

Sentinel LDK 9.0 with Sentinel LDK-EMS

RELEASE NOTES



Revision History

Part number 007-001946-001, Revision G, 2403-1

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Sentinel LDK 9.0 with Sentinel LDK-EMS Release Notes

These release notes are subject to change. If you are reading the release notes that were installed with the product, Thales recommends that you check the release notes available online to see if any information was added or changed. You can access the latest release notes from: [Sentinel LDK Release Notes](#)

View in: [Deutsch](#) [日本語](#) [中文](#)

[View the previous version](#) in English of the release notes.

[Download a ZIP file](#) in English with all Sentinel LDK release notes.

Service Pack: **9.0.200** | December 2023

- > ["New Features, Enhancements, and Changes" on page 8](#)
- > ["Installation and Upgrades" on page 17](#)
- > ["Resolved Issues" on page 42](#)

Service Pack: **9.0.101** | October 2023

- > ["Installation and Upgrades" on page 17](#)
- > ["Resolved Issues" on page 42](#)

Service Pack: **9.0.100** | September 2023

- > ["New Features, Enhancements, and Changes" on page 8](#)
- > ["Installation and Upgrades" on page 17](#)
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Release: **9.0** | April 2023

- > ["New Features, Enhancements, and Changes" on page 8](#)
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- > ["Security Updates" on page 20](#)
- > ["Supported Platforms" on page 21](#)
- > ["Documentation" on page 37](#)
- > ["Resolved Issues" on page 42](#)
- > ["Known Issues and Workarounds" on page 48](#)

These release notes have been changed since the initial release of Sentinel LDK 9.0 as follows:

- > Changes to vendor libraries that affect the FQDN clone protection scheme have been implemented. For details, click [here](#).
- > Support for Linux Ubuntu 20.4 has been added. For details, click [here](#).
- > An enhancement to the Run-time Environment has been added. For details, click [here](#).
- > The description of Sentinel LDK Licensing REST API has been updated to state that it supports HL keys. For details, click [here](#).
- > The supported versions for Python have been documented. For details, click [here](#).

Product Overview

Sentinel LDK is Thales' industry-leading software protection and licensing solution. It provides cutting edge security technologies for the utmost in copy protection, a range of license models and entitlement fulfillment options, and out-of-the-box tools which facilitate quick integration and deployment. Sentinel LDK supports hardware-based, software-based and cloud-based licensing and includes a range of APIs to allow software vendors to automate and tailor the implementation to their unique business requirements.

The strength, uniqueness, and flexibility of Sentinel LDK are based on two primary principles:

- > *Protect Once—Deliver Many—Evolve Often™* — this unique design philosophy enables you to fully separate your business and protection (engineering) processes in order to maximize business agility while ensuring optimum use of your employee time and core competencies, resulting in faster time to market.
- > *Cross-Locking™* — the technology that supports the *Protect Once—Deliver Many—Evolve Often* concept, enabling a protected application to work with a Sentinel hardware key or a Sentinel License Certificate (software key).

All commercial decisions, package creation and license definitions are executed by product or marketing managers after the protection has been implemented.

This workflow model provides you with greater flexibility and freedom when defining new sales and licensing models, including feature-based and component licensing, evaluation, rental, floating, subscription, trialware, pay-per-use, and more, enabling you to focus on revenue growth.

Sentinel Vendor Keys

When you purchase Sentinel LDK, you are provided with two Sentinel Vendor keys—the Sentinel Developer key and the Sentinel Master key.

The Sentinel Developer key is used by your software engineers in conjunction with the Sentinel LDK protection tools to protect your software and data files.

The Sentinel Master key is only required if you install Sentinel LDK-EMS on premises. It is used in conjunction with Sentinel LDK and is attached to the Sentinel LDK-EMS Server. This key is used by your production staff to create licenses and lock them to Sentinel protection keys, to write specific data to the memory of a Sentinel protection key, and to update licenses already deployed in the field.

Important: The Master key is especially valuable because it is used to generate licenses. Both Vendor keys contain secrets and enable the use of tools and API libraries which can access the memory of user keys and use of the cryptographic functionalities.

New Features, Enhancements, and Changes

- > ["Service Pack: 9.0.200 " below](#)
- > ["Service Pack: 9.0.100 " on the next page](#)
- > ["Release: 9.0 " on page 10](#)

NOTE If you are upgrading from a version of Sentinel LDK that is earlier than 8.5, be sure to review the release notes for all intervening versions. Significant enhancements and changes are introduced in each version of Sentinel LDK. [Download a ZIP file](#) that contains all Sentinel LDK release notes to see the changes.

Service Pack: 9.0.200

In this section:

- > ["Enhanced Envelope Protection for Python Applications Under Windows" below](#)
- > ["Improved Windows Shell Protection for .NET Assemblies" below](#)
- > ["Additional Enhancements to Sentinel LDK Envelope" on the next page](#)
- > ["New Version of Tomcat" on the next page](#)

Enhanced Envelope Protection for Python Applications Under Windows

Sentinel LDK now provides a new command-line tool called **Script Envelope** for applying Sentinel LDK Envelope protection to Python applications on a Windows machine.

After you create a project file that contains protection parameters, you can protect the Python application simply by executing Script Envelope. No additional steps are required.

For details, see [Sentinel LDK Envelope for Windows](#).

Improved Windows Shell Protection for .NET Assemblies

Until now, Sentinel LDK Envelope supported shell protection for normal .NET executables.

Effective with this release, the Envelope V3 engine additionally supports shell protection for .NET mixed mode executables and DLL assemblies under Windows.

Additional Enhancements to Sentinel LDK Envelope

The following enhancements have been implemented by this service pack:

- > .NET Envelope runtime message boxes now display as a foreground window.
- > For application protected using the Windows V3 engine, Envelope runtime message boxes now display as a foreground window.
- > The .NET target frameworks under which protected applications are supported includes .NET 8. For details, see this [table](#).

New Version of Tomcat

Sentinel LDK-EMS now works with Tomcat 9.0.83. When you install this service pack on your machine, Tomcat 9.0.83 is installed automatically on the machine.

Service Pack: 9.0.100

In this section:

- > ["Sentinel LDK-EMS Now Supports Microsoft Office 365 SMTP Without Basic Authentication" below](#)
- > ["Disabling Cloud Licensing Even If Cloud Licensing Module Has Expired" below](#)
- > ["Master Wizard Now Communicates Using HTTPS" below](#)
- > ["Changes to Support for .NET Target Framework" on the next page](#)
- > ["Enhancements to Sentinel LDK Envelope and Data Protection Utility" on the next page](#)

Sentinel LDK-EMS Now Supports Microsoft Office 365 SMTP Without Basic Authentication

Microsoft has disabled the basic authentication approach for Office 365. Sentinel LDK-EMS now supports Office 365 SMTP for vendors who are using email for license activation.

Disabling Cloud Licensing Even If Cloud Licensing Module Has Expired

A vendor can now set the **Cloud Licensing** configuration parameter in Sentinel LDK-EMS to **Disabled** even if the Cloud Licensing module in their Master license has expired. As a result, a vendor who used cloud licensing for a limited period is no longer blocked from disabling cloud-enablement for existing SL keys.

Master Wizard Now Communicates Using HTTPS

Communication between Sentinel LDK Master Wizard and Thales servers is now secured using HTTPS protocol.

Changes to Support for .NET Target Framework

When installing Service Pack 9.0.100, the .NET target frameworks under which protected applications are supported is modified. For details, see this [table](#).

Enhancements to Sentinel LDK Envelope and Data Protection Utility

The table below describes enhancements to Sentinel LDK Envelope and Sentinel LDK Data Protection utility.

Component	Description
Windows V3 protection engine	The advanced protection parameter Keep Debug Info has been implemented for the Windows V3 protection engine. When this parameter is set to True , debug information for the application is retained. (Default setting is False .) Note: For the Windows V3 engine, this functionality retains debug information for both executables and DLLs.
Envelope GUI for Windows	The Feature ID and Frequency columns have been added back to the data grids for .NET and Java.
Windows V3 protection engine	When you attempt to protect a program file with the V3 protection engine, Envelope now detects if the program file is already protected with the Windows NG engine. If the program is already protected, Envelope issues an error message and the operation fails.
Windows NG protection engine	When you attempt to protect a program file with the NG protection engine, Envelope now detects if the program file is already protected with the Windows V3 engine. If the program is already protected, Envelope issues an error message and the operation fails.
Windows V3 protection engine	When protecting a program file, Envelope now removes an existing Authenticode signature and logs a warning that the protected program file needs to be re-signed.
Linux Envelope	Linux Envelope for QT framework has been implemented.
Data File Protection for Linux	Data file protection now supports new file statistics functions of recent versions of glibc .

