

Intel® Media Server Studio 2017 R2 Driver, SDK for Linux* Getting Started Guide

Overview

For the most up to date version of this guide please refer to [“Getting Started Guide – Linux* Installation”](https://software.intel.com/sites/default/files/media_server_studio_getting_started_guide.pdf) on the Intel® Media Server Studio Support [documentation page](#).
https://software.intel.com/sites/default/files/media_server_studio_getting_started_guide.pdf

Intel® Media Server Studio 2017 R2 for Linux* provides software development tools and libraries needed to develop enterprise grade media solutions on Intel® server products.

This document covers installing the package components, which include source code, libraries, user mode graphics stack components, and kernel module patches.

A set of simplified examples which can be used to validate the install can be found under Intel® Media Server Studio Product Page-> Support -> Code Samples -> [Tutorials Package](#).

As multiple installation layouts are possible, we provide file paths relative to the folder where `intel-linux-media_<os>_<version>_64bit.tar.gz` package is unpacked.

Installation Procedure

IMPORTANT NOTE: The installation procedure for this release is different than previous installations. This product is a combination of driver, library, and graphics stack components requiring specific hardware, Linux* distributions, and kernel versions.

For Intel® Media Server Studio 2017, there is a new Gold OS and a new approach to installing kernel updates. Supported processors also change from Intel® Media Server Studio 2016.

Double check the processor on your system with “`cat /proc/cpuinfo`” before starting.

This release supports 6th Generation Intel® Core™ processors (formerly “Skylake”) with integrated graphics. It also covers 5th Generation Intel® Core (formerly “Broadwell”). **Note:** 4th Generation Core™ and earlier processors are not supported by Media Server Studio 2017 R2.

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This article describes the processor and OS support matrix:

<https://software.intel.com/en-us/articles/driver-support-matrix-for-media-sdk-and-opencl>

Please consult this article and the release notes for more background and details.

This release is validated with CentOS 7.2.1511 using patches to its default kernel (3.10.0-327.13.1.x86_64), referred as “Gold”. A “Generic” option based on the 4.4.0 kernel from www.kernel.org is also available.

Please note: 7.2.1511 is no longer the most recent CentOS 7 release, and is not the default download from www.centos.org. For a "Gold" configuration please use CentOS 7.2 from http://vault.centos.org/7.2.1511/isos/x86_64/. Other distributions, including newer versions of CentOS, can be used with "Generic" installation mode but cannot be considered "Gold".

Prerequisite Steps

Add the user(s) who will run Intel® Media Server Studio – SDK applications to the video group

```
$ usermod -a -G video [LOGIN]
```

Check that an Intel VGA adapter can be found with `lspci`:

```
$ lspci -nn -s 0:02.0
```

```
00:02.0 VGA compatible controller [0300]: Intel Corporation Broadwell-U  
Integrated Graphics [8086:193b] (rev 09)
```

The command output above shows 193b as the graphics device ID. The ID reported by `lspci` may be different for your machine. The main thing to look for is that an Intel graphics adapter is available. If not, you may need to check your BIOS settings and hardware configuration.

For Media Server Studio hardware access:

1. The chipset must support integrated graphics and the motherboard must be wired for display from the processor. This is generally always the case for Intel® Core™-based systems, but may need to be checked for systems using Intel® Xeon® processors. The best place to start is your hardware documentation.
2. Intel integrated graphics must be enabled in the BIOS. For many server machines there is also a small graphics adapter on the motherboard which can be configured separately. Usually integrated graphics should be enabled and the motherboard adapter disabled. Some experimentation may be required to find the best configuration for your system if your hardware documentation does not indicate the settings to use.

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3. You must have a processor with Intel integrated graphics (see product release notes for specific processor details.)

If all of these criteria are met and `lspci` shows an Intel graphics adapter you are ready to proceed with Media Server Studio installation.

Make sure that proxies, network connections, firewalls, etc. are set up to allow `yum` and `wget` to download packages.

CentOS 7.2 "Gold" installs

These steps are intended for use with the CentOS 7.2.1511 kernel (3.10.0-327.13.1.x86_64).

Please note: 7.2.1511 is no longer the most recent CentOS 7 release, and is not the default download from www.centos.org. For a "Gold" configuration please use CentOS 7.2 from http://vault.centos.org/7.2.1511/isos/x86_64/. Other distributions, including newer versions of CentOS, can be used with "Generic" installation mode but cannot be considered "Gold".

