Intel® Software Guard Extensions SDK for Linux* OS

Installation Guide
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## Revision History

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Intel® Software Guard Extensions SDK and Platform Software Installation
This document provides the instructions on how to install Intel® Software Guard Extensions SDK and platform software. You can see the details in the following topics:

- Install Intel® Software Guard Extensions SDK and Platform Software
- Install Intel® Software Guard Extensions Eclipse* Plug-in

Install Intel® Software Guard Extensions SDK and Platform Software
The current Linux* OS installation packages include three binary installers packaged separately:

- Installation package for Intel® Software Guard Extensions (Intel® SGX) driver
- Installation package for Intel® SGX platform software (PSW)
- Installation package for Intel® SGX SDK

Download the following installation packages:

- Intel® SGX driver: sgx_linux_x64_driver.bin
- Intel® SGX PSW: sgx_linux_x64_psw_<version>.bin
- Intel® SGX SDK: sgx_linux_x64_sdk_<version>.bin

**NOTE**
Only 64-bit installation packages are available.

**NOTE**
The Intel® SGX driver needs to be signed if Secure Boot is enabled. Please consult the distribution documentation on how to sign drivers for Secure Boot.

Hardware Requirements

- 6th Generation Intel® Core™ Processor or newer
- Intel® SGX option enabled in BIOS

**NOTE**
This is required when you need to install the Intel® SGX driver or Intel® SGX PSW, but not required when you install the Intel® SGX SDK installer.

Prerequisites
Ensure that you have one of the following operating systems:

- Ubuntu® Desktop-16.04-LTS 64bits
- Red Hat® Enterprise Linux Server release 7.4 64bits
- CentOS® 7.3.1611 64bits

To install Intel® SGX PSW, first install the following tools: For example:

1. On Ubuntu® 16.04:
   
   $ sudo apt-get install libssl-dev libcurl4-openssl-dev libprotobuf-dev

2. On Red Hat® Enterprise Linux 7.4 and CentOS® 7.3:
   
   $ sudo yum install openssl-devel libcurl-devel protobuf-devel

To install Intel® SGX SDK, install the following:

1. On Ubuntu® 16.04:
   
   $ sudo apt-get install build-essential

2. On Red Hat® Enterprise Linux 7.4 and CentOS® 7.3:
   
   $ sudo yum groupinstall 'Development Tools'

To use the trusted platform service, install the following:

- Ensure mei_me driver is enabled and /dev/mei0 exists.
  
  On Red Hat Enterprise Linux 7.4, update the kernel version to kernel-3.10.0-514.el7 or newer:
  
  $ sudo yum update kernel

- Download [iclsClient] and install it using the following commands:

  On Ubuntu® 16.04:
  
  $ sudo apt-get install alien

  $ sudo alien --scripts iclsClient-1.45.449.12-1.x86_64.rpm
Download source code from the [dynamic-application-loader-host-interface] project. In the source code folder build and install the JHI service using the following commands:

On Ubuntu* 16.04:

$ sudo apt-get install uuid-dev libxml2-dev cmake
$ cmake .;make;sudo make install;sudo systemctl enable jhi

On Red Hat* Enterprise Linux 7.4 and CentOS* 7.3:

$ sudo yum install libuuid-devel libxml2-devel cmake
$ cmake .;make;sudo make install;sudo systemctl enable jhi

Installation

You need the root (or sudo) privilege to install the driver and PSW packages, and install them in following order:

1. Intel(R) SGX driver
2. Intel(R) SGX PSW
3. Intel(R) SGX SDK

Use the following steps to install these packages:

1. Install the Intel(R) SGX driver package using the following command:

   $ sudo ./sgx_linux_x64_driver.bin

   The installer also loads the driver and sets it to be auto-load when the machine reboots.

   After the Intel(R) SGX driver installation, you can see a generated script uninstall.sh under the /opt/intel/sgxdriver directory. You can use this script to uninstall the driver.

2. Install the Intel(R) SGX PSW package using the following command:
$ sudo ./sgx_linux_x64_psw_<version>.bin

The Intel SGX platform software package includes user space libraries such as uRTS and AESM. After installation, the libraries are installed to the directory /usr/lib. The AESM service executable and the AE libraries are installed to the directory /opt/intel/sgxpsw/aesm.

