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# Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Description</th>
</tr>
</thead>
</table>
| December 2019 | 3.0      | 1.1.1 Supported Features on page 6: Updated Supported Features list.  
1.1.2 Improvements on page 6: Added topic.  
1.3 Known Issues on page 8: Removed note about changing the BIOS version.  
2.1.1.1 New in R3 Release on page 10: Updated section.  
2.1.1.2 Historical Features on page 10: Updated section.  
2.3 Fixed Issues on page 11: Added issues VVP0-511, VVP0-512, VVP0-528, VVP0-529, VVP0-530, and VVP0-540.  
2.4 Known Issues on page 11: Added issues VVP0-536 and VVP0-544 and removed issue VVP0-512.  
3.0 Host Side Software (Drivers and Apps) on page 13: Added topic.  
3.1 Introduction on page 13: Added topic.  
3.2 Release Content on page 13: Added topic.  
3.3 Features on page 13: Added topic.  
3.4 Fixed Issues - Host Side Software (Drivers and Apps) on page 14: Updated table for accuracy.  
3.5 Known Issues - Host Side Software (Drivers and Apps) on page 14: Updated table for accuracy. |
| October 2019  | 2.2      | 2.1 Introduction on page 9: Updated text for accuracy.                                                                                      |
| October 2019  | 2.1      | 2.1 Introduction on page 9: Updated Android Cloud Gaming Software Stack on VCAC-R (PDC) image for clarity.                                   |
| October 2019  | 2.0      | 1.1.3 New in This Release on page 7: Updated with new items for R2 release.  
1.3 Known Issues on page 8: Added note warning not to change the BIOS version.  
2.1.1 Supported in This Release on page 10: Reorganized section.  
2.1.1.1 New in R3 Release on page 10: Added section.  
2.1.1.2 Historical Features on page 10: Added section.  
2.3 Fixed Issues on page 11: Added topic.  
2.4 Known Issues on page 11: Added issues VVP0-490, VVP0-492, VVP0-507, and VVP0-512. |
| September 2019 | 1.2      | 1.3 Known Issues on page 8: Reformatted and updated Known Issues table.  
2.4 Known Issues on page 11: Reformatted Known Issues table.  
3.4 Fixed Issues - Host Side Software (Drivers and Apps) on page 14: Added topic.  
3.5 Known Issues - Host Side Software (Drivers and Apps) on page 14: Added issue VCASS-2857 and moved issue VCASS-1771 to Fixed Issues.  
5.0 Acronyms and Terms on page 17: Added HOST to Acronym table. |
| August 2019   | 1.1      | 1.1.1 Supported Features on page 6: Updated Supported Features list.  
1.2.1 Software List on page 7: Removed Frame Analyzer from Software List.  
3.5 Known Issues - Host Side Software (Drivers and Apps) on page 14: Updated Issue IDs. |
| August 2019   | 1.0      | Initial document version.                                                                                                                  |
1.0 Windows-Based Functionality

NOTE
This section of the Release Notes focuses on the Visual Cloud Accelerator Card - Rendering when running on a Windows-based platform.

1.1 Introduction

NOTE
This document provides a brief introduction to the Visual Cloud Accelerator Card - Rendering, lists known and fixed issues, and provides available workarounds. In addition, a list of important acronyms and terminology is provided. The content of this document will be updated as applicable and updates will be reflected in the Revision History.

Cloud gaming is a fast-grown use scenario. Intel® provides the reference solution to enable a server-client cloud gaming platform based on the GamingAnywhere open source project. This version is dedicated for Intel® server platforms to take advantage of Intel® hardware features.

Figure 1. Intel® Windows Cloud Gaming Software Stack
Intel® server platforms provide the possibility of high performance implementation of cloud gaming solutions. The intention of this release is to present to the community a reference solution which will leverage future projects in this area. As foundation of this project, the open source GamingAnywhere solution was chosen. For this foundation to run on Intel® server platforms, some improvements and changes have been made.

This document provides system requirements, issues and limitations, and legal information.

