stream(s) to a new file. You can choose the stream(s) in a stream selection dialog, as shown in Figure 6.

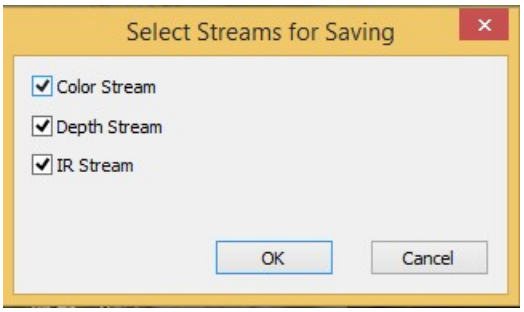


Figure 6: Stream Selection Window

- **Compress** – Save all streams to a new file with compression.
- **Decompress** – Save all streams to a new file without compression.
- **Import**
  - **From Image List** – Create new SDK recorded file from all frames in separate image files. The header (`header.bin`) and layout (`layout.txt`) are generated if not available.
- **Export**
  - **As Image List** – Extract all frames and service data to a set of image list.
  - **Current Frame** – Save the current frame to an image file.
- **Exit** – Exit the program. The tool will prompt if there are unsaved changes.

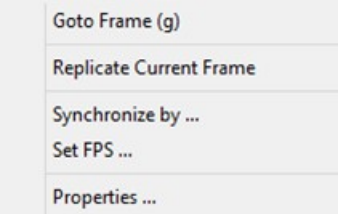


Figure 7: The ClipEditor Edit Menu

The Edit menu (see Figure 7) provides additional navigation and editing operations:

- **Goto Frame** – Jump to the specific frame position in current stream. You can use the keyboard shortcut 'g' to trigger this feature.
- **Replicate Current Frame** – Replicate currently selected frame several times and shift the timestamps to the right of the remaining frames in the stream. Replication options are selected through an additional dialog (see Figure 8):

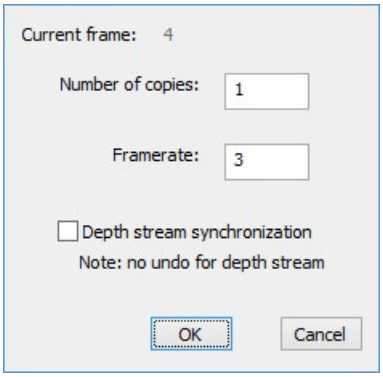


Figure 8: The Replicate Current Frame Dialog

  - **Current frame** – Shows the frame number of the frame that will be replicated.
  - **Number of copies** – Controls how many copies of the frame to insert.
  - **Framerate** – Sets the interval between timestamps of inserted frames.
  - **Depth stream synchronization** – Apply the replication operation to the depth stream also. This is useful to maintain synchronization in the remaining portion of the clip.
- **Synchronize by** – Select a master stream to synchronize the streams to. You can select the master stream in a dialog box, as shown in Figure 9. If you select the color stream as master, for each color frame, the tool finds the closest depth frame and sets to the same time stamp as the color frame. The tool may drop or duplicate certain depth frames. Otherwise, for each depth frame, the tool finds the closest color frame and sets to the same time stamp as the depth frame. The tool may drop or duplicate certain color frames.

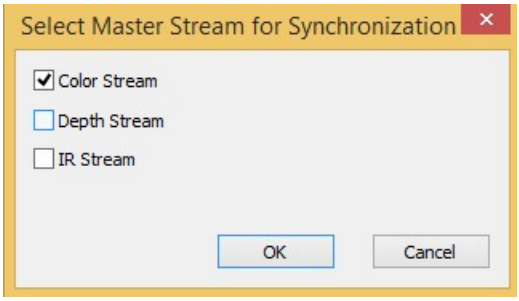


Figure 9: Master Stream Selection Dialog

- **Set FPS** – Replace the timestamps of the current stream frames to have constant time stamp difference based on the specified fps value.
- **Properties** – Show the properties for viewing or modification, as illustrated in Figure 10. You can perform the following operations:
  - **Load from XML**: Load the device properties from an XML file. See Table 1 for the XML file format.
  - **Save to XML**: Save the device properties to an XML file.
  - **Modify Property**: Modify the device property values.

