Release Notes

Intel® RealSense™ SDK Gold R1 Release

SDK version 3.1.0.85181

This release notes covers Intel® RealSense™ SDK for use with Intel® RealSense™ 3D Camera, code named Bell Cliffs. Please review the **"Intel RealSense SDK License.rtf"** for licensing terms. Please refer to attributions.rtf for third party attributions and third_party_programs.txt for third party licenses.

This SDK bundles the DCM version 1.2.14.24922.

IMPORTANT! PLEASE READ!

- This release supports **the Bell Cliffs PRQ camera only. Creative* Senz3D* Camera is not supported.**
- The Bell Cliffs PRQ camera **requires USB3, and must be connected to a dedicated USB3 port** within the client system (**do not use a hub**). **Any peripherals must also be directly plugged into a dedicated port**. Even with this configuration, USB Audio devices may experience issues.
- If installer requests that you reboot, **please reboot**, or your system will not install correctly.
- Microsoft* **Windows* 8.1 x64 August Update required**. The Bell Cliffs Camera will not work on Windows 7.

SDK Features:

Please note that SDK features are at various levels of maturity in this release as follows:

Maturity	Feature
Gold	SDK essential interfaces and color/depth/IR data streaming. Face Tracking Hand Tracking Speech Recognition and Synthesis Unity* Toolkit
Beta	Object Tracking Background Segmentation Touchless Controller
Alpha	Browser Support
Experimental	Emotion Recognition Java* language and Processing* framework support

- **Gold Features:**
  - SDK essential interfaces:
    - Session management
    - SenseManager pipeline programming
    - File recording and playback
  - Color and Depth Streaming:
    - Read color (YUY2), depth and IR samples from the camera.

        - Map coordinates among color, depth coordinates, and world coordinates.
        - **New:** Recording/playing back device property changes.
        - Bug Fixes:
            - AcquireFrame freezes when pulsing all module processings.
    - Depth Camera Manager
        - Intel RealSense Depth Camera Manager Service - The camera service is a Microsoft* Windows* based service that runs on the client machine. The camera service allows multiple Intel RealSense SDK applications and a single non SDK application to access data from the camera simultaneously, without blocking each other.
        - Intel RealSense 3D Camera Virtual Driver - The camera virtual driver is a Microsoft Windows based AVStream driver that runs on the client machine. The camera virtual driver allows non-SDK application to access camera streams as if they are connecting directly to the camera and without blocking other SDK applications.
    - Face Tracking:
        - **Fixed bugs from Beta**
            - Power and performance reduced below PRD requirements for HSW-U and BDW-U platforms
            - Fixed alerts system and accuracy, mainly false alarms
            - significant improvements in expressions (open mouth and smile)
            - improvements in landmarks robustness for wider angles and for different skin tones
            - improved face detection stability and robustness for all angles yaw, roll and pitch
            - fixed heuristics and number of faces configuration for the face module
        - **New:** The Unity* AVATAR Animation sample. Requires Unity Pro v3.4.3.
    - Hand Tracking:
        -
        - **Fixed bugs from Beta**
            - Power and performance reduced by 50%, now running at 60fps on HSW-U and BDW-U platforms
            - Fixed false hand recognition / ghost hands
            - Fixed skeleton jumping to the forearm
            - Fixed skeleton jitter/drift
            - *QueryOpenness* now works without calling *EnableSegmentationImage*
            - *EnableJointSpeed* now works in milliseconds instead of seconds
            - Improved accuracy for all gestures
            - Gesture callback only calls once when using *OnFireGesture*
            - Finger foldedness now supports continuous values (0-100)
            - Added an option in hands_viewer sample to select a specific gesture
            - Added an option to in mask_utils sample to set the number of blobs
    - Speech Recognition and Synthesis:
        - Command And Control
        - Dictation
        - Text To Speech
        - Support for US English, British English, Latin American Spanish, and Portuguese.