### 1.1.1 Supported Features

- Game streaming (video & audio) from server to the client.
- Enabled launching game mechanism from the Steam service.
- Game controller support.
- Network parameters configuration.
- Streamed video quality configuration.
- Latency measurement supported.
- Video speed (FPS) configuration.
- Supported API: DX11, DX9.
- Encoding H.264.
- Maximum acceptable video delay.
- Fullscreen/windowed screen.
- Video content dumping.

### 1.1.2 Improvements

- Added Intel based hooking mechanism.
- Problem with missing cursor textures on client.
- FFmpeg removed from distribution. Has to be configured by user.
- Added communication mechanism based on WebRTC.
- Changes in SDL library to improve mouse/controls functionality.
- Updated support for latest versions of libraries at this release time.
- Added support for Steam.
- Modified hand-shake of the client-server connection.
- IP address and port of server moved to the client configuration file.
- Added possibility to disable rendering on the server via server configuration file.
- Removed unused parts of code.
- Fixed general problems with stability and performance.
- Fixed some audio issues.
- Solution converted into Visual Studio 2017 IDE. Some internal configurations settings corrected.
1.1.3 New in This Release

1. Added support for DX9 and 32bit applications.
2. Added support for Vulkan. (See https://vulkan.lunarg.com/sdk/home#sdk/downloadConfirm/1.1.114.0/windows/VulkanSDK-1.1.114.0-Installer.exe to download and install Vulkan.)

1.2 Release Content

1.2.1 Software List

Table 1. Software List

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>GamingAnywhere core</td>
<td>Base project from github.</td>
</tr>
<tr>
<td>GPA (Graphics Performance Analyzer)</td>
<td>Implementation of the hooking mechanism and process injection.</td>
</tr>
<tr>
<td>SDL2</td>
<td>User interface components processing.</td>
</tr>
<tr>
<td>SDL2_ttf</td>
<td>Font processing.</td>
</tr>
<tr>
<td>LIVE555 Streaming Media</td>
<td>Communication mechanism.</td>
</tr>
<tr>
<td>DXGI Desktop Duplication</td>
<td>Mouse capture mechanism based on DXGI Desktop Duplication sample.</td>
</tr>
</tbody>
</table>

1.2.2 External Dependencies

- FFMPEG binaries(supported version 4.1.3):
  - Shared - https://ffmpeg.zeranoe.com/builds/win64/shared/ffmpeg-4.1.3-win64-shared.zip
  - Dev - https://ffmpeg.zeranoe.com/builds/win64/dev/ffmpeg-4.1.3-win64-dev.zip
- EasyHook binaries (supported version 2.7) - https://github.com/EasyHook/EasyHook/releases/tag/v2.7.6789.0
- Pthreads Win32 (supported version 2.9.1) - https://sourceware.org/pthreads-win32/
- Open WebRTC (supported version 3.3.0) - https://registrationcenter.intel.com/en/products/download/3385/
## 1.3 Known Issues

### Table 2. Known Issues

<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Exposure</th>
<th>Title &amp; Workaround</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGFX-1083</td>
<td>Medium</td>
<td>Run client Gaming Anywhere with value <code>disable</code> to control-relative-mouse-mode parameter in configuration.</td>
</tr>
<tr>
<td>CGFX-1085</td>
<td>Medium</td>
<td>Run server Gaming Anywhere with a value of 1024x768 to game-resolution parameter in configuration.</td>
</tr>
<tr>
<td>CGFX-1084</td>
<td>Medium</td>
<td>Run server Gaming Anywhere with a value 240 to video-fps parameter in configuration.</td>
</tr>
<tr>
<td>CGFX-1082</td>
<td>Medium</td>
<td>Run server Gaming Anywhere with an incorrect type of value to server-max-tokens parameter in configuration.</td>
</tr>
</tbody>
</table>
2.0 Cloud Gaming Reference Solution for Android Functionality

**NOTE**
This section of the Release Notes focuses on the Visual Cloud Accelerator Card Cloud Gaming Reference Solution for Android.

2.1 Introduction

Cloud gaming is a fast-grown use scenario. Intel® provides the reference solution to enable a server-client cloud gaming platform. This version is dedicated for Intel® server platforms to take advantage of Intel® hardware features.