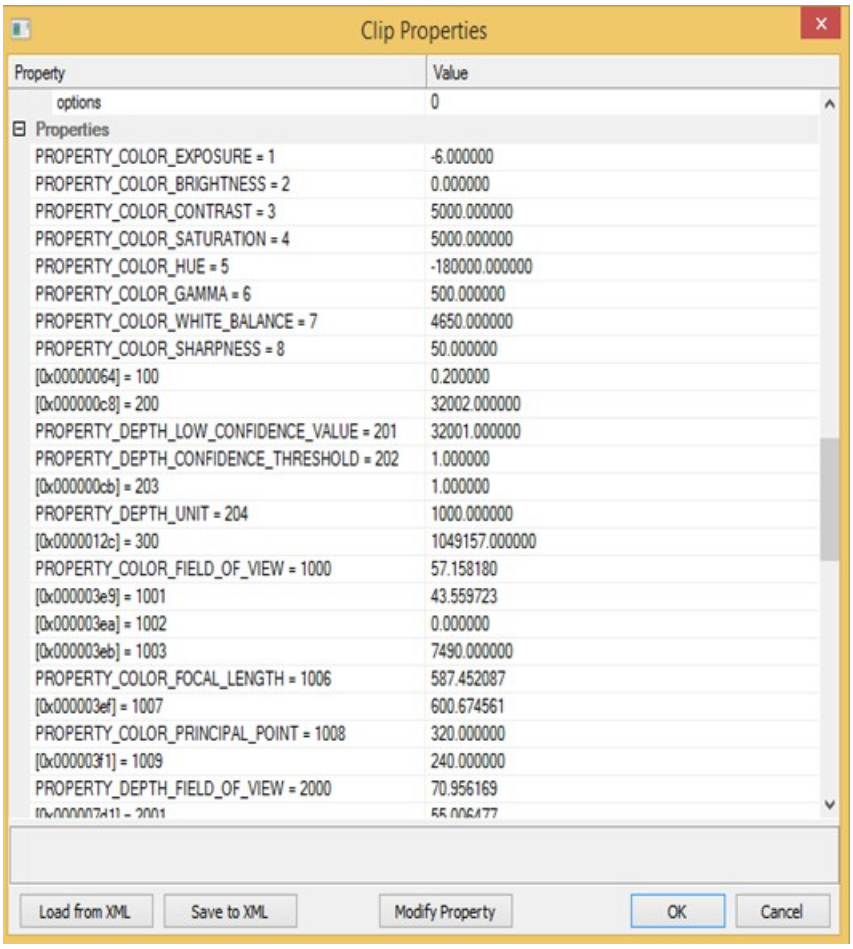


Figure 10 The Device Property Editing Window

```
<?xml version="1.0" encoding="utf-8"?>
<!-- This file contains a set of camera device properties for ClipEditor
-->
<SDKFormat>
  <Properties append="0">
    <!-- attribute "append" defines a type of properties' loading -->
    <!-- append=1 : all properties from the file will be ADDED to the list
-->
    <!-- append=0 : any existing list will be cleaned and filled with data
from the file -->
    <Prop name="PROPERTY_COLOR_EXPOSURE" label="1" value="15.625000"/>
    <!-- each string has 3 attributes and it describes one property:
name / label / value -->
    <Prop label="2" value="55.000000"/>
    <!-- attribute "name" can be skipped -->
    ...
    <Prop name="PROPERTY_DEPTH_UNIT" label="204" value="31.250000"/>
    <!-- if a property is in the list, it will be changed to new value -->
    <!-- otherwise, new property will be added to the list -->
  </Properties>
</SDKFormat>
```