        - Note: Due to large size, speech redistributables will be provided as a separate installer (web or bundled), which will be available on the Intel® RealSense™ Technology developer website in the next few weeks.
    - Support for Unity* ToolKit:
        - Scripts and prefabs for easy game development for all RealSense capabilities such as face tracking, hand tracking, object tracking and speech recognition.
        - Samples included to illustrate the use of the scripts and prefabs.
        - **New:** Blob detection and tracking support ("Contour mode") – detect a blob at a specific area in front of the camera and track it
        - **New:** Smoothing utility available directly from the Inspector for selected Actions
        - **New:** 3D segmentation support and dedicated prefab added
        - **New:** several Prefabs for hand and face tracking
        - **New:** Hand openness rules
        - Bug fixes:
            - Virtual Box can be fixed at the Game Object Center, World Center, Another reference object center or custom values.
            - Better and more reliable interactions for Translate, Rotate and Scale.
            - Better AR support
            - IR image support
            - RGB resolution dropdown box is available at the SenseToolkitManager script (prefab).
- **Beta Features:**
    - Object Tracking:
        - RGB+Depth marker-less tracking for 2D objects.
        - Edge-based 3D object tracking.
        - ToolBox: Camera Calibration, creation of object model and configuration files for 3d feature based and edge based tracking
        - Instant 3D tracking (SLAM) feature to create a map of the scene and start tracking automatically.
        - **New:** Extensible learning mode for 2D/3D tracking.
    - 3D Background Segmentation:
        - Segments the user from the background, ie removes background.
        - Bug Fixes:
            - Better segmentation on various environments
            - Improved hair segmentation
            - Better jitteriness
            - Better performance and power consumption.
            - User can be very close to the background (even 20 cm)
            - Better stability
            - Improved fingers segmentation
            - User notification by fade out when user is too close / too far
    - Touchless Controller
        - Control windows UI with hand gestures.
        - Map user behaviors to UI events, supporting nativation and selection, scrolling, zooming, going to start menu, backing, edge scrolling.
- **Alpha Features:**

- Support for web browsers via JavaScript*:
  - Supports Hand, Face Tracking, and Speech Recognition.
- Support for Unity C# (web player platform):
  - Run SDK game applications in web browsers.

- **Experimental Features:**
  - Emotient* Emotion Detection:
    - Support primary emotions: Anger, contempt, disgust, fear, joy, sadness, and surprise
    - Support sentiments: Positive, negative, and neutral
  - Java*/Processing*:
    - Support Java language programming. Used under the JDK environment or under the Processing framework.

Hardware Requirements:

- 4th Generation Intel® Core™ Processor (code name Haswell), or later. Core i5/i7 recommended.
- 8 GB free hard disk space
- The Intel RealSense 3D Camera
  - PRQ hardware version with firmware 2.38.05 or above.
  - The Intel RealSense 3D Camera may have known defects and errata which will be provided with the product.
- A free USB 3 port for the Intel RealSense 3D Camera.

  IMPORTANT NOTE: To support the bandwidth needed by the camera, a **USB3** interface is required. This interface must be connected to a **dedicated** USB3 port within the client system (do not use a hub).

Software Requirements:

- Microsoft **Windows 8.1 x64 August Update** operating system
- Microsoft Visual Studio* 2010-2013 with the latest service pack or update
- Microsoft .NET* 4.0 Framework for C# development
- Unity Pro 4.1.0 or later for Unity game development
- One of the following browsers for JavaScript* development
  - Microsoft Internet Explorer* 10.0.13 or later for Javascript development
  - Google* Chrome* 33.0.1750.146 or later for Javascript development
  - Mozilla* Firefox* 27.0.1 for Javascript development
- Processing* 2.1.2 or higher for Processing development
- Java* JDK 1.7.0_11 or higher for Java development

Installation steps for SDK Gold – This is for developer systems ONLY:

- Remove any previous SDK or DCM packages. Cleanup the destination directory if needed. **Reboot your computer to allow a complete uninstallation.**
- **Run the SDK off-line installer (**intel_rs_sdk_offline_package_r_3.1.0.85181.exe) **Reboot your computer again.**

API Changes:

- SDK Gold 84596:
  - The PXC[M]SenseManager made the following changes:
    - **New:** OnStatus is invoked upon module issued warnings.
  - The PXC[M]Capture interface made the following changes:
    - **New:** Added StreamOption. Corresponding changes in PXC[M]VideoModule.
    - **New:** QueryIVCAMAccuracyDefaultValue
    - **New:** QueryColorPowerLineFrequencyDefaultValue
  - The PXC[M]HandConfiguration interface made the following changes:
    - **New:** SetSmoothingValue
    - **New:** QuerySmoothingValue
    - Removed QueryDistanceUnit, marked as Deprecated since alpha.
    - Removed SetDistanceUnit, marked as Deprecated since alpha.
  - The PXC[M]BlobExtractor/PXC[M]ContourExtractor interfaces made the following changes:
    - ProcessImage takes the PXC[M]Image instance at input, instead of ImageData.
    - QueryBlobData takes the application allocated PXC[M]Image instance at input, instead of ImageData.
  - The PXC[M]FaceData interface made the following changes:
    - **New:** Added new facial expression EXPRESSION_TONGUE_OUT
    - **New:** Added UnregisterUserById under the RecognitionModuleData interface.
  - The PXC[M]SpeechRecognition/PXC[M]SpeechSynthesis interface made the following changes:
    - **New:** Added the language enumeration LANGUAGE_LA_SPANISH.
  - The PXC[M]Tracker interface made the following changes:
    - Added the extensible argument to the tracking setup functions.
    - Set3DInstantTrack added an optional argument to skip unstable incoming frames.
- SDK Beta 73633:
  - The PXC[M]Capture interface made the following changes:
    - Deprecated SetDepthLowConfidenceValue.
    - Deprecated Query/SetDepthSaturationValue and QueryColorSensorRange.
    - Changed QueryDepthUnit return type from int to float for better accuracy.
    - Changed Query/SetColorBackLightCompensation to int (from bool) for additional modes.
    - **New:** QueryDepthFocalLengthMM to return the focal length in mm.
    - **New:** QueryXXXXInfo for all read/write device properties.
  - **New:** New pixel format PIXEL_FORMAT_Y8_IR_RELATIVE for relative I1-I0 IR.
  - **New:** The PXC[M]HandData interface added the QueryOpenness function.
  - **New:** blob, contour and data smoothing utility interfaces under include/utilities.
- SDK Alpha Hot-Fix 65110:
  - No Interface change.
  - The default camera mirror mode is now MIRROR_MODE_DISABLED.
- SDK Alpha 60111:
  - This is the first major SDK release with new interfaces.

Known Issue and Limitations:

- **SDK Core/SDK Framework:**

<table>
<tr><th>Issue</th><th>Recovery/Workaround</th></tr>
<tr><td>High CPU use / low FPS seen in varous scenerios, particularly when running multiple applications simultaneously</td><td>Will be addressed in future releases.</td></tr>
<tr><td>File recording on the 1920x1080 color stream may result in slow performance, frame skipping or out of memory crash in extreme cases.</td><td>Enable H.264 encoding for any HD resolution color stream recording and playback. See the reference manual for how to enable the H.264 stream compression. See the following table for reference:
<table>
<tr><td>Resolution</td><td>< 640x480</td><td>>640x480</td></tr>
<tr><td>Fast SSD</td><td>LZO* (default)</td><td>H.264</td></tr>
<tr><td>Hard disk</td><td>H.264</td><td>H.264</td></tr>
</table></td></tr>
<tr><td>sdk_info may not display the SDK version information or any updates if switching mode to advanced from the camera tab.</td><td>Avoid this sequence of operations:
1. Switch mode in the camera tab.
2. Go to the Update tab for SDK version information.</td></tr>
<tr><td>The following exact installation sequence results in unuseable SDK applications after the SDK developer package is uninstalled:
1. Install the SDK developer package on a clean machine.
2. Install any shipped SDK applications.
3. Uninstall the SDK developer package.
At this point, the SDK runtimes got uninstalled. The SDK applications do not work.
This issue does not occur if the SDK developer package and the shipped SDK applications are different in SDK versions.</td><td>Avoid installing the SDK developer package before any SDK applications. If there is any SDK application installed before the SDK developer package, the uninstallation of the SDK developer package does not impact any SDK application installed before or after.</td></tr>
<tr><td>The PXC[M]Projection::ProjectDepthToCamera returns wrong coordinates if the camera mirror mode is set to MIRROR_MODE_HORIZONTAL. The output camera coordinates are horizontally mirrored.</td><td>Revert the X values of the camera coordinates. The camera mirror mode affects only the 2D color and depth images and should not impact the camera coordinate system.</td></tr>
</table>

- **Face Detection, Pose Detection and Landmark Tracking:**

Issue	Recovery/Workaround
The camera mirror mode is unsupported.	Mirror images in the application, if needed.
Sporadic low confidence for landmarks a few frames after occlusions and fast movements	N/A.
The face recognition CPU utilization is higher than desired.	Disable face recognition when not really needed.
Some expressions are still in the alpha quality (especially brows and kiss).	Use the landmarks directly.

In face_tracking sample, with RealSense camera connected, 2D mode cannot be used	This will be addressed in an upcoming update
When working with 3D camera and requesting face to work in 2D mode Face still works in 3D mode only.	Support for Face in 2D mode will become available in a future update release.
C# face_tracking sample does not work in 2D mode even when a 2D camera is connected	Use the face_tracking C++ sample
In a scenario when one application is setting the camera profile (resolution, FPS etc.) to an unsupported configuration by Face, Face behavior is unexpected	Ensure camera profile is set to one of the supported Face configurations

- **Hand Tracking and Gesture Recognition:**

Issue	Recovery/Workaround
The gesture full hand pinch and fist gestures are similar in terms of user experience, and thus can clash.	Avoid using them in the same application context.
In a scenario when one application is setting the camera profile (resolution, FPS etc.) to an unsupported configuration by Hands, accuracy might be impacted	Ensure camera profile is set to one of the supported Hands configurations

