

# One Identity Safeguard for Privileged Sessions 6.6

## Release Notes

### May 2020

These release notes provide information about the One Identity Safeguard for Privileged Sessions 6.6 release.

## About this release

One Identity Safeguard for Privileged Sessions Version 6.6 is a release with new features and resolved issues. For details, see:

- [New features](#)
- [Resolved issues](#)

#### NOTE:

For a full list of key features in One Identity Safeguard for Privileged Sessions, see [Administration Guide](#).

## About the Safeguard product line

The One Identity Safeguard Appliance is built specifically for use only with the Safeguard privileged management software, which is pre-installed and ready for immediate use. The appliance is hardened to ensure the system is secured at the hardware, operating system and software levels. The hardened appliance approach protects the privileged management software from attacks while simplifying deployment and ongoing management -- and shortening the timeframe to value.

## Safeguard privileged management software suite

Safeguard privileged management software is used to control, monitor, and govern privileged user accounts and activities to identify possible malicious activities, detect entitlement risks, and provide tamper proof evidence. The Safeguard products also aid incident investigation, forensics work, and compliance efforts.

The Safeguard products' unique strengths are:

- One-stop solution for all privileged access management needs
- Easy to deploy and integrate
- Unparalleled depth of recording
- Comprehensive risk analysis of entitlements and activities
- Thorough Governance for privileged account

The suite includes the following modules:

- **One Identity Safeguard for Privileged Passwords** automates, controls and secures the process of granting privileged credentials with role-based access management and automated workflows. Deployed on a hardened appliance, Safeguard for Privileged Passwords eliminates concerns about secured access to the solution itself, which helps to speed integration with your systems and IT strategies. Plus, its user-centered design means a small learning curve and the ability to manage passwords from anywhere and using nearly any device. The result is a solution that secures your enterprise and enables your privileged users with a new level of freedom and functionality.
- **One Identity Safeguard for Privileged Sessions** is part of One Identity's Privileged Access Management portfolio. Addressing large enterprise needs, Safeguard for Privileged Sessions is a privileged session management solution, which provides industry-leading access control, as well as session monitoring and recording to prevent privileged account misuse, facilitate compliance, and accelerate forensics investigations.

Safeguard for Privileged Sessions is a quickly deployable enterprise appliance, completely independent from clients and servers - integrating seamlessly into existing networks. It captures the activity data necessary for user profiling and enables full user session drill-down for forensics investigations.

- **One Identity Safeguard for Privileged Analytics** integrates data from Safeguard for Privileged Sessions to use as the basis of privileged user behavior analysis. Safeguard for Privileged Analytics uses machine learning algorithms to scrutinize behavioral characteristics and generates user behavior profiles for each individual privileged user. Safeguard for Privileged Analytics compares actual user activity to user profiles in real time and profiles are continually adjusted using machine learning. Safeguard for Privileged Analytics detects anomalies and ranks them based on risk so you can prioritize and take appropriate action - and ultimately prevent data breaches.

# New features

New features in SPS version: 6.6:

## Quick visualization of the audit data access rules

Audit data access rules allow you to restrict users to access audit data only for sessions for which they are granted permission. When creating a new rule, you can now use a preview to ensure that the search query returns relevant results.

## ECDSA 256 (ecdsa-sha2-nistp256) SSH host key support

SPS now supports the ECDSA 256 (ecdsa-sha2-nistp256) SSH host key, which is a variant of the Digital Signature Algorithm (DSA).

## Improved Safeguard Desktop Player installer on Windows

The installation of the Safeguard Desktop Player on Windows has been improved. You no longer need elevated privileges to install the Safeguard Desktop Player, and for future versions, you can install the new version without first having to uninstall the previous version.

## The Plugin upload page has been renewed

The **Basic Settings > Plugins** page has been renewed, and now contains more detailed information about the plugins.

You can now also verify the integrity of the plugins that you have uploaded.

## Screenshots are available for alerts and events

You can now click each alert and event on the Search interface to view a corresponding screenshot.

## Other improvements

- You can now easily query the available server-side host keys or create a new one.
- MSSQL query and server responses are now indexed and can be searched using the Search interface. You can download the relevant audit trail, open using the Safeguard Desktop Player, and export as CSV or PCAP format.

# Deprecated features

## Arguments of Authentication and Authorization and Credential Store plugins that begin with target\_ have been deprecated

These arguments were deprecated because the target\_host or target\_server arguments either contained a hostname or an IP address.

Now, new arguments have been added to the Authentication and Authorization and Credential Store plugins to replace deprecated arguments. The new argument names explicitly define the values they contain. That is, a server\_ip argument will always contain an IP address, and a server\_hostname argument will always contain a hostname.

The deprecated arguments are the following:

Authentication and Authorization plugin: get\_password\_list and get\_private\_key\_list input arguments:

- target\_username
- target\_host
- target\_port
- target\_domain

Credential Store plugin: authorize method:

- target\_server
- target\_port
- target\_username

# Resolved issues

The following is a list of issues addressed in this release.