Release: 9.0

In this section:

> ["Enhancements to Sentinel LDK Envelope" on the next page](#)

- > ["Enhancements to Sentinel Run-time Environment Installer API" on the next page](#)
- > ["Enhancement to V-Clock for Sentinel SL Keys" on the next page](#)
- > ["RUS Branding Has Been Removed from Sentinel LDK-EMS GUI" on the next page](#)
- > ["Expiration Date Licenses Can Now Be Assigned a Start Date" on page 13](#)
- > ["Identity Strings Can Now Be Hidden" on page 13](#)
- > ["Rate Limiting for Cloud Licensing" on page 14](#)
- > ["Licensing REST API Is Now Available" on page 14](#)
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- > ["Improved Help System for Admin Control Center" on page 15](#)
- > ["Enhancement to the Run-time Environment Changes a Return Code in Admin API" on page 15](#)
- > ["FQDN Clone Protection Scheme Has Been Changed" on page 16](#)
- > ["Additional Changes to Sentinel LDK" on page 16](#)

Enhancements to Sentinel LDK Envelope

Sentinel LDK Envelope now supports the following functionality:

> **Enhanced V3 Engine**

The Windows V3 engine has been significantly enhanced to provide more robust and stable protection of Windows applications. As a result, Thales now recommends the use of the V3 engine as the engine of choice when protection applications.

The behavior of Sentinel LDK Envelope 9.0 is as follows:

- When you start Sentinel LDK Envelope 9.0 for the first time, by default the Windows engine used for applications in new projects is V3.
- If you open a project that was created in Sentinel LDK Envelope 8.5 or earlier, the protection engine in the Envelope Settings dialog box changes for that project to the setting that was in force when that project was created.

Once you manually change the Windows engine in the Settings dialog box and click OK, the engine you selected is applied for all applications that you add to any project, regardless of when the project was created.

> **Support for AppOnChip in the V3 Protection Engine**

The enhanced V3 protection engine now supports the use of AppOnChip functionality to protect applications that are licensed using HL (Driverless configuration) keys.

> Support for .NET 7

Sentinel LDK Envelope now supports .NET 7 applications.

Enhancements to Sentinel Run-time Environment Installer API

Sentinel Run-time Environment Installer API has been enhanced as follows:

- > The **haspds_Install** function has been enhanced to support forcing installation of the RTE with legacy drivers if required.

Enhancement to V-Clock for Sentinel SL Keys

The V-Clock in an SL key can now be set to a specific date and time, or to the date and time from the system clock on the machine where the V2C file is generated. This may be required, under certain circumstances, to re-enable a Feature that was blocked due to time-tampering.

NOTE Before applying a V2C file to reset the V-Clock using the system clock, the user should ensure that the system clock is set to the current date and time.

RUS Branding Has Been Removed from Sentinel LDK-EMS GUI

Support for RUS branding in Sentinel LDK-EMS has been changed as follows:

- > The functionality of generating a branded RUS executable has been removed from the Sentinel LDK-EMS user interface. (This functionality was available from the **Developer > RUS Branding** tab.)

This functionality has been replaced by a new standalone tool called **Sentinel RUS Generator**, which is available from the Sentinel LDK launcher. This tool can be used to generate a RUS utility executable that is associated with your Batch Code and that is customized with your company name and any additional text that you want to provide.
- > The branded RUS utility executable can no longer be downloaded from the Sentinel LDK-EMS Customer Portal when used to deliver licenses. Thales recommends that you provide a branded RUS utility executable as part of the software package that you deliver to your customers.

For more information, see [Sentinel RUS Generator](#).

Generation of executable files (EXE) that contain V2C data is no longer supported while producing protection key update entitlements.

Expiration Date Licenses Can Now Be Assigned a Start Date

When defining license terms for a Feature with an expiration date using Sentinel License Generation API, you can now optionally define a start date for the license.

For example: If you want to provide a customer with a 30-day license that expires on a specific date, you can deliver the license any time prior to the start date specified in the license. The customer will be able to use the license only from the specified start date.

NOTE By default, expiration date licenses can be used starting from 00:00:00 on the start date and expire at 23:59:59 on the expiration date. You can optionally specify different times in the license definition.

If no start date is specified, the license is active as soon as it is received and installed by the customer.

The start date is specified as an attribute of the expiration date tag. For example:

```
<expiration_date start_date="2023-06-01">2023-12-31</expiration_date>
```

The following limitations apply:

- > Requires Sentinel Run-time Environment 9.12 or later.
- > Only applicable for SL AdminMode and SL UserMode keys.
- > Currently, start date and expiration date are calculated based on UTC and may not use the date and time that the user expects. In an upcoming release, the client time zone will be considered during license generation to ensure that the expected date and time are used.

Identity Strings Can Now Be Hidden

Identity strings used by cloud licensing can now be hidden in Sentinel Admin Control Center and in the **hasplm.ini** file on licensed users' machines. This prevents licensed users from sharing their identity strings with other users.

When hidden, the identity string is replaced in the serveraddr string in Admin Control Center with "**".

Automatic detach remains supported even if the identity string is not visible in Admin Control Center or the hasplm.ini file.

Licenses that were detached before the identity string was hidden continue to be available without providing the identity.

For more information, see [Sentinel Admin API Reference](#).

Rate Limiting for Cloud Licensing

Sentinel Licensing API now supports rate limiting for cloud license managers. As a result, it is now possible to implement rate limiting for cloud license requests issued by protected applications on customers' machines. The use of rate limiting prevents overloading the license server and improves the user experience if licensed user interactions with the applications are generating an excessive number of requests to the license server. For more information, see [Sentinel Licensing API Reference](#).

Licensing REST API Is Now Available

This release introduces the Sentinel LDK Licensing REST API web service. This API is recommended for use with both cloud-based applications (Software-as-a-Service offerings) and local applications that run in a trusted environment. There is no need to embed or install Sentinel LDK Run-time Environment or License Manager.

Sentinel LDK Licensing REST API web service supports both HL keys and SL keys (including CL keys).

If your application runs locally in an untrusted environment, Thales recommends using Sentinel LDK Envelope, which wraps your application in a protective shield.

For more information, see [Sentinel Licensing REST API Reference](#).

Directories for Licensing API Have Been Renamed

The sample and API directories for Sentinel Licensing API in the Sentinel LDK installation have been renamed as follows:

From:

- > \Samples\Runtime\
- > \API\Runtime\

To:

- > \Sample\Licensing\
- > \API\Licensing\

These directories have been renamed for Windows, Linux, and Mac installation of Sentinel LDK. This change aligns the name of these directories from the legacy name of the API (that is, **Runtime API**) to the current name (**Licensing API**).

Enhancement to Sentinel Admin API

Access to Sentinel Admin API can now be restricted so that it is only available for users from the local network. This can be enforced using firewall rules. Administrator-level requests would be allowed only on a specific port or network interface (or both).

Admin Control Center Now Uses Session-Based Authentication

Password protection in Sentinel Admin Control Center now uses session-based authentication instead of basic authentication. This enhancement provides the option to log in securely from any machine without the need to configure a trusted client.

NOTE If you have configured Admin Control Center to require login credentials, a user name is now required. If you have not defined a user name, use **admin** (the default user name) to log in to Admin Control Center.

Improved Help System for Admin Control Center

The help system for Sentinel Admin Control Center has been significantly improved. This new help system is provided when the user is working with Run-time Environment 9.12 and later.

Until now, the help system was implemented using simple HTML pages with very little navigation assistance.

The new help system is displayed in an independent browser window and provides:

- > Context-sensitive help content
- > A navigation pane
- > Search capabilities
- > Improved formatting and readability

These improvements will better assist users in working with Admin Control Center.

Enhancement to the Run-time Environment Changes a Return Code in Admin API

Sentinel Admin API generated a misleading return code as described below.

Given the following circumstances:

- > The provided scope for the **sntl_admin_get** function to retrieve an identity list returns a null data set.
- > The installed Run-time Environment is version 8.43 or earlier.

The value for the return code was **0** (SNTL_ADMIN_STATUS_OK).

After you install Run-time Environment version 8.51 or later, in the same circumstances, the value for the return code is (SNTL_ADMIN_SCOPE_RESULTS_EMPTY).

This enhancement (SM-122852) was implemented with the release of Sentinel LDK 8.5 , but was not reported in the documentation.

FQDN Clone Protection Scheme Has Been Changed

Vendor library (vlib) 9.12 was released as part of the initial release of Sentinel LDK 9.0. Vlib 9.13 was released shortly afterward. The vlib is downloaded when you introduce any of your Vendor keys using the Sentinel LDK Master Wizard.

After upgrading to vlib 9.12 or 9.13, under certain circumstances, SL keys that are protected using the FQDN clone protection scheme on machines are detected as cloned.

This issue is resolved in vlib 9.15, which has now been released. Vendors for whom this issue is problematic should re-introduce their Vendor key to download vlib 9.15.

For more information and security considerations regarding the FQDN clone protection scheme, see the description of the FQDN scheme in the [Sentinel LDK Software Protection and Licensing Guide](#).

Additional Changes to Sentinel LDK

The Sentinel LDK High Availability for Cloud Licensing Configuration Guide has been incorporated into the Sentinel LDK Installation Guide. This configuration guide was formerly a standalone document.

Generation of Executable files (EXE) that contain V2C data is no longer supported when producing protection key update entitlements.

Installation and Upgrades

Visit the [Sentinel LDK download page](#) for the most recent versions of Sentinel LDK software and embedded documentation.

- > ["Service Pack: 9.0.200 " below](#)
- > ["Service Pack: 9.0.101 " below](#)
- > ["Service Pack: 9.0.100 " below](#)
- > ["Release: 9.0" on the next page](#)

Service Pack: 9.0.200

Service Pack 9.0.200 is available for Sentinel LDK on Windows platforms. The service pack is not applicable for Linux or Mac.