Table 1: The Device Property XML File Format

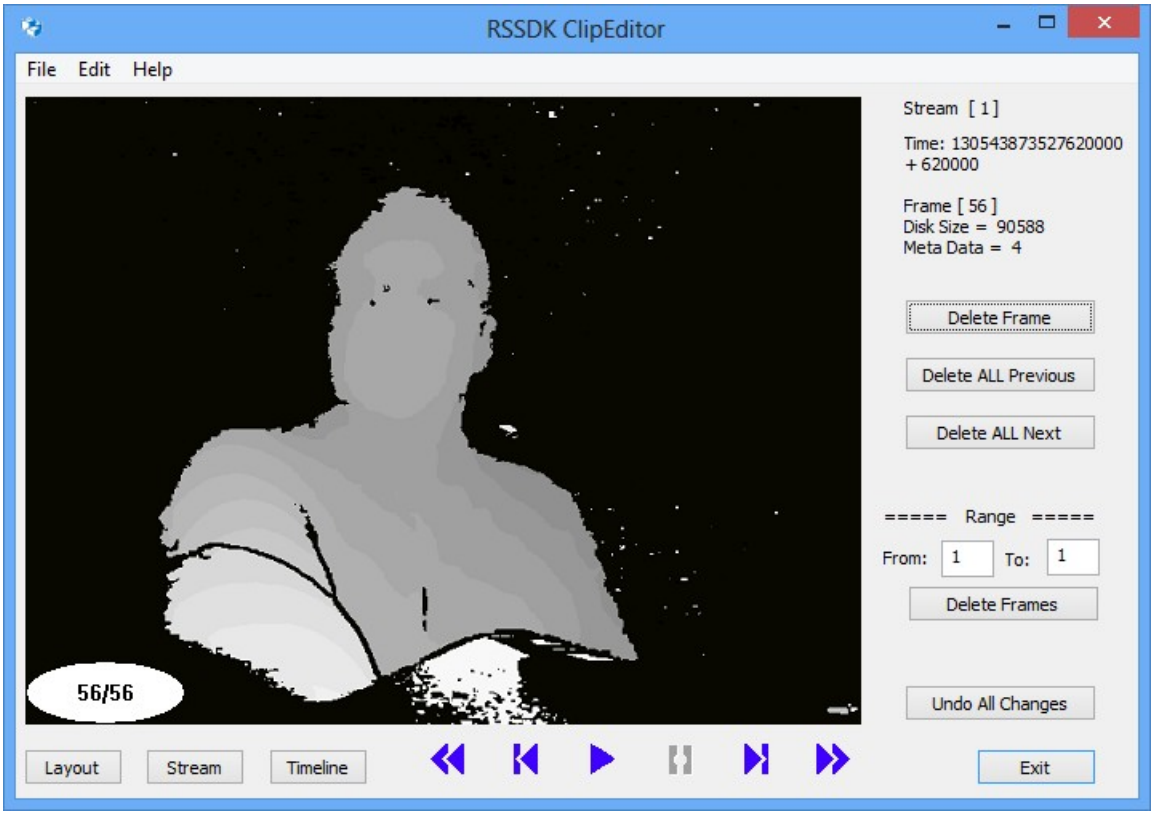


Figure 11 The ClipEditor Main Window

The main screen (see Figure 11) visualizes the current stream and provides navigation and edit options. The stream can be displayed in the playback mode or in the step-by-step mode. The frame display window at the upper left corner shows the current frame of the current stream with the overlaid zero-based frame number and 1-based frame position in the stream (4/30 in Figure 11).

The navigation panel below the display window has the following control elements:

- **Jump** to the first frame in the stream.
- **Step** one frame back.
- **Play**. (Enter the playback mode.)
- **Pause**. (Enter the step-by-step mode.)
- **Step** one frame forward.
- **Jump** to the last frame in the stream.

At the upper right corner, some additional frame information is displayed:

- The stream index.
- The time stamp of the frame in microseconds.

- The time stamp difference with between the previous and next frames.
- The frame index (1-based).
- The number of frames (of the current stream) in the recorded file.

The right panel provides stream editing options:

- **Delete Frame** – Remove the current frame from the stream; the timestamps of any remaining frames remain unchanged.
- **Delete ALL Previous** – Remove all frames prior to the current frame.
- **Delete ALL Next** – Remove all frames after the current frame.
- **Delete Frames** – Remove a range of frames.
- **Undo All Changes** – Cancel the changes and restore the original stream structure.

The buttons at the lower left corner enables additional operations:

- The **Layout** button displays the stream structure (see Figure 12) either in the file order (how frames are stored on the disk) or the time order (based on the time stamp information). The displayed numbers are correspond to the stream index of each frame.