Figure 2. Cloud Gaming Reference Solution for Android Software Stack on VCAC-R (PDC)

The solution contains the following main parts:

1. Android in Container. Customized Android running in docker container, to ease deployment in data center or edge server. Android game app running in Android container.

2. Intel Cloud Rendering (ICR). The ICR front-end receives rendering requests from the Android game app and Android framework, converts those requests to command streams and sends them to the ICR back-end. The ICR back-end performs real rendering and encoding on the accelerator card GPU, and then sends the video stream.
3. Visual Cloud Accelerator Card for Rendering. Provides high-density GPU rendering capability and high-performance hardware video codec, with whole software stack including user mode middleware, user mode drivers, and kernel mode drivers.

4. Scripts to build and setup the entire reference solution.

This document provides system requirements, issues and limitations, and legal information.

### 2.1.1 Supported in This Release

#### 2.1.1.1 New in R3 Release

- Android In Container
  - Fixed stability issues.
  - Fixed compatibility issues.

#### 2.1.1.2 Historical Features

- Android In Container
  - Enabled Android in Container
  - Support for a large number of Binder devices with kernel 4.4
  - Improves instance density via cpu-set, mem nodes, KMS, etc.
  - Update Houdini to 7.1. 1b.49852
  - Support skipDraw and FPS printing for OpenGL ES
  - Add OpenSFT support with input event injection
  - Enable debugfs for systrace and binder transaction dump
  - Upgrade AIC to Android 9 Pie based on host kernel 4.14.61
  - Update Houdini to 9.0.0y_50221

- Intel Cloud Rendering
  - Support EGL 1.4 and OpenGL ES 2.0 API, in Android N
  - Support transferring rendering cmd from front-end to back-bend
  - Support rendering acceleration by using AMD 18.30 driver on VegaM GPU
  - Support encoding rendering result to H264 video stream using FFmpeg 4.0.2 on Intel GPU
  - Support IRRV interface to provide H264 ES stream to customer gaming service, to be streamed out by customer protocol
  - OpenGL ES 2.0, 3.0, and 3.1 API

### 2.1.2 Release Format Update

The Android visual cloud gaming software stack released in the format of source code plus patches. A user should build up the acgss package with the build script as the first step, and then deploy the entire software stack with the acgss package(binary) as the second step.
2.2 Release Content

2.2.1 Software List

See `recipe.json` in release package for software configuration details

2.2.2 External Dependencies

RTMP: [https://github.com/arut/nginx-rtmp-module/archive/master.zip](https://github.com/arut/nginx-rtmp-module/archive/master.zip)
Docker: [https://docs.docker.com/](https://docs.docker.com/)

2.3 Fixed Issues

Table 3. Fixed Issues

<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Exposure</th>
<th>Title &amp; Workaround</th>
</tr>
</thead>
<tbody>
<tr>
<td>VVP0-486</td>
<td>P2-High</td>
<td>Android system displays internal problem with a device error after AIC start.</td>
</tr>
<tr>
<td>VVP0-487</td>
<td>P1-Stopper</td>
<td>The Android interface flashed after restarting AIC.</td>
</tr>
<tr>
<td>VVP0-491</td>
<td>P1-Stopper</td>
<td>AOV stops responding with input at Select Server page.</td>
</tr>
<tr>
<td>VVP0-499</td>
<td>P2-High</td>
<td>Port patch for adding VCA network device into black list to avoid uevent trigger during AIC start.</td>
</tr>
<tr>
<td>VVP0-500</td>
<td>P2-High</td>
<td>Port patch to disable sysrq to avoid host system hang.</td>
</tr>
<tr>
<td>VVP0-502</td>
<td>P1-Stopper</td>
<td>Failed to start IRR in render.</td>
</tr>
<tr>
<td>VVP0-504</td>
<td>P1-Stopper</td>
<td>ES hangs at start of 90x aic-p.</td>
</tr>
<tr>
<td>VVP0-511</td>
<td>P3-Medium</td>
<td>[Android P] FPS jitter found during 90x subway stress test every 3 hours.</td>
</tr>
<tr>
<td>VVP0-512</td>
<td>P3-Medium</td>
<td>[Android P] VE usage is 50% higher than AIC-N.</td>
</tr>
<tr>
<td>VVP0-513</td>
<td>P1-Stopper</td>
<td>KOG crash after login with a local render.</td>
</tr>
<tr>
<td>VVP0-528</td>
<td>P1-Stopper</td>
<td>[Android P] KOG crash after login using remote render mode.</td>
</tr>
<tr>
<td>VVP0-530</td>
<td>P3-Medium</td>
<td>[Android P] VCA modules fail to auto load using the deployment script.</td>
</tr>
<tr>
<td>VVP0-540</td>
<td>P2-High</td>
<td>QQ always crashes when restarting AIC.</td>
</tr>
</tbody>
</table>

