

# Intel® Media Server Studio 2018 R1 – 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”](#) on the Intel® Media Server Studio Support [documentation page](#).

**Intel® Media Server Studio 2018 R1 for Linux\*** provides software development tools and libraries needed to develop enterprise grade media solutions on Intel® Xeon® and Core™ processor-based platforms.

This document covers installing the package components, which includes 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 2018 R1 the Gold OS has been updated. The supported configuration for this release is based on CentOS 7.4 (1708). Intel Media Server Studio 2017 R3's Gold configuration was based on CentOS 7.3 (1611).

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

Intel® Media Server Studio – SDK supports the following platforms with the integrated graphics:

- Intel® Xeon® E3-1200 v4 Family with C226 chipset
- Intel® Xeon® E3-1200 and E3-1500 v5 Family with C236 chipset
- 5th Generation Intel® Core™

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- 6th Generation Intel® Core™
- Note: chipset must have processor graphics enabled. Make sure to check the datasheet for your system.
  - Having a C226/C236 chipset is necessary but not sufficient. Make sure to consult with specific platform or board vendor regarding processor graphics being supported. Check Media Server Studio website for the list of “Known OEM/ODM Functional Platforms”:  
<https://software.intel.com/en-us/intel-media-server-studio/details>

Additionally, for Intel® Xeon® E5 v4 and v5 processors, support of software-only (CPU) HEVC decode and encode, select video pre-processing (Color Space Conversion, Scaling), and virtualization (KVM\*, Xen\*) is available.

This article describes the processor and OS support matrix:

<https://software.intel.com/en-us/articles/driver-support-matrix-for-media-sdk-and-openc1>

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

**This release is validated with CentOS 7.4.1708** using patches to its default kernel (3.10.0-693.11.6.el7.x86\_64), referred as “Gold”. A “Generic” option based on the 4.4.111 kernel from [www.kernel.org](http://www.kernel.org) is also available.

Please note: 7.4.1708 may be no longer the most recent CentOS 7 release, and may not be the default download from [www.centos.org](http://www.centos.org). Please select 7.4.1708 from your local mirror. Kernel 3.10.0-693.11.6.el7.x86\_64 also not latest one and should be installed explicitly.

## 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:

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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 other product lines such as 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.
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 7.4 “Gold” installs

These steps are intended for use with the CentOS 7.4.1708 kernel (3.10.0-693.11.6.el7.x86\_64).

Please configure your OS to avoid automatic updates, especially for the kernel, `libva`, and `libdrm`.

**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.

Only the CentOS 7.4.1708 version of CentOS is fully supported. Other distributions, as well as other versions/updates of CentOS 7 (including newer releases of CentOS) are considered Generic installs.

Please note: 7.4.1708 may not be the most recent CentOS 7 release, and may not be the default download from [www.centos.org](http://www.centos.org). Please select 7.4.1708 from your local mirror. If it is not available there you can find it at [vault.centos.org](http://vault.centos.org).

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The CentOS install procedure in this section assumes 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 SDK2018*.tar.gz
$ cd SDK2018*/CentOS*
$ tar -xzf install_scripts_*.tar.gz
$ su
# ./install_sdk_CentOS.sh
# reboot
```

Intel-ocl driver is part of the Media Server Studio 2018 R1 release and automatically installed as part of the steps above.

## "Generic" Steps

The commands below show the steps to install using the Generic approach in the Gold CentOS 7.4.1708 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/mss-2017-generic-install>

```
#!/bin/bash

echo "remove other libdrm/libva"
find /usr -name "libdrm*" | xargs rm -rf
find /usr -name "libva*" | xargs rm -rf

echo "Remove old MSS install files ..."
rm -rf /opt/intel/mediasdk
rm -rf /opt/intel/common
rm -rf /opt/intel/opencl
```

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```

echo "install user mode components"
#unpack the generic package
tar -xvzf intel-linux-media_generic*.tar.gz
find ./ -type f -name "intel-openssl*x86_64.tar.xz" -exec tar xvJf
{} \;

#put the generic components in standard locations

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

echo "install kernel build dependencies"
if grep -i "rhel" /etc/os-release &>/dev/null; then
    yum install -y git fakeroot gcc gcc-c++ ncurses-devel
    openssl-devel bc xz
elif grep -i "ubuntu" /etc/os-release &>/dev/null; then
    apt-get -y install git fakeroot build-essential ncurses-
    dev xz-utils libssl-dev bc g++
fi

echo "download 4.4.111 kernel"
if [ ! -f ./linux-4.4.111.tar.xz ]; then
    wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-
    4.4.111.tar.xz
fi
tar -xJf linux-4.4.111.tar.xz

echo "apply kernel patches"
cp /opt/intel/mediasdk/opensource/patches/kmd/4.4.111/intel-
kernel-patches.tar.bz2 .
tar -xvjf intel-kernel-patches.tar.bz2
cd linux-4.4.111
for i in ../intel-kernel-patches/*.patch; do patch -p1 < $i; done

echo "build patched 4.4.111 kernel"
make olddefconfig
make -j 8
make modules_install
make install

echo "Install finished, please "
echo "1. update LD_LIBRARY_PATH to include
/usr/lib64;/usr/local/lib"
echo "2. add user to video group: usermod -a -G video user"
echo "3. reboot"

```

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**Note:** Make sure you boot the patched kernel. If you are installing a kernel with a lower version than one already present the newest kernel may load automatically by default. You may need to edit grub.cfg manually to automatically load the 4.4.111 kernel prepared here.