**Table 1: General resolved issues in release 6.6.0**

Resolved Issue	Issue ID
Private key generation is broken for local Credential Stores After generating an RSA key for a local Credential Store, committing the change failed with the following error message: 'Connection failed. Server is inaccessible, shut down, or not servicing requests.' This has been corrected.	PAM-12104
SPS installation on Azure vm made the firmware tainted The service walinuxagent, which is required to be run on azure instances,	PAM-12090

Resolved Issue	Issue ID
<p>creates files at runtime and this made the firmware tainted. These files have been added to the tainted whitelist.</p> <p>This has been corrected.</p>	
<p>Two active menu items at the same time</p> <p>When opening a menu item and then another menu item while the previous is loading, two menu items appear active at the same time.</p> <p>This has been corrected.</p>	PAM-12028
<p>Fixed content search in case session indexed state</p> <p>For sessions with full indexing policy and containing lots of screen content, the indexing process took so much time that the user was able to issue a content search either via REST or UI.</p> <p>As a result, internal server error was returned because in these scenarios the content file have not been written to disk and could not be opened for content search.</p> <p>This has been corrected.</p>	PAM-12022
<p>Save hashed PSK value in support bundle</p> <p>In order to diagnose clustering issues, it is important to verify that the cluster members share the same IPSec pre-shared keys, but this was impossible, because the values were masked out. Following this change, the generated PSK tokens of the configuration are replaced by their SHA256 hash value. This means that the comparison can be performed while the actual values still remain secret.</p>	PAM-11976
<p>Give user hints in case of service or minion unavailability during content search</p> <p>When trying to search content for a session that was recorded on minion node in cluster environment, in case the minion node was unavailable, content search failed with error and the user did not get any feedback about the underlying cause.</p> <p>User will now also receive information if the minion node is available but content service is not running.</p>	PAM-11961
<p>Audit Data Access menu element was not filtered with the right permission.</p> <p>The Audit Data Access menu was always visible to the user even if permission settings did not allow this.</p> <p>This has been corrected.</p>	PAM-11897
<p>When the user opens a session with an invalid sessionID the user has been redirected to the 404 Not found page.</p> <p>If an invalid session id was given, the search page did not open the details</p>	PAM-11859

Resolved Issue	Issue ID
tab, instead the user was informed about the invalid sessionID parameter. This has been corrected.	
Wrong value in fields caused error in dynamic report generation Dynamic report generation could have run into an error if the query field tried to use an invalid value. It has been fixed.	PAM-11844
On the about page the system monitor charts now uses GB for displaying data and now include legends for additional info. Each system monitor chart now displays the current, total, used and free amount of relevant data. The legends and presentation use unified number and amount presentation (2 digits and GB).	PAM-11836
A session that have started and finished in a different day but did not last longer than 24 hours only the start date was present. If a session is not longer than 24 hours, but starts and ends on a different day, now both the start and end date is displayed on the search page.	PAM-11806
Errors not shown on Audit data access rules input fields Validation errors were not shown correctly on Audit data access rules input fields. This has been corrected.	PAM-11785
Under Appliance Access rename the AAA to Users & Access Control After the Users & Access Control menu item rename, the Appliance Access menu still displayed the old naming convention. This has been corrected.	PAM-11774
Text changes to clarify the pages goal. The Audit data access page contained typos. This has been corrected and the descriptions are now more clear.	PAM-11773
Update the menu names that have changed in the last release. The AAA menu has changed to Users & Access Control in the last release, however, only Users & Access was visible. This has been corrected and Users & Access Control is now displayed.	PAM-11772
Audit data access rules look editable when the user does not have permission Audit data access rules looked editable when the user had only read permission. However, this was only a visual bug and the server still checked permissions when the user wanted to edit rules. This has been corrected and we created a read-only view for the Audit data access rules manage page.	PAM-11763
Brackets were removed from around IPv6 addresses by the HTTP proxy in headers The HTTP proxy removed the brackets from around IPv6 addresses in relayed	PAM-11758

Resolved Issue	Issue ID
<p>HTTP headers, eg. "Host: [2001:db8::]" became "Host: 2001:db8::1", which caused problems on the server side. This has been fixed and such headers are now relayed properly.</p>	
<p>Traceroute: switch to ICMP</p> <p>Traceroute utility traditionally defaults to UDP probe packets, but such packets are likely to be filtered out by firewalls, even between SPS cluster nodes. It is expected that ICMP probes are more tolerated on networks, thus Troubleshooting &gt; Traceroute has been changed to use ICMP instead of UDP.</p>	PAM-11755
<p>Missing validation for RDP connections when NLA is enabled but TLS is not.</p> <p>When SPS was configured to use Network Level Authentication in an RDP connection, but Legacy RDP Security Layer was selected for that connection, then no connection could be established. A traceback was written to the system log.</p> <p>This has been fixed, SPS now validates that a connection for which NLA is enabled also has TLS Transport Security selected.</p>	PAM-11753
<p>AA plugin "authorize" hook receives wrong domain name if autologon suffix is in use</p> <p>The "authorize" hook of the AA plugin received the domain name with the autologon suffix left in place. This has been corrected.</p>	PAM-11748
<p>Starting up and shutting down logs are transferred from boot journal to core firmware logs</p> <p>There were many cases when logs have not been transferred from boot journal store to core firmware. In that case, the network-related issues were not transferred. This has been corrected. Starting up and shutting down logs are transferred from boot journal to core firmware logs. This makes the investigation easier, because all the logs are in one place and these logs are stored for longer time.</p>	PAM-11738
<p>Error messages appear in HTTP proxy logs when Authorization headers are not valid base64 encoded data</p> <p>Our HTTP proxy tried to decode the Authorization header and if it could not, it logged an error because there was an error with the encoding. These log messages could be misleading as such headers happen frequently, so they were disabled.</p>	PAM-11713
<p>Fixed the hardware charts under the About page</p> <p>Previously only the relative amount of memory was displayed on the About page &gt; hardware charts. This has been corrected and the user can see the current, total, user and free values for each chart converted and displayed in GB.</p>	PAM-11705
<p>Restore the version number and the hostname to the header.</p>	PAM-