To install Service Pack 9.0.200, follow the instructions below for Service Pack 9.0.100 for Windows.

Service Pack: 9.0.101

Service Pack 9.0.101 is available for Sentinel LDK on Windows and Linux platforms. There is no service pack for Mac.

To install Service Pack 9.0.101, follow the instructions below for Service Pack 9.0.100.

Service Pack: 9.0.100

Service Pack 9.0.100 is available for Sentinel LDK on Windows and Linux platforms. There is no service pack for Mac.

For Windows

The Software Manager for Sentinel LDK will deliver this service pack to vendors who are currently using Sentinel LDK 9.0. The service pack is delivered to each Windows machine which is online and on which Sentinel Vendor Suite or Sentinel LDK-EMS is installed.

For Sentinel LDK-EMS (hosted by Thales) customers, the service pack is installed automatically by Thales.

To install the service pack for Sentinel LDK-EMS (on-premises) or for Sentinel Vendor Tools:

1. Click the **Install** button in the notification screen that is automatically displayed on the Windows machine where Sentinel LDK is installed. The updated product components and documentation are automatically installed.
2. If you do not see the notification screen, monitor the [Sentinel LDK download page](#) and see when updates are published. Open the update for Service Pack 9.0.100 and click the link provided for installing the service pack.

After installing the service pack for Sentinel-EMS on-premises, you must restart the **Sentinel LDK-EMS** Service.

NOTE After installation of the service pack, Thales recommends that you re-introduce your Vendor key in order to download the latest Licensing API, vlibs, and Sentinel Runtime Environment installers. For details, see the [Sentinel LDK Installation Guide](#). You can also download the latest Run-time Environment from the [Sentinel LDK download page](#).

For Linux

You can download the Sentinel LDK 9.0 for Linux package, including Service Pack 9.0.100, from the Thales website:

https://supportportal.thalesgroup.com/csm?id=kb_article_view&sys_kb_id=1d6107451b05d050f12064606e4bcbb0&sysparm_article=KB0021880

NOTE After installation, Thales recommends that you re-introduce your Vendor key in order to download the latest Licensing API, vlibs, and Sentinel Runtime Environment installers. For details, see the [Sentinel LDK Installation Guide](#). You can also download the latest Run-time Environment from the [Sentinel LDK download page](#).

Release: 9.0

In this section:

- > ["Installing Linux and Macs Packages" below](#)
- > ["Upgrading an Earlier Version of Sentinel LDK" on the next page](#)

Installing Linux and Macs Packages

Sentinel LDK files required for Linux and Mac platforms are available on the machine where Sentinel LDK for Windows is installed, under the following path:

`%ProgramFiles(x86)%\Thales\Sentinel LDK\Additional Platforms\`

Alternatively, you can download the relevant packages directly from the Thales website:

- > Linux: https://supportportal.thalesgroup.com/csm?id=kb_article_view&sys_kb_id=1d6107451b05d050f12064606e4bcbb0&sysparm_article=KB0021880
- > Mac: https://supportportal.thalesgroup.com/csm?id=kb_article_view&sys_kb_id=fc624f891b05d050f12064606e4bcb4e&sysparm_article=KB0021881

Upgrading an Earlier Version of Sentinel LDK

Instructions for upgrading from earlier versions of Sentinel LDK can be found in the [Sentinel LDK Installation Guide](#).

Considerations when upgrading Sentinel LDK:

- > When upgrading to Sentinel LDK 9.0 from Sentinel LDK v.7.3 through v.7.8, all non-English locales of Customer contacts and Channel Partner contacts in Sentinel LDK-EMS are converted to the English locale. If this issue is applicable to your installation of Sentinel LDK-EMS, make sure to read [this technical note](#) before upgrading to Sentinel LDK 9.0.

NOTE You can ignore this issue if all of your Customer contacts and Channel Partner Contacts are set up to use the English locale or if you are not upgrading Sentinel LDK-EMS.

- > The procedure for upgrading to Sentinel LDK 9.0 has been tested only for Sentinel LDK v.8.3 and later.

If you plan to upgrade from an earlier version of Sentinel LDK, please contact Technical Support to validate the upgrade scenario. (This applies whether you are upgrading Sentinel LDK Vendor Tools, Sentinel LDK-EMS, or both.)

Security Updates

For the latest information regarding any older or newly-discovered issues, see:

<https://cpl.thalesgroup.com/software-monetization/security-updates>

Reporting a Security Vulnerability

If you think you have found a security vulnerability, please report it to Thales using the links in:

<https://cpl.thalesgroup.com/software-monetization/security-updates>

Release: 9.0

There are no known security issues at the time of this release, and this release does not resolve any known security issues relating to Sentinel products.

Supported Platforms

The operating system versions listed in this section were tested by Thales and verified to be fully compatible with Sentinel LDK. Older operating system versions are likely to be compatible as well, but are not guaranteed. For reasons of compatibility and security, Thales recommends that you always keep your operating system up to date with the latest fixes and service packs.

Release: 9.0

In this section:

- > ["Sentinel LDK Run-time Environment and Protected Applications for End Users" below](#)
- > ["Web Browsers for Sentinel Admin Control Center" on page 26](#)
- > ["Sentinel LDK-EMS Service" on page 27](#)
- > ["Sentinel LDK-EMS Database" on page 27](#)
- > ["Web Browsers for Sentinel LDK-EMS" on page 27](#)
- > ["Sentinel LDK Vendor Tools " on page 28](#)
- > ["Vendor Library Version Dependency" on page 30](#)
- > ["Supported Platforms for Code Samples" on page 32](#)
- > ["Tested Compilers for Code Samples" on page 32](#)
- > ["Current Firmware Version" on page 35](#)

Sentinel LDK Run-time Environment and Protected Applications for End Users

Sentinel LDK Run-Time Environment version 9.12 is provided for Windows, Mac, and Linux (Intel and ARM) systems.

To support all of the latest enhancements in Sentinel LDK, and to provide the best security and reliability, end users should receive the latest Run-time Environment (*RTE*).

NOTE

- > When working with cloud licensing, Thales highly recommends that you always install the latest version of the RTE on the license server machine. (This is applicable for both vendors and customers who are hosting cloud licenses on their license server machine.)
If you downgrade the Run-time Environment after implementing cloud licensing, client identities or licenses may become unavailable. To resolve such issues, upgrade to the previously-installed RTE version or later.
- > Upgrading Sentinel LDK RTE to version 8.21 or later migrates existing SL AdminMode licenses to a new secure storage. Once this occurs, you cannot downgrade the RTE to an earlier version. Downgrading the RTE will make existing SL AdminMode licenses invalid.

For all pre-existing functionality in Sentinel LDK, earlier versions of the RTE are supported as follows:

> **When using customized vendor API libraries v.9.12 - version-restricted option:**

Whenever the RTE is required, Sentinel LDK RTE v.8.15 or later must be provided.

> **When using customized vendor API libraries v.9.12 - version-unrestricted option:**

The protected application does not check the version number of the RTE. Whenever the RTE is required, the RTE must be from a version of Sentinel LDK that supports the features that you are using to protect and license your applications.

For details, see "Required Version of the Run-time Environment" in the [Sentinel LDK Software Protection and Licensing Guide](#).

Sentinel LDK RTE, and protected applications (with or without the RTE), can be installed under the following systems:

System	Supported Versions
.NET	<p>Sentinel LDK 9.0 provides support for the following target frameworks:</p> <ul style="list-style-type: none">> .NET Framework: v2.0 - v4.8> .NET Standard: v2.1> .NET 5> .NET 6> .NET 7 <p>Sentinel LDK 9.0.100 or later provides support for the following target frameworks:</p> <ul style="list-style-type: none">> .NET Framework: v4.8> .NET 6> .NET 7 <p>Sentinel LDK 9.0.200 or later provides support for the following additional target framework:</p> <ul style="list-style-type: none">> .NET 8 <p>Protected applications that use the supported .NET frameworks are supported on the following platforms:</p> <ul style="list-style-type: none">> Windows (Win32 and x64)> Linux Intel (x86_64)> Linux ARMHF> Linux ARM64> Mac (only protected with Licensing API) <div><p>NOTE When protected with Envelope: .NET applications with platform-specific functionality such as Windows Forms and Windows Presentation Foundation (WPF) work only on Windows platforms.</p></div>

System	Supported Versions
Windows	<p>x86 and x64 versions of the following:</p> <ul style="list-style-type: none"> > Windows Server 2016 > Windows Server 2019 > Windows Server IoT 2019 > Windows Server 2022 > Windows Server IoT 2022 > Windows 10 IoT Enterprise 2019 LTSC > Windows 10 IoT Enterprise 2021 LTSC > Windows 10 22H2 > Windows 11 22H2 > Windows 11 ARM 22H2 (only protected with Licensing API) <div> <p>NOTE Support on Windows ARM machines with the ARM64-based processor:</p> <ul style="list-style-type: none"> > Sentinel LDK is supported via emulation. > Sentinel HASP keys and Sentinel HL (HASP configuration) keys are not supported. > Applications that are licensed with HASP4 or Hardlock keys are not expected to work. </div> <p>Note: Windows Insider Preview builds are not supported. The latest service packs and security updates must be installed.</p>
Mac	<ul style="list-style-type: none"> > macOS 11.7 Big Sur > macOS 12.6 Monterey > macOS 13.3 Ventura <div> <p>Support on Mac machines with the ARM64-based processor:</p> <ul style="list-style-type: none"> > Sentinel LDK is supported via Rosetta 2. > Sentinel Licensing API version 8.41 and later is supported natively. </div> <p>Note: The Sentinel Remote Update System (RUS utility) is not supported for Mac systems. To obtain a fingerprint, use Sentinel Admin Control Center.</p>

System	Supported Versions	
Linux	Linux Intel (x86-64)	<ul style="list-style-type: none">> OpenSUSE Leap 15.4> Red Hat EL 9.1> Ubuntu Server 20.04, 22.04> Ubuntu Desktop 20.04, 22.04> Debian 11.6> CentOS Stream 9 <p>The latest service packs and security updates must be installed.</p>
	Linux ARM 32-bit (armel and armhf)	<p>The following hardware/boards have been validated:</p> <ul style="list-style-type: none">> BeagleBone Black> Raspberry Pi-4> NI cRIO-9068
	Linux ARM 64-bit (arm64)	<p>The following hardware/board has been validated:</p> <ul style="list-style-type: none">> Qualcomm DragonBoard 410c
	Wine	Sentinel LDK RTE was tested on Linux platforms with Wine 8.0
Python	Python 2 and Python 3 applications can be protected using Sentinel LDK Envelope on a Windows or Linux platform.	