The installation script prevents incompatible CentOS upgrades by utilizing `"yum --releasever=7.2.1511"`.

Important Note: It appears that CentOS has a bug in mirrorlist backend which requires manual edit of `/etc/yum.repos.d/CentOS-Base.repo` file. Correct installation procedure requires commenting out mirrorlist lines and uncommenting baseurl lines. Like:

```
#mirrorlist=http://mirrorlist.centos.org/?release=\$releasever&arch=\$basearch&repo=os&infra=\$infra
baseurl=http://mirror.centos.org/centos/\$releasever/os/\$basearch/
```

Installation script automatically performs check of `"--releasever"` functionality and aborts installation if environment is not correctly configured.

CentOS installs assume the "Development and Creative Workstation" base environment for included scripts. Other configurations will require additional packages which are not installed by default. To prepare packages for a minimal server target please see the "Minimum Install" section at the end of this document.

Installation scripts are in the `install_scripts_centos*.tar.gz` bundle. Install is simplified to a single `"install_sdk_CentOS.sh"` script.

```
$ tar -xzf MediaServerStudio*.tar.gz
$ cd MediaServerStudio*
$ tar -xzf SDK2017*.tar.gz
$ cd SDK2017*/CentOS
$ tar -xzf install_scripts_*.tar.gz
```

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```
$ su
# ./install_sdk_CentOS.sh
# reboot
```

Note: you may see several warnings from depmod about “needs unknown symbol”. This is from a step intended to remove previous installs and does not indicate that anything is missing from the current install. These warnings can be ignored.

Intel-openc1-r4.0 driver is part of the Media Server Studio 2017 R2 release.

To install intel-openc1-r4.0 driver on a Media Server Studio 2017 R2 preconfigured system you need to install the user mode drivers:

```
$ sudo rpm -ivh intel-openc1-r4.0-BUILD_ID.x86_64.rpm
$ sudo rpm -ivh intel-openc1-devel-r4.0-BUILD_ID.x86_64.rpm
$ sudo rpm -ivh intel-openc1-cpu-r4.0-BUILD_ID.x86_64.rpm
```

“Generic” Steps

The commands below show the steps to install using the Generic approach in the Gold CentOS 7.2.1511 environment. These steps may need to be modified for other configurations. For a version of the script ready to cut and paste as well as info for other distros see <https://software.intel.com/en-us/articles/how-to-setup-media-server-studio-on-secondary-os-of-linux>.

```
#!/usr/bin/bash
# install prerequisite packages
yum -y -t groupinstall "Development Tools"
yum -y -t install kernel-headers kernel-devel bc wget bison ncurses-
devel hmaccalc zlib-devel binutils-devel elfutils-libelf-devel rpm-
build redhat-rpm-config asciidoc hmaccalc perl-ExtUtils-Embed pesign
xmlto audit-libs-devel binutils-devel elfutils-devel elfutils-libelf-
devel newt-devel numactl-devel pciutils-devel python-devel zlib-devel
mesa-dri-drivers openssl-devel

GENERIC_KERNEL_SRC=linux-4.4.tar.xz
GENERIC_KERNEL_WEB_PATH=http://www.kernel.org/pub/linux/kernel/v4.x

#install Media Server Studio packages
find . -name 'libdrm*' -exec rm {} \;
find . -name 'libkms*' -exec rm {} \;
find . -name 'libva*' -exec rm {} \;

/bin/cp -r etc/* /etc
/bin/cp -r opt/* /opt
/bin/cp -r lib/* /lib
```

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```

/bin/cp -r usr/* /usr

#get generic kernel source
if [ ! -f ./$GENERIC_KERNEL_SRC ]; then
    wget $GENERIC_KERNEL_WEB_PATH/$GENERIC_KERNEL_SRC
fi

if [ ! -f ./$GENERIC_KERNEL_SRC ]; then
    echo -e "Failed to get $GENERIC_KERNEL_SRC, please try download it
manually from $GENERIC_KERNEL_WEB_PATH, put it same folder as this
script, then run this script again." 1>&2
    exit 1
fi

tar -xJf $GENERIC_KERNEL_SRC

cp /opt/intel/mediasdk/opensource/patches/kmd/4.4/intel-kernel-
patches.tar.bz2 .

tar -xjf intel-kernel-patches.tar.bz2

cd linux-4.4
for i in ../intel-kernel-patches/*.patch; do patch -p1 < $i; done

make olddefconfig
make -j 8
make modules_install
make install

```

Intel-openc1-r4.0 driver is part of the Media Server Studio 2017 R2 release.