<b>Resolved Issue</b>	<b>Issue ID</b>
In previous versions of SPS, the version number and host name were removed from the header. This has been corrected and the version and the host name are now displayed on the header.	11704
When an audit trail was missing from the SPS, all further archiving processes failed	PAM-11700
When an audit trail was missing from SPS, all further archiving processes failed. This has been corrected and the archiving will continue to the next audit trail file, and SPS records the error in the local database.	
The firmware manipulation via console (core-shell) with firmwaredctl synchronizes the firmware to the HA pair node.	PAM-11642
The firmwaredctl console tool, which can be called on the core-shell, did not synchronize the firmware to the other HA node which caused firmware version mismatch in case of a failover.	
From now firmwaredctl synchronizes the firmware to the other HA node just like the Basic Settings > High Availability page on the web-ui does.	
The copyright end date always should present the shipped years.	PAM-11620
The copyright date showed the actual year instead of the shipped years. This has been corrected.	
Displaying the login page triggers General error (xcbError) SNMP or email alert	PAM-11597
When the login page was loaded in a browser, then a background request attempted to access a resource which mistakenly required an already authenticated user. If the General error (xcbError) alert was enabled on the Basic Settings / Alerting & Monitoring page, then this condition triggered sending SNMP or email alerts. This has been fixed.	
High memory consumption related to the indexer-jobgenerator service with sessions containing lots of channels	PAM-11513
The jobgenerator service now handles channel related messages which are not required to store in memory anymore.	
No warning is displayed when navigation away from a modified page without commit.	PAM-11307
Even when the "Warn when unsaved changes may be lost" option in the preferences was checked, no warning was displayed when navigating away from a modified page without commit. This has been corrected.	
Allow additional text in PEM files for ED25519 private keys	PAM-11236
RFC7468 requires parsers to tolerate additional data in PEM files, however, earlier versions of Safeguard for Privileged Sessions rejected ED25519 private keys with an error message. This has been corrected and additional	



Resolved Issue	Issue ID
<p>data (such as certificates or lines of text) in the PEM files are ignored for both PKCS#8 and OpenSSH formatted keys.</p>	
<p>Multiple IPv4 addresses on the network interface which is assigned to clustering can break cluster node communication if other than the first one is used for clustering</p> <p>Assigning multiple IPv4 addresses to the network interface which is used for clustering, and using other than the first one for secure communication between the cluster nodes results in a non-working configuration. Configuration validation has been extended with checks which prevent saving such configuration.</p>	<p>PAM-11047</p>
<p>HA IP negotiation fails when more than two SPS hosts are accessible on the HA interface</p> <p>When more than two SPS instances are accessible through the HA interface, the third host cannot obtain a valid HA IP address as the other two addresses are already taken. As this is not a supported way of working, a warning message is now shown to the user on the console.</p>	<p>PAM-10916</p>
<p>Remove Go back button from Reporting page, because it cause inconsistency. The Go back button on the reporting page of the auditor portal navigated to the wrong place. This has been corrected.</p>	<p>PAM-10715</p>
<p>On the search UI the click to search and manual time selection was interfered.</p> <p>Previously you were able to select incorrect date ranges on the Search interface. This has been corrected.</p>	<p>PAM-10513</p>
<p>Some browsers did not show submenus correctly.</p> <p>Some browsers did not show submenus correctly. This has been corrected.</p>	<p>PAM-10430</p>
<p>Events with really long name could overlap with different areas on the search detail page.</p> <p>Events with really long name could overlap with different areas on the search detail page. This has been corrected and long names now break into multiple lines.</p>	<p>PAM-10328</p>
<p>On the HTTP session' detailed page the terminate button appeared, but it should not be.</p> <p>On the HTTP session's detailed page, the terminate button has been removed due to technical limitations.</p>	<p>PAM-10280</p>
<p>On the search page, the errors of the search query and the timeline was not synchronized.</p> <p>When the search query was invalid, the timeline showed an error message. This has been corrected.</p>	<p>PAM-10269</p>

<b>Resolved Issue</b>	<b>Issue ID</b>
The logout countdown timer is not refreshed The logout countdown did not show time correctly. This has been corrected.	PAM-10036
Quick statistics cannot shows the whole server hostname Quick statistics did not show longer domain names. This has been corrected and now if you move the cursor over the domain name, it shows the whole domain name.	PAM-9999
A session with too many events wasn't properly displayed on search. Sessions with more than 10.000 events produced strange UI behavior, and after the first 1000 pages, empty pages were displayed. This has been corrected and now the empty pages are not displayed.	PAM-9360
On the search page, the search bar did not get focus on load. This has been corrected and now the search bar gets the focus.	PAM-9179
New sessions notification bell sometimes appear with the wrong number New sessions notification bell, which tells how many new sessions come to list sometimes appear with the wrong number. This has been corrected and we cut down the chance of occurrence.	PAM-8235
Unnecessary expiration warnings for indexer decryption key certificates The decryption keys and the certificates that belong to them, used by the internal indexer to process encrypted audit trails, may still be needed in the configuration in order to access older audit data, long after the certificate itself is expired. Due to this, the expiration of these certificates will no longer trigger configuration validation warnings.	PAM-7653
Fix referenced subchapter delete Under the Search Subchapters menu, the subchapter delete functionality was not correct previously. This has been corrected.	PAM-5979
In IE11, the first row of the search result list had a time column with misaligned values. In IE11, the first row of the search result list had a time column with misaligned values. This has been corrected.	PAM-4613