System	Supported Versions	
Android	Android ARM (32-bit)	Android 11.x, 12.x, 13.x
	Android ARM (64-bit)	Android 11.x, 12.x, 13.x
	Android Architecture	<p>The following architectures are supported:</p> <ul style="list-style-type: none"> > armv7 > armv7a > arm64
	Android ABI	<p>Sentinel LDK supports Android applications designed for the following Android application binary interfaces:</p> <ul style="list-style-type: none"> > armeabi > armeabi-v7a > arm64-v8a
Virtual Machines	<p>The VM detection and VM fingerprinting capabilities provided by Sentinel LDK have been validated on the following technologies:</p> <ul style="list-style-type: none"> > Parallels Desktop 18 for Mac > VMware Workstation 16 > VMware ESXi 6.7, 7.0 > Hyper-V Server 2019 (SL only) > Xen Project 4.17 > KVM (RHEL 9.1, Ubuntu 22.04 server, Debian 11.6) > Microsoft Azure > VirtualBox 7.0 > Docker (Linux) containers, including under Kubernetes > LXC containers > Amazon EC2 > GCP Compute Engine > Alibaba Cloud Elastic Compute Service 	

Web Browsers for Sentinel Admin Control Center

The latest versions of the following Web browsers are supported:

- > Microsoft Edge
- > Mozilla Firefox

- > Google Chrome
- > Safari

Sentinel LDK-EMS Service

This section describes requirements for Sentinel LDK.

Operating Systems

When installed on premises, Sentinel LDK-EMS Service is supported under the following operating systems:

System	Supported Versions
Windows	<p>x64 versions of the following:</p> <ul style="list-style-type: none">> Windows Server 2016> Windows Server 2019> Windows Server 2022> Windows 10 22H2> Windows 11 22H2 <p>Note: Windows Insider Preview builds are not supported. The latest service packs and security updates must be installed.</p>

Sentinel LDK-EMS Database

When installed on premises, the Sentinel LDK-EMS database is supported as follows:

System	Supported Database Server Software
Windows	<ul style="list-style-type: none">> Microsoft SQL Server 2016> Microsoft SQL Server 2017 Express> Microsoft SQL Server 2019 Express <p>Note: Microsoft SQL Server 2019 Express Edition can be installed automatically by the Sentinel LDK-EMS Installation wizard. The installer for this version of Microsoft SQL Server is also available on the Sentinel LDK installation drive.</p> <p>Limitations: The Express editions of Microsoft SQL Server provide a maximum relational database size of only 10 GB. For details, see https://learn.microsoft.com/en-us/sql/sql-server/editions-and-components-of-sql-server-2016?view=sql-server-ver16#deciding-among-components.</p>

Web Browsers for Sentinel LDK-EMS

The latest versions of the following web browsers are supported with both HTTPS and HTTP:

- > Microsoft Edge

- > Mozilla Firefox
- > Google Chrome

NOTE The Mac Safari Web browser is *not* supported for Sentinel LDK-EMS (both Vendor Portal and Customer Portal).

Tomcat and JRE for Sentinel LDK-EMS

When installed on-premises, Sentinel LDK-EMS is compatible with the following:

- > **Tomcat:** 9.0.73 or later
- > **JRE:** OpenJDK 8.362

Sentinel LDK Vendor Tools

Important! You must always install the latest version of the Sentinel RTE on the machines that you use to work with Sentinel LDK Vendor Tools and Sentinel LDK-EMS. (Under Windows, the RTE is installed automatically as part of the Sentinel LDK installation procedure.)

System	Supported Versions
Windows	<p>x64 versions of the following:</p> <ul style="list-style-type: none">> Windows Server 2016> Windows Server 2019> Windows Server 2022> Windows 10 22H2> Windows 11 22H2 <p>Note: Windows Insider Preview builds are not supported.</p> <p>The latest service packs and security updates must be installed.</p> <p>Display: Requires a minimum screen resolution of 1280 by 1024 pixels with 24-bit color quality.</p> <p>Note for Sentinel LDK Envelope: To protect and execute the provided .NET sample application under Windows 8.1 or Windows Server 2012 R2, you must install Microsoft .NET Framework 3.5.</p>

System	Supported Versions
Mac	<ul style="list-style-type: none"> > macOS 12.6 Monterey > macOS 13.3 Ventura <div> <p>For Mac machines with the ARM64-based processor: Vendor Tools (Envelope, Data Protection utility) are supported using the Rosetta 2 emulator. For more information on support for Envelope, see Support for Rosetta 2 Emulation.Sentinel LDK Envelope for Mac</p> </div> <p>Applications built on the Cocoa framework are supported.</p> <p>Web Browsers for Sentinel Vendor Tools Help Systems:</p> <ul style="list-style-type: none"> > Mozilla Firefox > Mac Safari with configuration option Cross-Origin Restriction disabled. (This option can be accessed from the Developer menu.)
Linux Intel	<p>Sentinel LDK Envelope for Linux and Master Wizard for Linux are supported on the x86-64 version of the following distributions of Linux:</p> <ul style="list-style-type: none"> > OpenSUSE Leap 15.4 > Red Hat EL 9.1 > Ubuntu Server 22.04 > Ubuntu Desktop 22.04 > Debian 11.6 > CentOS Stream 9 <p>The latest service packs and security updates must be installed.</p>
Linux ARM	<ul style="list-style-type: none"> > ARM 32-bit > ARM 64-bit <p>Sentinel LDK Envelope for Linux (on a Linux Intel platform) can protect applications that will run on ARM 32-bit and ARM 64-bit platforms.</p>
Android	Android ARM platforms
Java	Java 8

Vendor Library Version Dependency

Your customized Vendor libraries (**haspplib_<vendorID>.***) are downloaded each time that you introduce one of your vendor keys to Sentinel LDK. You should re-introduce one of your vendor keys each time that you upgrade to a new version of Sentinel LDK.

This section describes dependencies for each version of the vendor libraries.

- > **When using the Admin License Manager:** The version of the RTE should normally be equal to or later than the version of the customized Vendor library unless specified otherwise (see rows below with multiple Vendor Library versions). For example:

Vendor Library Version	Required Run-time Environment Version
7.100	7.100 or later
8.11	8.11 or later
8.13	8.13 or later
8.15	8.15 or later
8.21	8.21 or later
8.23	8.23 or later
8.31, 8.32, 8.34	8.31 or later
8.41	8.41 or later
8.51	8.51 or later
9.12, 9.13, 9.15	9.12 or later

NOTE A given version of the Vendor library is compatible with newer versions of the RTE. However, to support the enhancements in a given version of the RTE, the equivalent version of the Vendor library may be required.

- > **When using the External License Manager (hasp_rt.exe):** The following table indicates the version dependency of the customized Vendor library:

Vendor Library Version	Required External License Manager Version
7.100	23.0
8.11	24.0

Vendor Library Version	Required External License Manager Version
8.13	24.2
8.15	24.4
8.21	25.0
8.23	25.2
8.31, 8.32, 8.34	26.0
8.41	27.0
8.51	28.0
9.12, 9.13, 9.15	29.1 or later

NOTE Make sure that the Vendor library and External License Manager versions are synchronized according to the table.

You can download the latest External License Manager from the **Sentinel LDK Runtime & Drivers** link at: <https://cpl.thalesgroup.com/software-monetization/sentinel-drivers>

- > **When using the Integrated License Manager:** Your customized Vendor library is not required, so there is no version dependency.
- > **When using high-availability for cloud licensing:** The Vendor library version must be in sync with the LMS version. Older Vendor libraries are not supported.

The following table lists the supported versions of the Vendor libraries and the matching LMS (Run-time Environment) version:

Vendor Library Version	Matching LMS (Run-time Environment) Version
8.31, 8.32, or 8.34	8.31
8.41	8.41
8.43	8.43
8.51	8.51, 8.52, 8.53, 8.54
9.12, 9.13, 9.15	9.12 or later

Supported Platforms for Code Samples

The code samples are supported on the same platforms as listed for ["Sentinel LDK Vendor Tools " on page 28.](#)

NOTE The **hasp_net_windows.dll** provided in the Licensing API vb.net and C# samples for Windows has been compiled with .NET Framework 4.5.