## Standalone OpenCL™ Installs

The Linux Intel® SDK for OpenCL™ Applications components may be updated in separate standalone releases. Steps are similar to above, but may diverge occasionally and may not always be compatible with Intel® Media Server Studio. Instructions on how to install these standalone versions are included with those releases.

## 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.

**Note:** vainfo and other libva tools are part of "libva-utils" package. Please download source code of package from <https://github.com/01org/libva-utils> and install it manually.

These steps may also be necessary to build libva-utils, since the version of libva in this package may not match the latest version of libva-utils:

```
$ git checkout tags/1.8.3  
$ sudo yum install automake libtool  
$ autogen.sh  
  
(comment out line 244-248 in encode/avcenc.c)  
  
$ make  
$ sudo make install
```

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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 1.0.0
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_1_0
libva info: va_openDriver() returns 0
vainfo: VA-API version: 1.0 (libva 2.0.0.pre1)
vainfo: Driver version: 16.8.69021-ubit
vainfo: Supported profile and entrypoints
    VAProfileH264ConstrainedBaseline: VAEntrypointVLD
    VAProfileH264ConstrainedBaseline: VAEntrypointEncSlice
    VAProfileH264Main                 : VAEntrypointVLD
    VAProfileH264Main                 : VAEntrypointEncSlice
    VAProfileH264High                 : VAEntrypointVLD
    VAProfileH264High                 : VAEntrypointEncSlice
...

```

If you see an error that i965\_drv\_video cannot be found, verify and update your environment settings:

```
$ export LIBVA_DRIVERS_PATH=/opt/intel/mediasdk/lib64
$ export LIBVA_DRIVER_NAME=iHD

```

Prebuilt samples are available for install smoke testing in MediaSamples\_Linux\_2018R1\_b982.tar.gz

```
$ tar -xzf MediaSamples_Linux_*.tar.gz
$ cd MediaSamples_Linux_2018R1_b982/samples/_bin/x64
$ cd
$ ./sample_multi_transcode -i::h264 ../content/test_stream.264 -o::h264
test_out.h264 -hw -la

```

Expected output:

```
Multi Transcoding Sample Version 8.2.25.982

libva info: VA-API version 1.0.0
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_1_0
libva info: va_openDriver() returns 0
Pipeline surfaces number (DecPool): 59

```

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```
MFX HARDWARE Session 0 API ver 1.25 parameters:
Input video: AVC
Output video: AVC
```

Session 0 was NOT joined with other sessions

Transcoding started

..

Transcoding finished

Common transcoding time is 0.235762 sec

```
-----
*** session 0 PASSED (MFX_ERR_NONE) 0.235465 sec, 101 frames
-i::h264 ../content/test_stream.264 -o::h264 test_out.h264 -hw -la
-----
```

The test PASSED

## Samples and Tutorials

Media Server Studio package includes MediaSamples\_Linux\_bin-16.8-69021.tar.gz tar ball with released samples binaries for testing after install. The package with latest samples binaries will not auto installed by installation script.

Media Server Studio package includes full Samples package MediaSamples\_Linux\_2018R1\_b982.tar.gz with released samples source code and binaries as well.

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  
<https://software.intel.com/sites/default/files/managed/2b/60/mediasdk-tutorials-0.0.4.tar.gz>

### **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](http://www.cmake.org) or installed via standard package management. To install samples prerequisites in CentOS 7.4.1708:

```
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
```

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

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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 support in samples will be disabled.

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
```

### **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 full 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.

## Minimum Install

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Please note: Intel® Media Server Studio 2018 is only fully validated against a CentOS7.4 “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 7.4 “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/2.0.1.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_2.0.1.pre1.tar.gz libva*.so*
```

### **Step 3: Install and configure Target system**

Install CentOS 7.4 ‘minimal’ install on target system

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

(Found in CentOS directory in MediaServerStudio\*/ SDK2018\*)

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```
intel-linux-media-16.8-*.el7.x86_64.rpm
libdrm-2.4.67-*.el7.x86_64.rpm
intel-openc1-16.8-*.x86_64.rpm
intel-openc1-devel-16.8-*.x86_64.rpm
intel-openc1-cpu-16.8-*.x86_64.rpm
ukmd-kmod-16.8-*.el7.x86_64.rpm
```

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

```
libva_2.0.1.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 *.rpm
tar -xvf libva_2.0.1.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 ukmd-kmod-16.8-*.el7.x86_64.rpm

echo "Installation done."
```

## CentOS 7.4 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.

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

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### 3. Utils – Provides tools

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
ukmd-kmod	N/A	centos official kernels
intel-ocl	N/A	N/A

#### Devel

	internal dependencies*	direct external dependencies**
libdrm-devel	libdrm	kernel-headers
libva-devel	libva	N/A
intel-linux-media-devel	intel-linux-media	N/A
intel-ocl-devel	N/A	N/A

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### Util/sample

	internal dependencies*	direct external dependencies**
drm-utils	libdrm	N/A

\* '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 7.4 minimal install includes all fundamental dependency libraries by default.

## **Runtime library external dependencies in CentOS 7.4**

### Libdrm

libpciaccess Library is included in the CentOS7.4 minimal install therefore all internal and direct dependencies of libdrm libraries are met on CentOS7.4.

### Libva

The following libraries are required by libva-x11 library

- mesa-libGL
- libX11
- libXext
- libXfixeslibraries

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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.

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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