2.4 Known Issues

Table 4. Known Issues

<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Exposure</th>
<th>Title &amp; Workaround</th>
</tr>
</thead>
<tbody>
<tr>
<td>VVP0-490</td>
<td>P3-Medium</td>
<td>Failed allocating swap storage error reports in render when running at 13x subway in Android.</td>
</tr>
<tr>
<td>VVP0-492</td>
<td>P3-Medium</td>
<td>Restart subway shows only half screen displayed after install of AOV.</td>
</tr>
</tbody>
</table>

continued...
<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Exposure</th>
<th>Title &amp; Workaround</th>
</tr>
</thead>
<tbody>
<tr>
<td>VVP0-507</td>
<td>P3-Medium</td>
<td>20% higher render/video usage at 15x subway performance test compared with Android N.</td>
</tr>
<tr>
<td>VVP0-536</td>
<td>P3-Medium</td>
<td>[Android P] [VCA2] Gem objects total of node01 has a rise from 8.90 to 9.28.</td>
</tr>
<tr>
<td>VVP0-544</td>
<td>P3-Medium</td>
<td>[VCA2] The game icon shows black box in the game “食物语.”</td>
</tr>
</tbody>
</table>
3.0 Host Side Software (Drivers and Apps)

3.1 Introduction

This section is intended to be a reference for installing and using Intel® Visual Cloud Accelerator Card for Rendering (Intel® VCAC-R) product family base software. The list of required files is:

- Linux* kernel
- Kernel modules
- User space app (vcactl)

The VCAC-R card is managed by a CLI called vcactl app and a Linux daemon called vcactl.service. There are several kernel modules as a part of vcass-modules installation package. Only the Linux kernel patches are a part of the release content.

3.2 Release Content

Software required to manage the VCAC-R can be built using files at the following public location: https://github.com/OpenVisualCloud/VCAC-SW. Look for the latest release for this card (VCAC-R) (currently https://github.com/OpenVisualCloud/VCAC-SW/tree/VCAC-R_R3). Regardless of the release, the major components are (in source code form):

- apps
- modules
- patches
- buildscripts
- eeprom
- BIOS (the latest BIOS version can be found at: https://hardwaresupport.celestica.com)

3.3 Features

VCAC-R R3 release features:

- Windows* baremetal can be booted over iPXE
- Dual BIOS feature that allows recovery of BIOS using its gold copy (with the command vcactl recovery-BIOS)
### 3.4 Fixed Issues - Host Side Software (Drivers and Apps)

**Table 5.** Fixed Issues - Host Side Software (Drivers & Apps)

<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Exposure</th>
<th>Title &amp; Workaround</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCASS-1771</td>
<td>Medium</td>
<td>Link down, caterr state instead of power_off state after vcactl os-shutdown command. <strong>Workaround:</strong> This state (link_down, caterr) is not correctly reported by card BIOS. There is power off state from electric point of view. Execution of the command vcactl pwrbtn-short on link_down, caterr state will bring node to bios_up state as expected from power_off state. Ask card vendor for BIOS updates to resolve this issue.</td>
</tr>
<tr>
<td>VCASS-2857</td>
<td>High</td>
<td>Node 0 and Node 1 can cause interference (DMA hang) with each other. This situation can happen when one node is using network (between host and card) traffic and another one is rebooted or reset at the same time. <strong>Workaround:</strong> Reboot host server to recover from DMA hang.</td>
</tr>
<tr>
<td>VCASS-2977</td>
<td>High</td>
<td>Vcactl config gateway does not work for Windows* card OS.</td>
</tr>
<tr>
<td>VCASS-2973</td>
<td>High</td>
<td>&quot;Black screen&quot; on Windows* 1803 with VEGA as the primary GPU after installing iGFX and AMD GPU drivers.</td>
</tr>
<tr>
<td>VCASS-2670</td>
<td>Medium</td>
<td>Vcactl info system command does not have enough buffer to fit overall output. <strong>Workaround:</strong> This is seen only with additional text together with driver version (version is expected in X.Y.Z format). To avoid problems, compile driver and apps with minimal strings as a package version.</td>
</tr>
<tr>
<td>VCASS-2887</td>
<td>Medium</td>
<td>Vcactl recovery-BIOS does not work on PDC cards</td>
</tr>
</tbody>
</table>