To work with this DLL, .NET Framework 4.5 or later must be installed on your machine.

Prior to Sentinel LDK v.7.4, this DLL was compiled with .NET Framework 2.0, which is now known to contain security vulnerabilities. Because of these vulnerabilities, Thales highly recommends that you upgrade to .NET Framework 4.5 or later.

If you do not want to upgrade your old .NET Framework, you can obtain and use the **hasp_net_windows.dll** for Windows from a Sentinel LDK release earlier than v.7.4. To obtain an earlier version of Sentinel LDK, contact Technical Support.

Tested Compilers for Code Samples

API	Programming Language	Tested Compilers
Licensing API for Windows	AutoCAD	AutoCAD 2020, 2021, 2022
	C	Microsoft Visual Studio 2019, 2022
	Visual Basic .NET	Microsoft Visual Studio 2019, 2022
	C#	Microsoft Visual Studio 2019, 2022
	C++	Microsoft Visual Studio 2019, 2022 GCC
	Delphi	Delphi 11.3
	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
	C# - .NET	.NET 6, .NET 7
	Note: An application linked with libhasp_windows_bcc_vendorId.lib always requires Sentinel LDK RTE on the machine.	

API	Programming Language	Tested Compilers
Licensing API for macOS	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
	C	Clang 12.0.0 or later Xcode 12.0 or later
	C# - .NET	.NET 6, .NET 7
Licensing API for Linux	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
	C	GCC
	C++	GCC
	C# - .NET Core	.NET 6, .NET 7
Licensing API for Android	Java	Oracle JDK 1.8
License Generation API for Windows	C, C#, Visual Basic .NET	Microsoft Visual Studio 2019, 2022
	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
License Generation API for Linux	C	GCC
Activation Sample Calling Web Services for Windows	C	Microsoft Visual Studio 2019, 2022 You may need to convert the provided workspace for the VS version used.
	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17

API	Programming Language	Tested Compilers
Activation Sample Calling Web Services for macOS	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
Activation Sample Calling Web Services for Linux	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
Runtime Environment Installer	C	Microsoft Visual Studio 2019, 2022
	MSI	InstallShield 12 InstallShield 2013 or later
Admin API for Windows	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
	C, C#, C++, Visual Basic .NET	Microsoft Visual Studio 2019, 2022
	C# - .NET Standard	.NET 6, .NET 7
Admin API for Linux	C	GCC
	C# - .NET Standard	.NET 6, .NET 7
Admin API for macOS	C	Clang 12.0.0 or later Xcode 12.0 or later
	C# - .NET	.NET 6, .NET 7
Envelope .NET Runtime API	C#	Microsoft Visual Studio 2019, 2022
Java Envelope Configuration API	Java	Oracle JDK 1.8 Oracle JDK 17 OpenJDK 17
Licensing Rest API for Windows	Java	Oracle JDK 1.8 Oracle JDK 17 Open JDK 17

API	Programming Language	Tested Compilers
Licensing Rest API for Linux	Java	Oracle JDK 1.8 Oracle JDK 17 Open JDK 17
Licensing Rest API for macOS	Java	Oracle JDK 1.8 Oracle JDK 17 Open JDK 17

Current Firmware Version

The table that follows indicates the firmware version on Sentinel HL keys when Sentinel LDK was released.

Sentinel LDK Version	Firmware Version on...		
	Sentinel HL (Driverless Configuration) Keys	Sentinel HL (HASP Configuration) Keys	(Legacy) Sentinel HASP Keys
8.5, 9.0	4.x Firmware keys: 4.60 or 4.70 4.x Firmware keys with microSD: 4.61 6.x Firmware keys: 6.09	4.x Firmware keys: 4.35 or 4.70 6.x Firmware keys: 6.09	3.25
8.2, 8.3, 8.4	4.x Firmware keys: 4.60 4.x Firmware keys with microSD: 4.61 6.x Firmware keys: 6.09	4.x Firmware keys: 4.35 6.x Firmware keys: 6.09	3.25
8.0	4.x Firmware keys: 4.60 4.x Firmware keys with microSD: 4.61 6.x Firmware keys: 6.08	4.x Firmware keys: 4.35 6.x Firmware keys: 6.08	3.25
7.8, 7.9, 7.10	4.54	4.33	3.25
7.6, 7.7	4.53	4.33	3.25
7.5	4.27	4.27	3.25

To determine the version of the firmware for any given Sentinel HL key, connect the key to a computer where Sentinel LDK RTE is installed. View the list of keys in Admin Control Center.

- > If the firmware version on a given Sentinel HL (HASP configuration) key is earlier than 4.60, the firmware is automatically upgraded when you upgrade the key to Sentinel HL (Driverless configuration). The firmware is upgraded to the latest version (based on the version of the License Generation libraries in use).

This upgrade affects the firmware only—Sentinel LDK functionality remains unchanged. This upgrade is not relevant for HL Drive microSD keys.

- > If the firmware on a Sentinel HL (Driverless configuration) key is earlier than 4.27, then the first time you assign concurrency to a license on the key, the firmware on the key is automatically upgraded to the latest version (based on the version of the License Generation libraries in use).

Documentation

This section describes the documentation provided with Sentinel LDK.

Online Documentation

Most Sentinel LDK documentation can be found online at:

<https://docs.sentinel.thalesgroup.com/ldk/home.htm>

Locally Installed Documentation

The Sentinel LDK documentation described below is placed on the local machine where Sentinel LDK is installed.

Software Protection and Licensing

Sentinel LDK documents can be found where Sentinel LDK is installed, under:

%ProgramFiles(x86)%\Thales\Sentinel LDK\Docs

Document	Description
Sentinel LDK with Sentinel LDK-EMS – Installation Guide	Details the prerequisites and procedures for installing Sentinel LDK Vendor Tools, Sentinel LDK-EMS Server (only for Sentinel LDK-EMS on-premises), launchers for Sentinel LDK-EMS, and the Run-time Environment.
Sentinel LDK Software Protection and Licensing Guide	Familiarize you with the Sentinel LDK applications and their functionality. This guide provides in-depth information about the logic of the applications and best practices for maximizing your software protection and licensing strategies. The guide describes a wide range of licensing strategies and models that you can implement, and can serve as the basis for elaboration and for creating new, tailor-made licensing models.
Sentinel LDK: Choosing and Integrating Hardware-, Software-, and Cloud Licensing	Provides a description of the differences and advantages of SL and cloud-based protection keys versus HL keys.

Tutorials and Quick Start Guides

Learn how to work with Sentinel LDK and familiarize yourself with the various components that let you protect and license your software. Get your free Sentinel LDK Demo Kit package or downloadable demo from your Thales sales representative

Document	Description
Sentinel LDK Software Protection and Licensing Tutorials	<p>Familiarize you with the Sentinel LDK applications and their functionality.</p> <ul style="list-style-type: none">> The Demo Kit tutorial is for vendors that want to evaluate Sentinel LDK.> The Starter Kit tutorial is for vendors that have already purchased Sentinel LDK. <p>Two versions of each tutorial are provided – one for working with Sentinel LDK-EMS as the back office system, and one for vendors who want to provide their own back office system and only use the Sentinel LDK APIs to handle licensing and protection.</p>
Sentinel LDK Quick Start Guide	Provide a short and simple demonstration of how you can easily protect your software using Sentinel HL keys.

Migration Guides

The following guides describe how to migrate to Sentinel LDK from earlier products.

Document	Description
Guides for Migrating to Sentinel LDK	<p>These guides describe how to migrate to Sentinel LDK from:</p> <ul style="list-style-type: none">> Hardlock> SmartKey> Sentinel SuperPro> HASP HL> HASP4> Sentinel Hardware Keys

Sentinel LDK-EMS

Sentinel LDK-EMS documents can be found where Sentinel LDK-EMS is installed, under:

%ProgramFiles(x86)%\Thales\Sentinel LDK-EMS\EMSServer\webapps\ems\Docs

Sentinel LDK-EMS Configuration Guide	Provides information on setting up and configuring Sentinel LDK-EMS to satisfy the requirements of your organization.
Sentinel LDK-EMS User Guide	Provides the Sentinel LDK-EMS user with detailed directions on how to set up license entities and how to handle entitlements, production, and support for Sentinel HL and SL keys. (This information is also provided in online help for the Sentinel LDK-EMS user interface.)
Sentinel LDK-EMS Web Services Guide	Provides the developer with an interface for integrating Sentinel LDK-EMS functionality into the vendor's existing back-office systems.
Integrating Sentinel LDK-EMS Server Into Your Existing Back-Office Systems	Outlines the many ways that software vendors can maximize the potential of their existing back-office systems, such as ERP, CRM, and business intelligence systems, through seamless integration with Sentinel LDK-EMS Server. This guide can be found where Sentinel LDK is installed, under: %ProgramFiles(x86)%\Thales\Sentinel LDK\Docs\

Getting Started Guides for Non-Windows Platforms

Getting Started Guides for Sentinel LDK under non-Windows operating systems can be found as follows:

Document	Location
Getting Started Guide for Linux	In the Linux download, or where Sentinel LDK is installed, under: %ProgramFiles(x86)%\Thales\Sentinel LDK\Additional Platforms\Linux\
Getting Started Guide for macOS	In the Mac download, or where Sentinel LDK is installed, under: %ProgramFiles(x86)%\Thales\Sentinel LDK\Additional Platforms\MacOS\
Getting Started Guide for Android	Where Sentinel LDK is installed, under: %ProgramFiles(x86)%\Thales\Sentinel LDK\Additional Platforms\Android\

Sentinel LDK and Sentinel LDK-EMS User Interfaces

The documentation described in the table that follows can be accessed from the user interface for the relevant Sentinel LDK component.