- **Personify* 3D Background Segmentation:**

Issue	Recovery/Workaround
The module sporadically fails to segment when multiple users are in the camera FOV.	Leave a single user in camera FOV
Black headphones that the user wear aren't segmented properly	Will improve in future releases.
The module fails to segment dark long hair	With plain background in another color – hair is segmented better.
The module confuses black objects from background that are at the same camera eye level of the user's head.	Will improve in future releases.
Upon movement there is background trail due to temporal misalignment of the depth	Use SetIVCAMMotionRangeTradeoff to reduce motion blur as needed (tradeoff with FPS and with quality). Will improve in future releases
Black watches that the user wear aren't segmented	Will improve in future releases
Wearing certain materials black shirt leads to poor segmentation	Will improve in future releases
The C# sample reduces the module FPS significantly.	Use the C++ sample.
Background Segmentation fails to segment when the user touches the background	Get close to the camera / cover the camera and uncover
Background between fingers can be seen on certain backgrounds	Will improve in future releases
Wrong segmentation when user touches objects and then leaves FOV	Cover the camera and uncover
Small slice of user is not segmented in FOV right edge on certain resolutions	Move to center of FOV

The module doesn't work together with other RSSDK modules	Work with 3D Background Segmentation solely

- **Metaio Object Tracking:**

Issue	Recovery/Workaround
When the edge based 3D tracking from CAD models is enabled, the initial pose coordinate system is always on and considered as a detected object until the target object in the scene is detected. After that point the initial rendered coordinate system is replaced by the new detected coordinate system.	Will be fixed in the next releases.

- **Unity Toolkit:**

Issue	Recovery/Workaround
Editing Rules on multiple objects is currently not working	User must Edit each rule separately.
Continuous tracking option causes left/right hand confusion sometimes	Need to be used with care.
PointCloud mesh is 9th of the maximum depth resolution due to Unity's mesh limitation	N/A.
Tracking's orientation causes flip sometimes. (visually unpleasant)	
Working on AR mode (with "Sense AR" prefab) requires the game to be in a specific aspect ratio. Currently there is no automatic check and the objects are not falling at the right spot with respect to the RGB image	Set the game aspect ratio manually to 4:3.

- **Nuance Speech Recognition and Synthesis:**

Issue	Recovery/Workaround
The release does not include redistributable components for speech recognition and synthesis.	Due to large size, speech redistributables will be provided as a separate installer (web or bundled), which will be available on the RealSense developer website in the next few weeks. Contact your Intel rep if redistributables package is needed sooner.
Speech synthesis does not properly select the languages installed on the system.	Develop by installing a single language on the system. This issue will be fixed in the next release.

- **Frameworks Support (C#, Unity, Web support, Java and Processing):**

Issue	Recovery/Workaround
Sample Browser/Processing: The Processing sample does not run out of box. You need to set the sketch folder location in the Processing sample before running the sample.	Set the sketch folder location in the Processing Preferences to $(RSSDK_DIR)/framework/Processing.

Java: Advanced streaming through the PXCMCaptureManager interface does not work as designed. The function LocateStreams may return failed on valid stream requests.	Avoid using the LocateStreams function. Use PXCMSenseManager for color/depth streaming.

- **Touchless Controller:**

Issue	Recovery/Workaround
The Back gesture may not be recognized.	Will improve in future releases.
The Pinch gesture is intentionally ignored in the lower part of FOV.	Perform the gesture in the upper half of the FOV.

- **Depth Camera Manager**

Issue	Recovery
Windows update KB2919355 causes virtual driver to stop working. This is a known issue reported by Microsoft	Install KB2966804
Physical cameras are exposed to users: Intel(R) RealSense(TM) 3D Camera (Front F200) Depth Intel(R) RealSense(TM) 3D Camera (Front F200) RGB In addition to the virtual driver Intel(R) RealSense(TM) 3D Camera Virtual Driver Using either of the physical cameras can block SDK applications	Use virtual driver and not physical cameras. You may wish to implement Microsoft KB Article 2978137 to hide cameras for Windows Store applications.
Sporadic streaming failures on return from hibernate both over virtual driver and for SDK apps.	For SDK apps restart application. For virtual driver restart service.
UVMap is cut off in HVGA and QVGA Resolutions	Do not use UVMap in HVGA and QVGA
Uninstalling DCM while SDK applications are streaming may cause application to crash.	Close all SDK applications before uninstalling DCM.

  - Further details may be found in DCM release notes

Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

Notice revision #20110804