### 3.5 Known Issues - Host Side Software (Drivers and Apps)

**Table 6.** Known Issues - Host Side Software (Drivers & Apps)

<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Exposure</th>
<th>Title &amp; Workaround</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCASS-2578</td>
<td>Medium</td>
<td>VCAC-R configuration file is broken after non-graceful system shutdown (power switch restarts). <strong>Workaround:</strong> Execute vcactl config-default command.</td>
</tr>
<tr>
<td>VCASS-2694</td>
<td>Medium</td>
<td>Vcactl pwrbtn-short command does not work on Windows on node - no reaction to command on net_device_ready state. <strong>Workaround:</strong> Execute vcactl os-shutdown command. Nodes will go down as usual. (See additional limitations about vcactl os-shutdown command in defect list below.)</td>
</tr>
<tr>
<td>VCASS-2038</td>
<td>Medium</td>
<td>Reading SN using vcactl info hw command does not work for Windows on card. <strong>Workaround:</strong> SN can be read correctly using Linux images.</td>
</tr>
<tr>
<td>VCASS-2667</td>
<td>Medium</td>
<td>ICMP-watchdog’s restore script is not triggered after losing connection to the node. <strong>Workaround:</strong> N/A</td>
</tr>
<tr>
<td>VCASS-2663</td>
<td>Low</td>
<td>No ip6 address returned in output while Windows 10 booted on nodes. <strong>Workaround:</strong> N/A</td>
</tr>
<tr>
<td>VCASS-2146</td>
<td>Low</td>
<td>Reinstallation of apps displays error messages but succeeds. <strong>Workaround:</strong> N/A</td>
</tr>
<tr>
<td>VCASS-152</td>
<td>Low</td>
<td>Confusing message in vca_config_upgrade.sh script. <strong>continued...</strong></td>
</tr>
<tr>
<td>Issue ID</td>
<td>Exposure</td>
<td>Title &amp; Workaround</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>VCASS-27</td>
<td>Low</td>
<td>vca_config_upgrade.sh script doesn't recover removed option in manual mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Workaround:</strong> N/A</td>
</tr>
</tbody>
</table>
4.0 Supporting Documentation

Please see the following documents for more information on the Rendering card:

- [https://hardwaresupport.celestica.com](https://hardwaresupport.celestica.com) (please contact your Celestica™ representative for access)
# 5.0 Acronyms and Terms

The following acronyms and terms are used in this document.

<table>
<thead>
<tr>
<th>Acronym/Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGSS</td>
<td>Android cloud gaming software package</td>
</tr>
<tr>
<td>AIC</td>
<td>Android in Container</td>
</tr>
<tr>
<td>FFmpeg</td>
<td>A popular media framework</td>
</tr>
<tr>
<td>HOST</td>
<td>Heterogeneous Optimized Scheduling Tool</td>
</tr>
<tr>
<td>Intel® MSS</td>
<td>Intel® Media Server Studio</td>
</tr>
<tr>
<td>MSDK</td>
<td>Media Software Development Kit</td>
</tr>
<tr>
<td>KMD</td>
<td>Kernel Mode Driver</td>
</tr>
<tr>
<td>OpenCL</td>
<td>Open Computing Language</td>
</tr>
<tr>
<td>UMD</td>
<td>User Mode Driver</td>
</tr>
<tr>
<td>VCAC-R</td>
<td>Visual Cloud Accelerator Card - Rendering</td>
</tr>
</tbody>
</table>