To install intel-openc1-r4.0 driver on a Media Server Studio 2017 R2 preconfigured system you need to install the user mode drivers:

```

$ mkdir intel-openc1
$ tar -C intel-openc1 -Jxf intel-openc1-r4.0-BUILD_ID.x86_64.tar.xz
$ tar -C intel-openc1 -Jxf intel-openc1-devel-r4.0-
BUILD_ID.x86_64.tar.xz
$ tar -C intel-openc1 -Jxf intel-openc1-cpu-r4.0-BUILD_ID.x86_64.tar.xz
$ sudo cp -R intel-openc1/* /
$ sudo ldconfig

```

Standalone OpenCL Installs

The Linux Intel(R) SDK for OpenCL(TM) applications components, including drivers, may be updated in separate standalone releases. Steps are similar to above, but may diverge occasionally. Instructions on how to install these standalone versions are included with those releases. Please note – these standalone releases are not intended to be compatible with Media SDK.

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This install includes the SRB4 OpenCL driver, also available in a standalone version.

Verifying correct installation

The `/opt/intel/mediasdk` directory should be populated

```
$ ls /opt/intel/mediasdk/  
builder  doc  include  lib  lib64  opensource  plugins  samples  tools
```

The `/dev/dri` directory should have a `renderD` interface.

The `vainfo` utility should show the current driver, Media SDK's iHD (from `/opt/intel/mediasdk`) and several codec entry points.

```
$ vainfo | grep -v 'unknown'  
libva info: VA-API version 0.99.0  
libva info: va_getDriverName() returns 0  
libva info: User requested driver 'iHD'  
libva info: Trying to open /opt/intel/mediasdk/lib64/iHD_drv_video.so  
libva info: Found init function __vaDriverInit_0_32  
libva info: va_openDriver() returns 0  
vainfo: VA-API version: 0.99 (libva 1.67.0.pre1)  
vainfo: Driver version: 16.5.1.59511-ubit  
vainfo: Supported profile and entrypoints  
    VAProfileH264ConstrainedBaseline: VAEntrypointVLD  
    VAProfileH264ConstrainedBaseline: VAEntrypointEncSlice  
    VAProfileH264Main                 : VAEntrypointVLD  
    VAProfileH264Main                 : VAEntrypointEncSlice  
    VAProfileH264High                 : VAEntrypointVLD  
    VAProfileH264High                 : VAEntrypointEncSlice
```

Prebuilt samples are available for install smoke testing in `MediaSamples_Linux_*.tar.gz`

```
$ tar -xzf MediaSamples_Linux_16.5.1-59511.tar.gz  
$ cd MediaSamples_Linux_bin  
$ ./sample_multi_transcode -i::h264 ../content/test_stream.264 -o::h264  
test_out.h264 -hw -la
```

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Expected output:

```
Multi Transcoding Sample Version 7.0.16053633

libva info: VA-API version 0.99.0
libva info: va_getDriverName() returns 0
libva info: User requested driver 'iHD'
libva info: Trying to open /opt/intel/mediasdk/lib64/iHD_drv_video.so
libva info: Found init function __vaDriverInit_0_32
libva info: va_openDriver() returns 0
Pipeline surfaces number: 120
MFX HARDWARE Session 0 API ver 1.21 parameters:
Input  video: AVC
Output video: AVC

Session 0 was NOT joined with other sessions

Transcoding started

Transcoding finished

Common transcoding time is 0.18 sec
MFX session 0 transcoding PASSED:
Processing time: 0.18 sec
Number of processed frames: 101

The test PASSED
```

Samples and Tutorials

Media Server Studio package includes MediaSamples_Linux_2016_bin.tar.gz tar ball with released samples binaries for testing after install. RPM package with latest samples binaries will not auto installed by installation script.

Samples and tutorials are available at <https://software.intel.com/en-us/intel-media-server-studio-support/code-samples>

Samples are longer, more complex, and their main purpose is to show a broad range of the capabilities in Media Server Studio. Tutorials are shorter, clearer, and intended to be starting points for understanding how to develop code with the SDK.