Document	Description
Sentinel Admin Control Center User Guide	Documentation for the end user, describing Sentinel Admin Control Center and providing instructions for performing the various functions such as updating or attaching licenses.
Sentinel LDK-EMS User Guide	Provides the Sentinel LDK-EMS user with detailed directions on how to set up license entities and how to handle entitlements, production, and support for Sentinel HL and SL keys.
Sentinel LDK Data Encryption Utility User Guide (Separate versions for Windows and for Mac)	Provides the developer with a description of the Sentinel LDK Data Encryption utility (formerly DataHASP utility), used for protecting data files that are accessed by Sentinel LDK Envelope.
Sentinel LDK Envelope User Guide (Separate versions for Windows, macOS, and Linux)	<p>Describes how to employ Sentinel LDK Envelope to automatically wrap your programs with a protective shield. The application provides advanced protection features to enhance the overall level of security of your software.</p> <p>The user guide for Linux can be found in the Linux download, or where Sentinel LDK is installed, under: %ProgramFiles (x86)%\Thales\Sentinel LDK\Additional Platforms\Linux\Docs\Manuals & Tutorials.</p>
Sentinel LDK ToolBox	Describes how to work with the ToolBox user interface for the Licensing API, License Generation API, and Admin API. Using Sentinel LDK ToolBox, the developer can experiment with the individual functions that are available in each API and can generate programming code for insertion in the developer's own program. Provides full documentation for each of the included APIs.

Sentinel LDK APIs

Documentation for the Sentinel LDK APIs described below can be found where Sentinel LDK is installed, under:
%ProgramFiles(x86)%\Thales\Sentinel LDK\API

Sentinel LDK API	Description
Admin API Reference	Provides the functionality available in Admin Control Center and Sentinel License Manager in the form of callable API functions.
Licensing API Reference (formerly Run-time API)	Provides the developer with an interface to use the licensing and protection functionality available in the Sentinel LDK Run-time Environment.
Run-time Installer API	Provides the developer with an interface for integrating installation of the Run-time Environment into the installation of the vendor's protected application.
License Generation API Reference	Provides access to the power and flexibility of Sentinel protection keys without the need to use Sentinel LDK-EMS. The developer can call functions in this API to generate and update licenses for Sentinel protection keys.

Resolved Issues

- > ["Service Pack: 9.0.200 " below](#)
- > ["Service Pack: 9.0.101 " on the next page](#)
- > ["Service Pack: 9.0.100 " on the next page](#)
- > ["Release: 9.0 " on page 45](#)

Service Pack: 9.0.200

The following issues that were reported by vendors were resolved in this release.

Reference	Resolved Issue	Components
SM-154180	The Windows V3 engine was not compatible with certain modern CFG (control flow guard) flags.	Envelope
SM-154421	The assembly resolver did not fully support multibyte unicode characters in the input path when a runtimeconfig.json had to be processed.	Envelope
SM-154877	Under certain unusual circumstances, an application protected with the Windows V3 engine would fail.	Envelope
SM-149829	It was possible to re-open a completed entitlement using web services.	LDK-EMS
SM-151501	<p>Given the following circumstances:</p> <ol style="list-style-type: none">1. Sentinel LDK-EMS is configured to include the customer name in the License File Name Format parameter.2. A customer is defined in Sentinel LDK-EMS with non-Unicode characters in the customer name.3. An entitlement is generated for the customer, and the license is activated.4. The generated V2C or V2CP file is downloaded. <p>The generated file was named "downloadV2CFile.html" instead of containing the relevant customer name.</p>	LDK-EMS

Reference	Resolved Issue	Components
SM-153693	In Sentinel LDK-EMS 9.0, the Map button (under the Product Catalog page) for protection key memory was no longer accessible for products that were deployed under earlier versions of Sentinel LDK-EMS.	LDK-EMS
SM-149256	An exception was sometimes triggered while LDK-EMS was handling multiple requests at the same time, possibly resulting in a login failure.	LDK-EMS

Service Pack: 9.0.101

The following issues that were reported by vendors were resolved in this release.

Reference	Resolved Issue	Components
SM-154454	After Service Pack 9.0.100 is installed, Sentinel LDK-EMS would fail to send scheduled reports and fail to send email notification for Master licenses.	LDK-EMS

Service Pack: 9.0.100

The following issues that were reported by vendors were resolved in this release.

Reference	Resolved Issue	Components
SM-130336	Under certain circumstances, attempting to check in a C2V file would result in the error Unable to find Vendor with ID {0} .	LDK-EMS
SM-139221	Under certain circumstances, clicking Produce for an entitlement that had already been produced and then returned to the Draft status would result in an internal error.	LDK-EMS
SM-140816	Under certain circumstances, the Produce & Push action would result in a failed operation.	LDK-EMS
SM-140864	The Master Wizard was not able to handle downloads for two Batch Codes simultaneously.	Master Wizard

Reference	Resolved Issue	Components
SM-142350	When Envelope is used to protect a python application that utilizes multiprocessing, under certain circumstances a STATUS_SHARING_VIOLATION error would occur.	Envelope
SM-145299	Envelope would fail while attempting to protect an application with a large number of PE import entries.	Envelope (Windows V3 engine)
SM-145354	The Generate License popup was not displayed when a user clicked the Offline Activation button in the Customer Portal.	LDK-EMS (On-Premises)
SM-145697	When adding products to an existing entitlement, the Product Selection list would include products that were already included in the entitlement.	LDK-EMS
SM-146621	The LMS would fail when installing a license if the following conditions exist: <ul style="list-style-type: none"> > The V2C file contains customer info and readable=no. > The fingerprint for the license was generated with an RTE version earlier than 8.5. 	License Manager Service
SM-146982	The RUS Generator did not handle and tags correctly.	RUS Generator
SM-147165	The Thales application logo height in the user interface was incorrect.	LDK-EMS
SM-148116	When searching for a company customer in entitlement creation, the default contact email was not selected.	LDK-EMS
SM-148134	An unhandled exception could not be detected by native code when a .NET application protected by WinShell.	Envelope (Windows NG engine)
SM-148898	Envelope .NET runtime signature check would fail on CentOS Stream 9.	Envelope
SM-149538	Need more condition check for Electron application.	Envelope (Windows NG engine)

Reference	Resolved Issue	Components
SM-150927	When introducing a Master (USB) key in Master Wizard, the folder name had been changed from Runtime to Licensing. but the required corresponding change had not been implemented in Envelope for copying the Linux/ARM libhasp*.so files to the output folder.	Envelope for Linux
SM-151318	The error "double free or corruption" would occur when exiting a class level-protected jar.	Envelope for Linux
SM-151938	Advanced debugger detection did not work correctly for certain DLLs.	Envelope (Windows V3 engine)
SM-154411	When an application that is protected with AppOnChip is run where the application can access a network HL key, the application would fail and return the message "Sentinel key not found."	Envelope (Windows V3 engine)

Release: 9.0

The following issues that were reported by vendors were resolved in this release.

Reference	Resolved Issue	Components
SM-97018	.NET Envelope runtime now supports dynamic GUI behavior. Error output of a .NET Envelope protected application now only outputs the error in the GUI when a GUI is available. If no GUI is supported, messages are automatically recorded in a console/eventlog.	Envelope-.NET
SM-119258	Sentinel LDK-EMS Web Services did not support adding dynamic memory files to Products.	Sentinel LDK-EMS
SM-132023	Resolved an issue with a manually-changed Envelope project file with AppOnChip enabled. Loading this special Envelope project file and re-enabling AppOnChip would sometimes cause the Envelope GUI to fail.	Envelope-GUI-Win
SM-132368	The combination of Sentinel Maze and WinNG Envelope protection would sometimes lead to an "integrity error" at runtime.	Envelope-NG

Reference	Resolved Issue	Components
SM-134020	Under certain circumstances, UDP packets may be lost. Broadcast search now repeats the UDP transmission multiple times to overcome the loss of UDP packets.	Run-time Environment/API
SM-134453	An issue with DFP encrypted AI model files that could cause an application crash has been resolved.	Envelope-DataHASP, Envelope-Linux
SM-136775	The License Manager was not able to keep track of more than 2,000 clients' LM identifiers. This could result in incomplete information when listing detached licenses in the server Admin Control Center pages. The limitation of 2,000 LM identifiers has been removed.	Sentinel License Manager
SM-137163	An issue which could lead to an application freeze after Envelope protection has been resolved. This issue would occur due to a deadlock when calling memcpy() in a secondary thread while loading the engine via dlopen().	Envelope-Mac
SM-139455	An issue with "large address" awareness of the Envelope command line application has been resolved. This issue would occur under very specific circumstances if the address space is already largely packed.	Envelope-GUI-Win
SM-139869	Previously, when a proxy was configured in ACC, the LM would attempt to resolve DNS names, even if they were not resolvable in the local network. This resulted in connection failures. Now, when a proxy is defined in ACC, the LM no longer attempts to resolve DNS names. Instead, it allows the proxy to handle DNS resolution.	Sentinel License Manager
SM-139963	When a seat was detached from a license with no vendor name defined, the H2R file would contain invalid information in the vendor name field.	Sentinel License Manager
SM-140043	Under certain circumstances, licenses protected with the FQDN clone protection scheme were marked as cloned after updating the vendor library (vlib) to version 9.12 or 9.13. This issue is resolved after upgrading to vlib 9.15 or later.	Sentinel License Manager