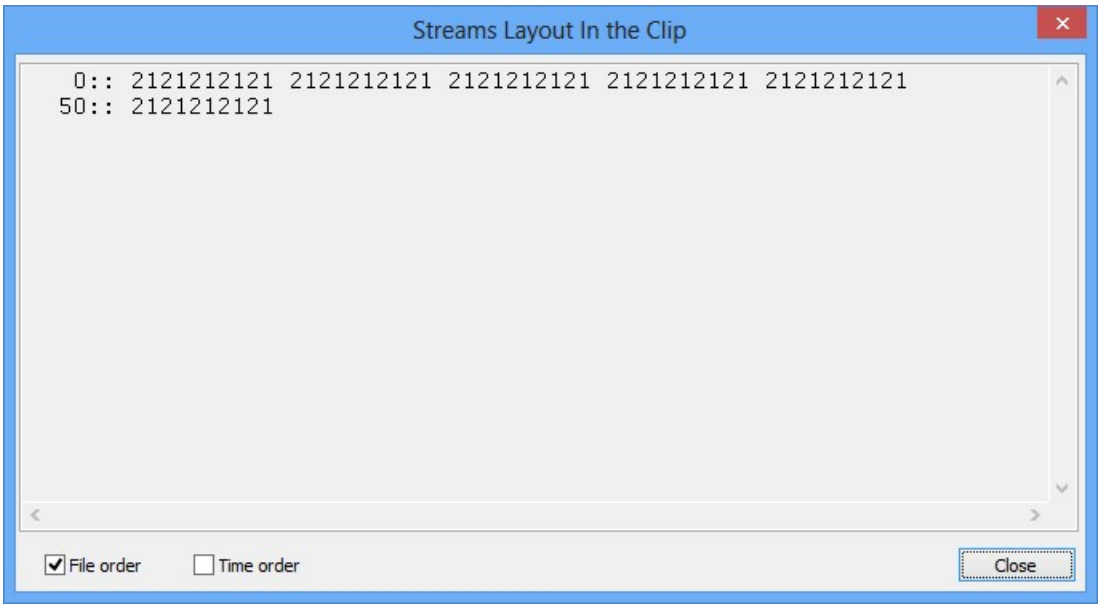


Figure 12: The Stream Layout Information

- The **Stream** button shows additional file information (see Figure 13) and selects the current stream for display and editing.

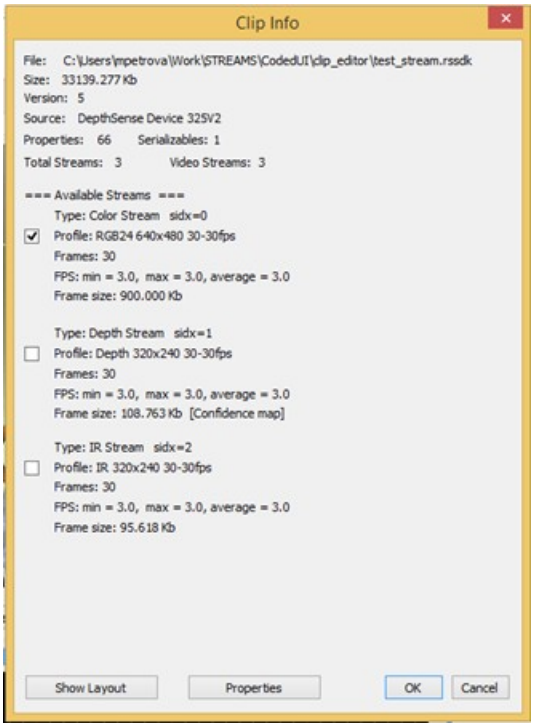


Figure 13: The Stream Header Information

- The **TimeLine** button shows the time line distance among the frames, as illustrated in Figure 14. The green line is the average frame rate of the stream and the yellow line is the instant frame rate of each frame.

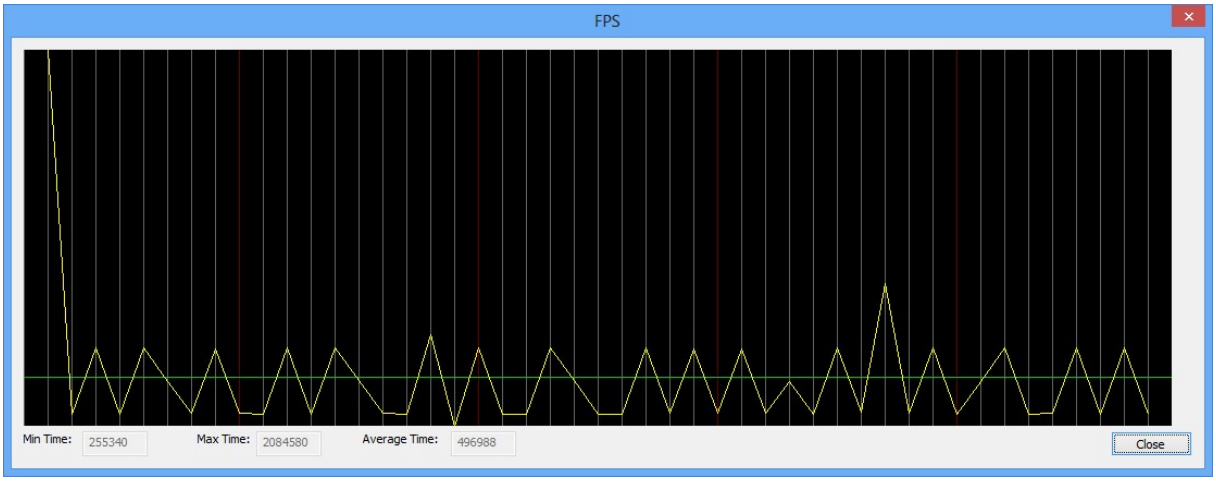


Figure 14: The Time Line Information