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Example code can be downloaded from
<http://software.intel.com/sites/default/files/mediasdk-tutorials-0.0.3.tar.gz>

Test content is available in the samples package and at
http://software.intel.com/sites/default/files/sample_video_content_0.zip

Building Intel® Media Server Studio Tutorials:

The tutorials are intended to be simple and clear starting points. They are built with standard makefiles. By default executables can be found in the `_build` directory.

To get more info on tutorial parameters use

```
[executable name] --help
```

Note: example programs in the tutorials package are suitable for SDK API study only. It has limited functionality and were not intended for any kind of SDK and media stack validation.

Building Intel® Media Server Studio Samples:

The Intel® Media SDK samples are built with a recent version of CMake*. This can be downloaded from www.cmake.org or installed via standard package management. To install samples prerequisites in CentOS 7.2.1511:

```
yum install cmake mesa-libGL-devel
```

To build, make sure `$MFX_HOME` is set to the directory corresponding to your build (by default `/opt/intel/mediasdk`) then type

```
perl build.pl --cmake=intel64.make.release -build
```

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in the `/opt/intel/mediasdk/samples` directory.

The `build.pl` script will only build samples if the prerequisites can be found. For most cases only `libdrm` is needed. If X11 is not installed the `_x11` samples will not be built.

The `transcode` sample is a great starting point to check your system:

```
sample_multi_transcode -i::h264 test_in.h264 -o::h264 test_out.h264 -hw
```

If you see an error that `i965` cannot be found, here is a workaround:

```
cd /opt/intel/mediasdk/lib64
ln -s iHD_drv_video.so i965_drv_video.so
```

To test OpenCL:

Download the OpenCL Linux samples package from <https://software.intel.com/en-us/intel-openc1-support/code-samples>

The `CapsBasic` sample prints OpenCL query results for your system, and makes an excellent smoke test.

```
cd CapsBasic; make; ./CapsBasic
```

This should show a functioning GPU device.

The `matrix multiply` sample tests launching kernels:

```
cd GEMM; make; ./GEMM -t gpu
```

Some OpenCL examples are included in the `Media Server Studio` samples package. They are not built with `cmake` like the other samples. These samples illustrate use of the `vector motion estimation (VME)` extensions.

For example, from the `samples` directory

```
$ cd samples/ocl_motion_estimation/MotionEstimation
$ make
```

More samples are available from <https://software.intel.com/en-us/intel-openc1-support/code-samples>. Use `OpenCL 1.2 Samples for Linux`.

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Minimum Install

Please note: Intel® Media Server Studio 2017 is only fully validated against a CentOS 7.2 “Gold” environment with all ‘Runtime’ and ‘Devel’ libraries installed.

This section documents how to take a subset of components from a development system to copy just enough to run Media SDK applications on a target/production system without additional dependency installs from yum. The model is develop and test in a full development environment, then copy the application executable and these components to the target system to run.

Step 1: Install and configure Development system

Complete steps documented in CentOS 7.2 “Gold” installs

Step 2: Rebuild Libva with only DRM backend dependencies

Rebuilding libva requires Media SDK ‘Devel’ libraries from a Gold install as well as other prerequisites.

The script below builds Libva with only DRM support. This script should be run on development system. The file will build required libraries and copy to compressed folder libva_1.67.0.pre1.tar.gz in the /tmp/ directory

```
#!/bin/bash
cd /opt/intel/mediasdk/opensource/libva/1.67.0.pre1-*/
tar -xjvf libva*
cd libva-*
./configure --enable-x11=no --enable-glx=no --enable-egl=no --enable-
wayland=no --disable-static --prefix=/usr --libdir=/usr/lib64/
make clean
make
cd va/.libs/
tar -czvf /tmp/libva_1.67.0.pre1.tar.gz libva*.so*
```

Step 3: Install and configure Target system

Install CentOS 7.2 ‘minimal’ install on target system

Step 4: Copy the following rpms and tar files to target system

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(Found in CentOS directory in MediaServerStudio*/ SDK2017*)

```
intel-i915-firmware-16.5.1-*.el7.x86_64.rpm
intel-linux-media-16.5.1-*.el7.x86_64.rpm
libdrm-2.4.66-*.el7.x86_64.rpm
intel-ocl-r4.0-*.x86_64.rpm
intel-ocl-cpu-r4.0-*.x86_64.rpm
kmod-ukmd-16.5.1-*.el7.x86_64.rpm
```