Reference	Resolved Issue	Components
SM-140200	Sentinel Admin API was not able to retrieve client identity information when the client identity was defined with multiple key IDs and admin_get was called using a specific key ID in the scope.	Sentinel Admin API
SM-141007	<p>If the session username contains the "&" character, the GetInfo function would report the value in the XML structure as specified, resulting in an invalid XML file. For example:</p> <pre><session username="AB&C" /></pre> <p>Now, the character is reported back as an XML entity. For example:</p> <pre><session username="ABamp;C" /></pre>	Sentinel Licensing API
SM-141419	Support of asynchronous I/O in the file copy function of Windows update KB5022913 has been added.	Envelope-DataHASP, Envelope-NG
SM-141837	Envelope support for Qt Plugin DLLs in Windows V3 has been added.	Envelope-V3

Known Issues and Workarounds

The known issues in Sentinel LDK 9.0 that are likely to have the most significant impact on users are listed below, according to component.

Additional, less-common issues can be found [here](#).

In this section:

- > "Sentinel LDK Installation and Software Manager" below
- > "Sentinel LDK-EMS" on the next page
- > "End Users, Sentinel LDK Run-time Environment, License Manager, and Customer Tools" on the next page
- > "Sentinel LDK Envelope and Data Encryption for Windows Platforms" on page 52
- > "Sentinel LDK Envelope and Data Encryption for Linux" on page 56
- > "Sentinel LDK Envelope, Data Encryption, and Licensing API for macOS" on page 57

Sentinel LDK Installation and Software Manager

Ref	Issue
SM-35287	<p>When upgrading from Sentinel LDK v.7.3 through v.7.8 to Sentinel LDK v.7.10, all non-English locales of Customer contacts and Channel Partner contacts in Sentinel LDK-EMS are converted to the English locale.</p> <p>Note: You can ignore this issue if all of your Customer and Channel Partner contacts are set up to use the English locale or if you are not upgrading Sentinel LDK-EMS.</p> <p>Workaround: A solution for this issue is provided in the technical note available here.</p>
SM-109765	<p>Under Windows 11, notifications from Sentinel LDK regarding software updates are not being delivered to vendors by the software manager (Sentinel Up).</p> <p>Workaround: Monitor the Sentinel LDK download page and see when updates are published.</p> <p>You can also subscribe to this page (article KB0021845) to receive notifications: https://supportportal.gemalto.com/csm?id=kb_article_view&sys_kb_id=c2241c1d1bb41890f12064606e4bcb3e&sysparm_article=KB0021845</p>

Sentinel LDK-EMS

Ref	Issue
SM-12832	<p>When a user clicks the link provided in an email (that is sent by Sentinel LDK-EMS) to display a scheduled report, the report is not displayed when the DNS server cannot resolve the server hostname present in the link. Instead, the message "This page can't be displayed" is shown.</p> <p>Workaround: In the etc/host file on the user's machine, add an entry that contains the hostname and IP address of the Sentinel LDK-EMS machine.</p>
SM-19045	<p>Customers who were associated with a channel partner prior to Sentinel LDK 7.7 will not be visible in Sentinel LDK-EMS to the relevant Channel Partner user. However, the Channel Partner user will not be able create a new entry for an existing customer with the same email address as already exists in the EMS database. In this situation, the Channel Partner user will not be able to fulfill an entitlement for the customer.</p> <p>Workaround: If the Channel Partner user cannot create the required customer in Sentinel LDK-EMS, the software vendor should handle the fulfillment of the entitlement for the customer.</p>
SM-108638	<p>After you upgrade to the latest version of Google Chrome or to Microsoft Edge version 95 or later, functionality related to protection keys is blocked if you access Sentinel LDK-EMS using HTTP mode. This applies to both the vendor portal and the customer portal.</p> <p>Workaround: Switch Sentinel LDK-EMS to HTTPS mode.</p>
SM-52262	<p>After you introduce or update a Master Key, you must notify all Sentinel LDK-EMS users to log off and log on again to get the latest changes.</p>
SM-68428	<p>When you generate a product key entitlement in Sentinel LDK-EMS, the customer does not receive the entitlement certificate email if the customer contact locale is not specified.</p> <p>Workaround: Specify the locale for the customer.</p>

End Users, Sentinel LDK Run-time Environment, License Manager, and Customer Tools

Ref	Issue
	<p>The Sentinel Remote Update System (RUS utility) is not supported for Mac systems.</p> <p>Workaround: To obtain a fingerprint, use Sentinel Admin Control Center.</p>

Ref	Issue
SM-116811	<p>When installing a different version of Sentinel LDK Run-time Environment (RTE) over an existing version on a Linux platform, the newly-installed hasplmd daemon is typically started automatically. However, in the following instances, the hasplmd daemon is not started automatically:</p> <ul style="list-style-type: none"> > When upgrading RTE version 8.13 or earlier to RTE version 8.15 or later <p>OR</p> <ul style="list-style-type: none"> > When downgrading RTE version 8.15 or later to RTE version 8.13 or earlier <p>Workaround: After installing the desired version of the RTE, do either of the following:</p> <ul style="list-style-type: none"> > Install the desired version of the RTE a second time. After performing the second installation, the hasplmd daemon starts automatically. <p>OR</p> <ul style="list-style-type: none"> > Start the hasplmd daemon manually by entering the command: systemctl start hasplmd
SM-94994	<p>Given the following circumstances:</p> <ul style="list-style-type: none"> > An RTE without legacy drivers is installed on a new machine. > An RTE with legacy drivers is installed afterward on the machine. <p>An application that requires an RTE with legacy drivers will not operate successfully. During installation of the RTE with legacy drivers, no warning or error is generated.</p> <p>Workaround: Using Admin Control Center, generate a diagnostic report, and contact Thales Technical Support.</p>
SM-82475	<p>Given the following situation:</p> <ul style="list-style-type: none"> > When the current state of an SL key is decoded (using SL License Generation API), the status of the container is shown as Secure Storage Id Mismatch in the Key ID column. > The key contains a Product that is rehostable or detachable OR the Product license type is Executions or Expiration Date. <p>If the SSID (secure storage ID) of the container changes (for example, the container becomes corrupted or is deleted), the Product will be marked as Cloned and become unusable. In any other situation, the status Secure Storage Id Mismatch has no significance and can be ignored.</p>

Ref	Issue
SM-76660	<p>Given the following circumstances:</p> <ol style="list-style-type: none"> 1. Windows is installed on a Mac machine with Boot Camp. 2. An SL license is installed in the Windows system. <p>The Secure Storage ID may change and cause Feature ID 0 to be flagged as "cloned".</p> <p>Workaround: Do not install the SL license in the Windows system. Have your application consume a network seat from a cloud license.</p>
SM-70131	<p>The Sentinel LDK License Manager (process hasplms.exe) hangs intermittently and reaches a very high CPU utilization (approximately 1.9 GB).</p> <p>Workaround: Protect the application using the latest API libraries and, if the RTE is required on the end user's machine, upgrade to the most recent RTE.</p>
SM-59868	<p>An application linked with libhasp_windows_bcc_vendorld.lib requires Sentinel LDK Run-time Environment on the machine.</p>
SM-546	<p>Given the following circumstances:</p> <ul style="list-style-type: none"> > A protected application was created using Visual Studio 2015 > Control Flow Guard is explicitly enabled in Visual Studio. > The application links statically or dynamically with Sentinel Licensing API. > The External License Manager (hasp_rt.exe) is not used. > The application is run under Windows 10, or Windows 8.1 Update (KB3000850). (Not all Windows 8.1, only recent ones) <p>The protected application may fail.</p> <p>Workaround: Include the External License Manager (hasp_rt.exe) with the protected application.</p>
LDK-14971	<p>Given the following circumstances at a customer site:</p> <ul style="list-style-type: none"> > One machine has Run-time Environment version 7.51. > A second machine has a version of Run-time Environment that is earlier than v.7.51. > The customer performs rehost of a license repeatedly between the two machines. > An update is applied to the license on either of these machines. <p>A rehost operation may fail with the message HASP_REHOST_ALREADY_APPLIED.</p> <p>Workaround: Obtain a new SL license from the software vendor for the protected application on the target machine. Before attempting any additional rehost procedure, install the latest Run-time Environment on both machines.</p>