**Table 2: General resolved issues in release 6.5.0**

<b>Resolved Issue</b>	<b>Issue ID</b>
SSH connections may not be denied when the server host key algorithm changes and the server host key check method is set to "Accept key for the first time". SPS can validate an SSH server by checking its host public key against a set of stored trusted public keys. When this host key check method was set to	PAM-11685

**Resolved Issue****Issue ID**

"Accept key for the first time" in "SSH Control > Connections > Server side host key settings > Plain host key check" and SPS already stored a trusted key in "SSH Control > Server Host Keys" of the type "ssh-rsa", and the server supported only the "ssh-ed25519" host key algorithm, then the connection succeeded, even though it should have been rejected.

The cause of this error was that SPS and the server negotiated "ssh-ed25519" as the host key algorithm, but since no "ssh-ed25519" host key was stored in SPS yet, it proceeded to learn the new "ssh-ed25519" key. This could have been used by a rogue server impersonating a legitimate server, to trick SPS into accepting a connection by offering a host key algorithm that the legitimate server did not offer.

This has been fixed, SPS now only offers those host key algorithms for which it already has a trusted key. It only offers all host key algorithms when no trusted host key is stored yet for the target server.

---

SSH connections may fail when server side host key check method is set to "Only accept trusted keys" PAM-11531

SPS can validate an SSH server by checking its host public key against a set of stored trusted public keys. When this host key check method was set to "Only accept trusted keys" in "SSH Control > Connections > Server side host key settings > Plain host key check" and SPS has already stored a correct trusted server host key in "SSH Control > Server Host Keys" of the type "ssh-rsa", and the server supported both the "ssh-ed25519" and the "ssh-rsa" host key algorithms, then the connection failed, even though it should have succeeded.

The cause of the connection failure was that SPS and the server negotiated the "ssh-ed25519" host key algorithm, not "ssh-rsa", but no trusted "ssh-ed25519" host key was stored.

This has been fixed, SPS now only offers to the server those host key algorithms that it already stores a trusted host key for. When the host key check method is set to "Accept key for the first time", and no host key is stored yet, all algorithms are offered. This allows learning a preferred host key.

---

View log files > Tail window remains open even after the administrator has logged out. PAM-11510

The browser window displaying the live machine logs (Basic Settings > Troubleshooting > View log files > Tail) did not stop displaying new log messages after an administrator has logged out of their session. This has been corrected. Note that the window displaying the past log messages remains open even after logging out of the session.

---

Missing timestamps in audit trails and "Error connecting TSA" messages in the logs. PAM-11391

Resolved Issue	Issue ID
A bug in ICA proxy caused missing timestamps in audit trails and "Error connecting TSA" messages in the logs. This has been fixed.	
Change in the trusted host keys did not trigger configuration synchronization in the SPS cluster. Adding or removing a trusted host key now triggers configuration synchronization in the SPS cluster.	PAM-11390
From now on, Chrome on a newer version of macOS accepts the certificate generated by SPS. The macOS has strictened its certificate policies, and the generated certificate of SPS was not compliant with it. On Chrome, one could not turn off the warnings about the invalid certificate, rendering users unable to configure SPS for the first time. During initial configuration (or later) one could upload a custom server certificate of course, but the browser did not allow the user to reach SPS to configure it. The newly generated cert has the following additional properties: <ul style="list-style-type: none"> <li>• validity is 800 days long;</li> <li>• extendedKeyUsage has been specified,</li> </ul> which makes it compliant with the recent Chrome+macOS combination.	PAM-11122
Invalid software RAID-related events generated during one-shot checking (affects only MBX T1 hardware) During the periodic checking of the software RAID array, DeviceDisappeared and NewDevice events were generated. These events were sent through SNMP or email, depending on the configuration. This has now been fixed and these events are no longer generated.	PAM-10771
Core files are generated for ICA sessions In certain situations after the client has closed an ICA session, SPS generated a core file. This has been corrected.	PAM-10316
A systemd service (proc-sys-fs-binfmt_misc.mount) failed to start at boot. The proc-sys-fs-binfmt_misc.mount unit failed to start at boot. This generated alerts for the customer which resulted in SNMP trap or email, depending on the configuration. The service now starts at boot.	PAM-9935
In case of high amount of information, paginated data storage solution was implemented, but not used by the indexer tool. To prevent overloading the database operations, data storage, for example, screen content storage during information collection from audit trail now works in an optimized way.	PAM-11523

<b>Resolved Issue</b>	<b>Issue ID</b>
<p>When high amount of audit trails were stored on the disk, a process could cause performance issues during upgrade, HA takeover or boot.</p> <p>After this fix this process will run only once.</p>	PAM-11618
<p>Under the "Reporting &gt; Search subchapters" page, it was possible to navigate away from the page without saving the changes to the configuration, without any notification.</p> <p>We have created a notification dialog and when the user has unsaved changes, we will notify them on page leave.</p>	PAM-11347