The installer also configures the AESM service as a system daemon, which starts with the user ID aesmd. The default home directory of the AESM service is /var/opt/aesmd.

After installing the platform software, you may need to setup an HTTP proxy server for the AESM service. You can use the file /etc/aesmd.conf as a reference. This file shows an example on how to setup the proxy but it is commented out.

After the Intel(R) SGX PSW installation, you can see a generated script uninstall.sh under the /opt/intel/sgxpsw directory. You can use this script to uninstall the platform software.

3. Install the Intel(R) SGX SDK using the following command:
   $ ./sgx_linux_x64_sdk_<version>.bin

This command starts the setup program in the interactive mode on the command line. When the question Do you want to install in current directory? [yes/no] appears, type yes and press Enter to install in the current directory and type no and press Enter to enter another path for installation.

After the installation, the Intel SGX SDK package is installed into the directory [User Input Path]/sgxsdk. Run the command source [User Input Path]/sgxsdk/environment, which also sets all the environment variables.

You can also see a generated script uninstall.sh under the [User Input Path]/sgxsdk directory and use it to uninstall the Intel(R) SGX SDK.

**NOTE**
The default installation directories for Intel(R) SGX PSW and Intel(R) SGX SDK are different:

- The Intel(R) SGX PSW package installs the user space libraries in /usr/lib.
The Intel(R) SGX SDK package installs the corresponding shell libraries in [User Input Path]/sgxsdk/lib64. Shell libraries contain the declaration of the public APIs and are only needed for building Intel SGX applications. At runtime, the standard user-space libraries in /usr/lib are loaded automatically.

**NOTE**
Sample code is installed under [User Input Path]/sgxsdk/SampleCode directory with read-only permissions for normal users. Each user can make separate copies to modify, build and experiment with the sample codes.

To uninstall Intel(R) SGX, run the corresponding `uninstall.sh` scripts to uninstall the components in the following order. You must have root privileges to uninstall driver and PSW packages.

1. Uninstall the Intel(R) SGX SDK
2. Uninstall the Intel(R) SGX PSW
3. Uninstall the Intel(R) SGX driver

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**Install Intel(R) Software Guard Extensions Eclipse* Plug-in**

The Intel(R) Software Guard Extensions Eclipse* Plug-in for Linux* OS helps the enclave developer to maintain enclaves and untrusted related code inside Eclipse* C/C++ projects.

This section contains steps to set up your Intel(R) Software Guard Extensions Eclipse* Plugin on a Linux* system, including necessary softwares, steps to install the product, and steps to configure your preferred product directory.

- **Prerequisites**
- **Installation**
- **Configuration**

**Prerequisites**
To use Intel(R) Software Guard Extensions Eclipse Plug-in, install the following softwares:

- Eclipse* Mars 1 with CDT IDE for C/C++ Developpers (version 4.5.1). To use this version, install Java* Development Kit (JDK) or Java* Runtime Environment (JRE) version 1.8 or above.
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- gcc*/g++ tools
- OpenSSL*
- Intel(R) SGX SDK for Linux* OS

Installation
Install Intel(R) Software Guard Extensions Eclipse* Plug-in as a regular Eclipse Plugin:

1. Download the zip archive of Intel(R) Software Guard Extensions Eclipse Plug-in from [Intel Site]
2. Go to Help menu -> Install New Software. Click the Add button for the Work with field to open the Add Repository dialog as shown in the following graphic:
Add Repository Dialog

3. Enter Intel\(^{(R)}\) SGX Archive in the Name field. Click the Archive... button and select the location of the downloaded archive as shown in the following graphic:
The Location of the Plugin zip Archive

4. Press OK to add the archive as a repository.
5. In the Install dialog, select the Intel(R) Software Guard Extensions Plugin check-box and proceed with the usual steps.
Configuration
If you do not install Intel(R) SGX SDK for Linux* OS in the default location, you need to specify the path for Intel(R) SGX SDK using the following steps:

1. Go to Window menu -> Preferences. Enter Intel(R) SGX in the filter text field to quickly locate the Intel(R) SGX Preferences page.

   ![Intel(R) SGX Preference Page](image)

   Intel(R) SGX Preference Page

2. Enter the path for Intel(R) SGX SDK for Linux OS in the Intel(R) SGX SDK Directory field.