Ref	Issue
LDK-12547	<p>Under Linux, if the user is running a Windows 64-bit protected application using Wine with default options, Linux may return a "debugger detected" error.</p> <p>Workaround: When you protect the application using Envelope, disable User debugger detection for the application. (Note that disabling debugger detection reduces the overall security of the application.)</p>
LDK-10670	<p>After a user connects a Razer Abyssus mouse and installs Razer drivers on a computer, the device manager on the computer does not recognize a Sentinel HL key if the key is connected to the same USB port where the mouse was previously connected.</p> <p>This issue has been reported to Razer.</p>
LDK-9044	<p>Given the following circumstances:</p> <p style="padding-left: 40px;">A Sentinel HL (Driverless configuration) key is connected to a USB host controller in default mode on QEMU emulator version 2.0.0 and Virtual Machine Manager version 0.9.5.</p> <p>When the key is disconnected, the key continues to be displayed in Admin Control Center as a connected key. (However, a protected application whose license is located in the key does not execute after the key is disconnected.)</p> <p>Workaround: Switch the USB controller to USB 2.0 mode.</p>
LDK-8480	<p>With some new USB chipsets, it is possible that the hasp_update() API call, used to update the firmware of Sentinel HL keys to version 3.25, will generate the HASP_BROKEN_SESSION return code, even if the firmware is correctly updated. (This issue does not occur with Sentinel HL Driverless keys with firmware version 4.x.)</p> <p>Workaround: Install the latest Run-time Environment. The automatic firmware update feature of the License Manager will automatically update the firmware of the key the first time that the key is connected, without the need to call hasp_update().</p>

Sentinel LDK Envelope and Data Encryption for Windows Platforms

General

Ref	Issue
LDK-11727	<p>Debugger detection is not provided for .NET applications.</p> <p>Workaround: Implement debugger detection mechanism in the application code, and use Envelope to protect the methods that call these functions.</p>

Ref	Issue
LDK-11191	When a protected application is run under Novell ZENworks Agent, the application may generate "Debugger Detected" errors and may fail to run. This is because ZENworks Agent attaches to the started application as a debugger in order to monitor different events.
LDK-6695	When a "Debugger Detected" error is generated, it is not possible for the protected application to determine which process is regarded as a debugger.
LDK-8850	When a protected application detects that a debugger is attached, the application may generate multiple "Debugger Detected" message windows.
SM-58676	<p>Given the following circumstances:</p> <ol style="list-style-type: none"> 1. Install SL AdminMode licenses on your local machine. 2. Run IObit Advanced SystemCare Ultimate 12 to clean and optimize your machine. 3. Restart your machine. <p>Local SL AdminMode licenses may be missing or may be identified as cloned licenses. This is an issue with the IObit product. Thales has reported this issue to IObit and it is currently under investigation.</p> <p>Workaround: Do not use the current version of the IObit product, <i>OR</i> do not use SL AdminMode licenses until this issue is resolved. (You can use SL UserMode licenses.)</p>
SM-65381	<p>Under Windows, execution of a Python application that is protected with DFP sometimes fails with the "Bad magic number" error if hasp_rt.exe is not present in the protected folder.</p> <p>Workaround: Ensure that hasp_rt.exe is present in the protected folder.</p>

Java

Ref	Issue
LDK-11195	<p>When protecting a Java application, Envelope fails with the message "Serious Internal Error (12)".</p> <p>Workaround: If this error occurs, protect the Java application using either of the following techniques:</p> <ul style="list-style-type: none"> > If the application contains JARs within a JAR/WAR executable, remove those JARs when protecting the executable with Envelope. You can add the JARs to the JAR/WAR executable after protection is complete. > Create a JAR/WAR executable using only those classes that you want to protect. After applying protection, you can add other classes or JARs, or any other dependencies in the protected JAR/WAR executable.

Ref	Issue
SM-10890	<p>Given the following circumstances:</p> <ul style="list-style-type: none">> An Envelope project was created with Envelope version 7.3 or earlier.> The project contains settings for a Java application.> On the Protection Settings tabbed page for the Java application, you select the option to overwrite default protection settings. <p>The Allows grace period after failed license check check box should be modifiable. However, the check box cannot be changed.</p> <p>Workaround: On the Advanced tabbed page, make any change to the MESSAGE_OUTPUT_MODE property, and then change it back. This forces Envelope to load an internal data structure that then makes the Allows grace period after failed license check check box modifiable.</p> <p>Note: This grace period is not supported for Web applications.</p>
SM-10969	<p>Due to a known limitation in Java, if a background check thread becomes non-EDT, the background check (Abort/Retry/Ignore) dialog box may not appear. Envelope has been modified so that the error dialog prompted by the protected method in the protected application takes precedence. This has reduced the occurrence of the problem, but it has not eliminated the problem entirely.</p>
SM-98384	<p>A protected WAR does not run successfully on WildFly Server 23.</p>
SM-110174	<p>Java class level protection and Data File protection in Windows Envelope for 64-bit applications are not supported under Wine.</p>

.NET

Ref	Issue
SM-554	<p>For apps that target the .NET Framework version 4.6 and later, CultureInfo.CurrentCulture and CultureInfo.CurrentUICulture are stored in a thread's ExecutionContext, which flows across asynchronous operations. As a result, changes to the CultureInfo.CurrentCulture and CultureInfo.CurrentUICulture properties are reflected in asynchronous tasks that are launched subsequently.</p> <p>If the current culture or current UI culture differs from the system culture, the current culture crosses thread boundaries and becomes the current culture of the thread pool thread that is executing an asynchronous operation.</p> <p>When protecting a sample application implementing above behavior with protection type as "Dot Net Only", then the application behaves as expected. However, with protection type "Dot Net and Windows Shell" or "Windows Shell Only", the thread uses the system's culture to define behavior.</p> <p>Workaround:</p> <p>Do the following:</p> <ol style="list-style-type: none"> 1. Use .NET Framework 4.5. 2. Use <pre>CultureInfo.DefaultThreadCurrentCulture = new CultureInfo(...)</pre> instead of <pre>Thread.CurrentThread.CurrentCulture = new CultureInfo(...).</pre>
SM-25875	<p>Given the following circumstances:</p> <ol style="list-style-type: none"> 1. A .NET application is protected with Envelope. 2. The protection type includes Windows Shell (with or without the method level). 3. The application attempts to get a module handle using the following method: <pre>IntPtr hMod = Marshal.GetHINSTANCE(Assembly.GetExecutingAssembly().GetModules()[0])</pre> <p>The handle returned may not be correct, and as a result, an error will be generated.</p> <p>Workaround: You can call the GetModuleHandle system API of the Kernel32.dll to get the module handle.</p> <p>For example:</p> <pre>[DllImport("kernel32.dll", CallingConvention = CallingConvention.StdCall, CharSet = CharSet.Auto)] private static extern IntPtr GetModuleHandle(IntPtr lpModuleName); IntPtr hMod = GetModuleHandle(Process.GetCurrentProcess().MainModule.ModuleName);</pre>

Ref	Issue
SM-26578	<p>If a .NET application protected with Windows Shell sets the exit code to ExitEventArgs such as "e.ApplicationExitCode = 1" when the application exits, the exit code cannot be retrieved by an external process.</p> <p>Workaround: Call "Environment.Exit(1)" to exit the process.</p>

Sentinel LDK Envelope and Data Encryption for Linux

Ref	Issue
SM-28403	<p>Given the following circumstances:</p> <ul style="list-style-type: none"> > A Linux application is protected with Envelope, with protection against debugging. > The application calls the wait(&status) system call. This is equivalent to: <pre>waitpid(-1, &status, 0)</pre> <p>The application may hang.</p> <p>Workaround 1: Call waitpid for a specific child process pid (pid > 0).</p> <p>Workaround 2: Disable the anti-debugging feature in Envelope. Note: This workaround significantly reduces the security of the protected application. Thales recommends that you consult with Technical Support before choosing this workaround.</p>
SM-69080	<p>A protected application may not handle signals properly when:</p> <ul style="list-style-type: none"> > Background check is enabled, and > Signal handlers are registered by a thread created by the application. <p>Workaround: Do one of the following:</p> <ul style="list-style-type: none"> > Disable both background check and anti-debugging. (You can do this by specifying the following line command flags: <code>-b:0 --debug --memdump</code>) > (Preferred workaround) Register the signal handler in a main thread instead of a thread function. Thread function is one of the following: <ul style="list-style-type: none"> • A function passed to pthread_create as start_routine • A function called from start_routine.

Sentinel LDK Envelope, Data Encryption, and Licensing API for macOS

Ref	Issue
LDK-11655	<ul style="list-style-type: none">> When running Envelope in a VMware Fusion 7.1.1 virtual machine on a Mac machine, if you save the protected application to an HGFS (Host Guest File System) volume, the application file is corrupted.> When you run a protected application on a VMware Fusion virtual machine from an HGFS share, if the application requires write access, the error "unable to write to file" is generated.
SM-57838	The command line Envelope tool (envelope_darwin) now only works if Envelope.app (UI bundle) is in the same folder. To use the command line tool, copy Envelope.app to the folder that contains the command line tool.
SM-57024	Dark Mode has been introduced by Apple in macOS 10.14 but is not supported yet by the Envelope GUI. You should disable Dark Mode to have a proper user experience.
SM-51456	<p>Due to reliability enhancements in Sentinel LDK under macOS, there is some performance impact in protected applications under macOS 10.13.</p> <p>A technical note will be issued that describes this issue and the option to disable these enhancements in favor of higher performance.</p>