**Table 3: General resolved issues in release 6.4.0**

<b>Resolved Issue</b>	<b>Issue ID</b>
<p>Traceback in the logs after rejecting a four-eyes authorization request</p> <p>A traceback appeared in the logs after rejecting a four-eyes authorization request. This has been corrected, the event is now handled properly.</p>	PAM-10881
<p>Traceback appears in the logs if the LDAP server is down</p> <p>A traceback appeared in the logs if the LDAP server was unavailable and SPS tried to access this server. This has been corrected, the error is now properly handled.</p>	PAM-11028
<p>False data in archiving notice</p> <p>After deleting a Connection Policy that had recorded sessions and creating a new policy with the same name, the number of archived files in the archiving notice was invalid. This has been corrected.</p> <p>NOTE: It is not recommended to delete Connection Policies that were used in production systems, as this can prevent SPS from archiving the files and data related to these policies. We recommend disabling unneeded Connection Policies instead.</p>	PAM-9615
<p>After upgrading a High Availability cluster, the Basic Settings &gt; High Availability page displayed the Boot firmware version of the Other node incorrectly</p> <p>After upgrading a High Availability cluster, the Basic Settings &gt; High Availability page displayed the Boot firmware version of the Other node incorrectly, as if that node was still running the old firmware version. Despite the information displayed on the web user interface, both nodes were running the new firmware version. This has been fixed.</p>	PAM-10413
<p>Timeout in RDGW sessions causes core files on SPS</p> <p>If a connection required for a Remote Desktop Gateway session could not be established within the expected timeout, the session failed and a core file appeared on SPS. This has been corrected, such timeout errors are now handled properly.</p>	PAM-11123

<b>Resolved Issue</b>	<b>Issue ID</b>
<p>Resizing the screen in ICA sessions to span multiple monitors did not work</p> <p>If the number of relayed monitor screens was changed during an ICA session the change was not relayed by SPS properly which made such changes impossible. The problem is now fixed and it is possible to change the number of monitors during the session.</p>	PAM-10988
<p>Sessions are terminated when using the credit-card detection and alerting features</p> <p>In certain cases when the credit-card detection and alerting features were used, SPS terminated the affected sessions even when the Terminate action was not selected. This has been corrected.</p>	PAM-11134
<p>RDP sessions shown as active even after client disconnects</p> <p>In certain cases, SPS reported RDP sessions as active even after the client has disconnected. This has been corrected.</p>	PAM-11168
<p>Client unexpectedly closes RemoteApp sessions</p> <p>In certain situations using RemoteApp connections, SPS sent an unneeded certificate to the client, causing the client to close the connection. This has been corrected, the unneeded certificate is not sent to the client.</p>	PAM-11187
<p>Overriding the global verbosity level in ICA connection policies had no effect</p> <p>In order to help troubleshooting, the global log verbosity level can be overridden in connection policies. This setting was ignored in ICA connections. This has been fixed, ICA connection policies now also allow setting a per-connection verbosity level.</p>	PAM-11251
<p>Configuration changes not taking effect</p> <p>In some cases, when the user modified system-related configuration settings of SPS, they did not take effect after committing the changes. This could happen for example when committing networking changes, and restarting the networking service was very slow. This has been corrected, such errors are now handled properly.</p>	PAM-10336
<p>Password reuse always allowed when changing the password over REST</p> <p>It is possible to configure SPS to prevent reusing previous passwords when changing the user password. This was not enforced when the password changed was performed through the REST API. It is now fixed and the restriction is enforced over the API, too.</p>	PAM-11213
<p>Remote Desktop Gateway authentication fails for Windows 2012 R2 clients</p> <p>Remote Desktop Gateway authentication failed for Windows 2012 R2 clients (Windows client version: Windows 2012 R2 , ver. 6.3.9600 Protocol 8.1). This has been corrected.</p>	PAM-9967
<p>IPv6 routing table is missing from the support bundle</p>	PAM-

Resolved Issue	Issue ID
The IPv6 routing table was missing from the support bundle. This has been corrected.	10354
<p>Improve the debug logging of Idapservice</p> <p>The debug log messages of the Idapservice process now include a unique id to simplify troubleshooting of request-response pairs.</p>	PAM-11135
<p>Failed screenshots in content subchapter reports</p> <p>Using external-indexer or near real time indexing lead to failed screenshots in content subchapter reports, indicated by the following error message in the logs:</p> <p>'Cannot retrieve image for screencontent'</p> <p>This has been corrected, screenshots are now properly generated for the reports.</p>	PAM-10190
<p>Following trail downloaded from Active Connections generates multiple Audit trail download events on Search</p> <p>When following an .srs trail downloaded from Active Connections page through Desktop Player, it spammed the 'Audit trail downloads' section on Search &gt; Details page of the connection in every second.</p> <p>This has been fixed, the 'Audit trail downloads' section displays now only once the event of download per trail download initiated from Active Connections page.</p>	PAM-10669
<p>Additional Metadata field may contain Gateway Password</p> <p>In certain cases, the "Additional Metadata" field contained the Gateway Password used in the session. This is the password that the user used to authenticate on the SPS gateway, and belongs to the Gateway Username of the user. The passwords used to authenticate on the target servers were not affected.</p> <p>For this error to occur, all of the following circumstances must have been met:</p> <ul style="list-style-type: none"> <li>• the client used an SSH session to access remote servers</li> <li>• in a joined SPS-SPP scenario</li> <li>• that used the SPS-initiated workflow</li> <li>• where the Authentication Policy of the SSH Connection Policy used the "Password" Gateway Authentication Method</li> <li>• and the version of the SPS appliance is 6.2.0 or 6.0.2.</li> </ul>	PAM-11073
<p>The error has been corrected.</p> <p>To find out whether this error has occurred in your environment, complete the following steps.</p>	