(Found in /tmp/. Generated by step 2)

```
libva_1.67.0.pre1.tar.gz
```

Step 5: Install on target System

Run the following script to install ‘runtime’ libraries on your target system

```
#!/usr/bin/bash
#install Media Server Studio packages
rpm -Uvh \
intel-i915-firmware-16.5.1-*.el7.x86_64.rpm \
intel-linux-media-16.5.1-*.el7.x86_64.rpm \
libdrm-2.4.66-*.el7.x86_64.rpm \
intel-ocl-r4.0-*.x86_64.rpm \
intel-ocl-cpu-r4.0-*.x86_64.rpm
tar -xvf libva_1.67.0.pre1.tar.gz -C /usr/lib64

#remove all other kmod-ukmd installation
for installed_kmod in `rpm -qa | grep kmod-ukmd`
do
echo "Removing previous version $installed_kmod..."
rpm -e $installed_kmod
done

#install kmod-ukmd
echo "Installing kmod-ukmd-$MILESTONE_VER-$BUILD_ID..."
rpm -ivh kmod-ukmd-16.5.1-*.el7.x86_64.rpm

echo "Installation done."
```

CentOS 7.2 Intel® Media Server Studio “Gold” Library Dependencies

This section is intended to help identify the minimal set of libraries and dependencies required on a production system.

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The Intel® Media Server Studio “Gold” libraries are provided as rpm binaries that are categorized as follows

1. Runtime – Libraries that are required at runtime to run media transcoding applications
2. Devel – Libraries that are required during development process to build applications and libva/libdrm libraries
3. Utils – Provides tools, such as vainfo

The tables below map each library to their dependencies

Runtime

	internal dependencies*	direct external dependencies**
libdrm	N/A	libpciaccess
libva	N/A	mesa-libGL libX11 libXext libXfixes mesa-dri-drivers
intel-linux-media	libdrm	N/A
intel-i915-firmware	N/A	N/A
kmod-ukmd	N/A	centos official kernels
intel-openc1	N/A	N/A

Devel

	internal dependencies*	direct external dependencies**
libdrm-devel	libdrm	kernel-headers

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libva-devel	libva	N/A
intel-linux-media-devel	intel-linux-media	N/A
intel-openccl-devel	N/A	N/A

Util/sample

	internal dependencies*	direct external dependencies**
drm-utils	libdrm	N/A
libva-utils	libdrm libva	libX11 libXext libXfixes

* ‘Internal dependencies’ means the dependencies which is also in our release packages

** ‘direct external dependencies’ means software components that are required to be installed on system before installation of Intel® Media Server Studio library. The table only identifies direct dependencies and these dependencies may have their own dependencies. . ‘yum’ can handle this situation very well, which means if you install one software components by ‘yum’, it will search all necessary dependencies and install them along with that one you request

Fundamental dependencies are also ignored in table. Fundamental dependencies include glibc, rpm-libs, system, bash, kmod, pkgconfig, libstdc++.

Packages marked as N/A have requirements on fundamental dependencies

CentOS 7.2 minimal install includes all fundamental dependency libraries by default.

Runtime library external dependencies in CentOS 7.2

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Libdrm

libpciaccess Library is included in the CentOS7.2 minimal install therefore all internal and direct dependencies of libdrm libraries are met on CentOS7.2.

Libva

The following libraries are required by libva-x11 library

- mesa-libGL
- libX11
- libXext
- libXfixeslibraries

libva-x11 is not required for general media transcoding applications as Libva uses DRM interface. Rebuilding Libva with only DRM support will eliminate dependency requirement on all four direct external dependencies listed above. To rebuild Libva with only DRM support see section “CentOS 7.2 Intel® Media Server Studio “Gold” minimum install steps”

Libva uses mesa-dri-driver as a backend accelerator for user-interface/X server. As Media SDK always uses the iHD driver there is no dependency on the “mesa-dri-driver” when Media SDK is used as programming interface to libva API.

Media SDK uses Libva DRM backend interface only. Where Libva is built with only DRM enabled no external dependencies are required

kmod-ukmd

kmod-ukmd requires that correct CentOS kernel version is installed.

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