## Resolved Issue

## Issue ID

1. Login to your SPS appliance as a user who has access to the Search page.
2. On the Search page, enter the following search query:  
recording.additional\_metadata: gp=
3.
  - If there are no search results, the error did not occur in your environment. Upgrade to SPS version 6.3.0a or 6.0.3 to ensure that it does not occur in the future.
  - If there are search results, continue with the next step of this procedure.
4. Click the ... button on the right of the **Export CSV** button.
5. Add the Gateway Username and the Recording Connection Policy fields to the list of fields to export.
6. Check which Authentication Policies do the Connection Policies that appear in Recording Connection Policy fields use.
7. Navigate to **SSH Control > Authentication Policies**, and check which Authentication Backend do the affected Authentication Policies use.
8. Contact the users appearing in the Gateway Username field to change their password in the affected backends.

Deadlock in HTTP proxy

PAM-11016

In some rare cases the HTTP proxy could get in a deadlock and stop working. This has been fixed.

HA takeover issues after multi-step upgrades

PAM-11292

If a system was upgraded in multiple steps (eg. from 5.11 to 6.0 to 6.3) without an HA takeover between the upgrades, a range of problems occurred while detecting the version of the firmware on the master and slave nodes. The problem has been fixed and these kinds of upgrades now work well.

Report generator service failure

PAM-10389

In some cases, the report generator service on the SPS appliance could fail due to a problem in the way the "Top 10 users" reports were generated. The problem has been fixed and reports are generated properly.

Error messages not shown during Starling join

PAM-10969

When a join to the Starling platform was initiated, the error messages such as SSL certificate errors were not shown to the user, making troubleshooting difficult.

These error messages are now shown on the UI.



<b>Resolved Issue</b>	<b>Issue ID</b>
<p>Dynamic Virtual Channels in RDP proxy are not handled properly</p> <p>Some of the Dynamic Virtual Channels in RDP proxy were allowed even if they were not enabled in a channel policy.</p> <p>Now it has been fixed and must be explicitly added to the "Permitted channels" under the Dynamic Virtual Channels channel policy.</p>	PAM-11319
<p>The built-in Cisco pattern set in telnet proxy does not work with Cisco Nexus 5000 devices</p> <p>Due to a different login prompt, the built-in Cisco pattern set did not extract the username properly in Cisco Nexus 5000 devices.</p> <p>This has been fixed.</p>	PAM-10908
<p>Wrong file transfer direction in RDP proxy</p> <p>File uploads (from the client machine to the remote server) were tagged with "download", and downloads (from the remote server to the client machine) with "upload".</p> <p>This has been corrected and tagged properly.</p>	PAM-10799

**Table 4: General resolved issues in release 6.3.0**

<b>Resolved Issue</b>	<b>Issue ID</b>
<p>Downloading audit trails fails on the Central Search node</p> <p>In a cluster environment, downloading from audit trails from the web interface failed on the Central Search node. This has been corrected.</p>	PAM-10971
<p>The Protocol field on the Search page contains invalid value</p> <p>In certain cases, the Protocol field contained the '-1' value instead of the name of the protocol. This has been corrected.</p>	PAM-10906
<p>The connections of an SPP access request on a joined SPS-SPP fail after upgrading to SPS 6.2</p> <p>The automatic upgrade of the SGAA/SGCredStore plugins caused a failure during the connections due to a plugin wrapper selection mistake. The plugin wrapper selection is fixed, connections now work as expected.</p>	PAM-10888
<p>'Analytics details are not available' warning appears on the UI</p> <p>In some cases, the 'Analytics details are not available' warning was displayed even though the analytics scores were available for the session.</p>	PAM-10886
<p>The Analytics tab of a session keeps loading infinitely</p> <p>Opening the Analytics tab of a session without the required privileges kept loading the page infinitely, instead of displaying a permission error. This has been corrected.</p>	PAM-10859

<b>Resolved Issue</b>	<b>Issue ID</b>
<p>If the session database is very large, opening new sessions is very slow</p> <p>In some cases, persisting indexer job status updates and command/title events made a big load on the database which caused big delays in opening new connections through SPS.</p> <p>The way of persisting indexer events to the database was optimized in a way that it should not add delay on new connections.</p>	PAM-10821
<p>Clicking on the chart in Flow view does not create the proper search query</p> <p>Click on the chart in the Flow view of the Search page created incorrect search queries. This has been corrected.</p>	PAM-10794
<p>Report queries are not updated</p> <p>In some cases, the queries of certain report subchapters were not updated, and therefore the reports contained outdated information. This has been corrected.</p>	PAM-10787
None	PAM-10787
<p>Error in handling compressed ICA traffic causes the server to terminate the session</p> <p>In some cases, SPS handled compressed ICA traffic incorrectly, causing the server to terminate the session. The following log message appeared in the system logs:</p> <p>'Compression PD: Unable to expand slab'</p> <p>This has been corrected, the traffic is now handled properly.</p>	PAM-10781
<p>Corrections to the on-screen instructions on checking plugin integrity</p> <p>The instructions on how to check the integrity of the plugins have been updated on the Basic Settings &gt; Plugins page.</p>	PAM-10675
<p>None</p> <p>When selecting a session in the Search page, clicking the 'Analytics' tab for first time showed an unnecessary error message for a second, before the actual contents were loaded. This has been corrected.</p>	PAM-10671
<p>Files copy-pasted in FreeRDP sessions cannot be exported</p> <p>Files copy-pasted in FreeRDP sessions were recorded in the audit trail, but exporting them failed. This has been corrected.</p>	PAM-10668
<p>Clicking the Back button on the Search page removes every filter</p> <p>Clicking the Back button of the browser on the Search page removed every filter, not only the last one. This has been corrected.</p>	PAM-10636
After deleting a filter on the Search page you cannot re-add it	PAM-

<b>Resolved Issue</b>	<b>Issue ID</b>
After deleting a filter from the query on the Search page, clicking on the same filter to re-add the filter did not have any effect. This has been corrected.	10583
Duplicate header appears on the ICA Control > Channel Policies page While editing a new Channel Policy on the ICA Control > Channel Policies page, clicking on the Show details icon caused a new header and footer to appear. This has been corrected.	PAM-10575
The Edit option is displayed on the Search Subchapter page to users with only read rights On the Reporting > Search Subchapters page, the Edit and Create New Subchapter options were visible even if the user had only Read privileges to the page. This has been corrected.	PAM-10429
SDP cannot replay VNC sessions with TightSecurity SDP failed to replay audit trails that contained VNC over WebSocket sessions that had TightSecurity enabled. This has been corrected, now SDP can replay these sessions.	PAM-10279
Clicking values with special characters on the Search page are not escaped Clicking on values on the Search page added the value to the search query, but special characters were not escaped, resulting in incorrect search queries if the selected value contained Lucene-specific characters. This has been corrected.	PAM-10234
Misspelled OK buttons on the web interface Some OK buttons were spelled as 'Ok' on the web interface. These have been corrected.	PAM-10155
Inaccurate warning when upgrading external indexers When upgrading an external indexer, an inaccurate warning was displayed about removing the directory that contained the configuration files of the old version of the indexer. This has been corrected.	PAM-9707
Content search field does not handle the '<' character Typing the '<' character followed by other characters in the screen content search field caused the query to disappear. This has been corrected, such queries are now handled properly.	PAM-9264
OpenSSL encryption failure when changing the password of a permanent keystore In some rare cases, when changing the password of a permanent keystore on the web interface, encrypting the keys failed with the following error message: 'Fatal error: escapeshellarg(): Input string contains NULL bytes in /opt/scb/lib/OpenSSL.php on line 62'	PAM-8345

Resolved Issue	Issue ID
This has been corrected.	
If completing the Welcome Wizard using the REST API fails, the appliance becomes unreachable	PAM-7760
If completing the Welcome Wizard using the REST API failed, an internal error made the product unreachable: the IP address became 192.168.1.1 and the console access of the root user was disabled. From now on, the console access of the root user remains active, so it can be used to fix such situations.	
The 'Timestamping policy' field is displayed for Local policies	PAM-426
On the <Protocol> > Global Options > Audit page, the 'Timestamping policy' field was displayed even when the timestamping policy was set to 'Local'. This has been corrected, now the field appears only if 'Remote' timestamping is selected.	

## System requirements

Before installing SPS 6.6, ensure that your system meets the following minimum hardware and software requirements.

The One Identity Safeguard for Privileged Sessions Appliance is built specifically for use only with the One Identity Safeguard for Privileged Sessions software that is already installed and ready for immediate use. It comes hardened to ensure the system is secure at the hardware, operating system, and software levels.

For the requirements about installing One Identity Safeguard for Privileged Sessions as a virtual appliance, see one of the following documents:

**NOTE:** When setting up a virtual environment, carefully consider the configuration aspects such as CPU, memory availability, I/O subsystem, and network infrastructure to ensure the virtual layer has the necessary resources available. Please consult [One Identity's Product Support Policies](#) for more information on environment virtualization.

- [Installation Guide](#)
- [Deployment from Azure Marketplace](#)
- [Deployment on Amazon Web Services](#)
- [Evaluation Guide](#)

## Supported web browsers and operating systems

**⚠ CAUTION:**

Since the official [support of Internet Explorer 9 and 10 ended](#) in January, 2016, they are not supported in One Identity Safeguard for Privileged Sessions (SPS) version 4 F3 and later.

**⚠ CAUTION:**

Even though the One Identity Safeguard for Privileged Sessions (SPS) web interface supports Internet Explorer and Microsoft Edge in general, to replay audit trails you need to use Internet Explorer 11, and install the [Google WebM Video for Microsoft Internet Explorer plugin](#). If you cannot install Internet Explorer 11 or another supported browser on your computer, use the the Safeguard Desktop Player application. For details, see "[Replaying audit trails in your browser](#)" in the [Administration Guide](#) and [Safeguard Desktop Player User Guide](#).

**NOTE:**

SPS displays a warning message if your browser is not supported or JavaScript is disabled.

**NOTE:**

The minimum recommended screen resolution for viewing One Identity Safeguard for Privileged Sessions's (SPS's) web interface is 1366 x 768 pixels on a 14-inch widescreen (standard 16:9 ratio) laptop screen. Screen sizes and screen resolutions that are equal to or are above these values will guarantee an optimal display of the web interface.

## Supported browsers

The current version of Mozilla Firefox and Google Chrome, Microsoft Edge, and Microsoft Internet Explorer 11 or newer. The browser must support TLS-encrypted HTTPS connections, JavaScript, and cookies. Make sure that both JavaScript and cookies are enabled.

## Supported operating systems

Windows 2008 Server, Windows 7, Windows 2012 Server, Windows 2012 R2 Server, Windows 8, Windows 8.1, Windows 10, Windows 2016, and Linux.

The SPS web interface can be accessed only using TLS-encryption and strong cipher algorithms.

Opening the web interface in multiple browser windows or tabs is not supported.

# Safeguard Desktop Player system requirements

The Safeguard Desktop Player application supports the following platforms:

- **Microsoft Windows:**

64-bit version of Windows 7 or newer. Install the appropriate driver for your graphic card.

- **Linux:**

RHEL 6, CentOS 6, or newer. The Safeguard Desktop Player application will probably run on other distributions as well that have at least libc6 version 2.12 installed.

- **Mac:**

macOS High Sierra 10.13, or newer.

Installing the Safeguard Desktop Player application requires about 200MB disk space, and a temporarily used disk space to store the audit trails that are replayed. The size of the temporary files depends on the size of the replayed audit trails.

You can install the Safeguard Desktop Player application with user privileges.

## Hardware specifications

The One Identity Safeguard for Privileged Sessions (SPS) appliances are built on high performance, energy efficient, and reliable hardware that are easily mounted into standard rack mounts.

The following sections provide detailed information of SPS appliances.

## Product licensing

### ***To enable a trial license***

1. Visit the [Download Trials page](#), and navigate to **One Identity Safeguard for Privileged Sessions > Download Free trial**.
2. Complete the registration form, and click **Download Trial**.
3. You will receive the details on how to access your license key and the download the ISO files in email.

### ***To enable a purchased commercial license***

1. Navigate to **My Account > My License Assets** on the [support portal](#).
2. To access your license key, click **Retrieve Key** next to your product.
3. Once you have the license keys, navigate to **My Account > My Products** and click

**Download** next to your product. The **Download Software** page is displayed.

4. Download the ISO image (install cdrom) of your product.

If you need help with accessing your license, navigate to the [Licensing Assistance](#) page, and follow the instructions on screen.

## Upgrade and installation instructions

The One Identity Safeguard for Privileged Sessions appliance is built specifically for use only with the One Identity Safeguard for Privileged Sessions software that is already installed and ready for immediate use.

### To upgrade to One Identity Safeguard for Privileged Sessions 6.6

For step-by-step instructions on upgrading to SPS 6.6, see [Upgrade Guide](#).

#### NOTE:

Due to legal reasons, installation packages of the external indexer application will be available only from the SPS web interface. After SPS versions 6.4 and 6.0.3 are released, the installation packages will be removed from our website.

### About feature releases

This is a feature release, which means that it will be supported for 6 months after the release date or 2 months after the release of a succeeding feature release (whichever date is later). It also means that if you are running a previous feature release (such as versions 6.1), you have 2 months to upgrade to version 6.6 if you want to keep running on a supported release.

For a full description of long-term-supported and feature releases, open the [SPS product page on the Support Portal](#) and navigate to **Self Service Tools > Product Support > Product Life Cycle & Policies > Product Support Policies > Software Product Support Lifecycle Policy**.

### If you have a physical appliance based on MBX hardware

One Identity recommends you to upgrade to SPS 6.6, if you are not running SPS on Pyramid hardware and any of the following is true:

#### NOTE:

If you do not know the type of your hardware, see [If you have a physical appliance based on Pyramid hardware](#).

- You wish to take advantage of any of the new features.
- You are running a previous feature release.
- You are OK with having to continuously upgrade to the latest feature release to

remain supported.

We are releasing new feature releases approximately once every 2 months.

### **If you have a physical appliance based on Pyramid hardware**

Do NOT upgrade to SPS6.6 if you are running SPS on Pyramid hardware:

### **Downgrading from a feature release**

Do NOT downgrade from a feature release.

**⚠ CAUTION:**

**Downgrading from a feature release is not supported. If you upgrade from an LTS release (for example, 4.0) to a feature release (4.1), you have to keep upgrading with each new feature release until the next LTS version (in this case, 5.0) is published.**

## **Verify successful installation**

Navigate to **Basic Settings > System > Version details** and verify that SPS is running version 6.6 of the firmware. If not, it means that the upgrade process did not complete properly and SPS performed a rollback to revert to the earlier firmware version. In this case, complete the following steps:

1. Navigate to **Basic Settings > Troubleshooting > Create support bundle** and click **Create support bundle**.
2. Save the resulting ZIP file.
3. [contact our Support Team](#) and send them the file. They will analyze its contents to determine why the upgrade was not completed and assist you in solving the problem.

## **More resources**

To obtain more information, read the technical documentation or consult the community:

- [One Identity Safeguard for Privileged Sessions - Technical Documentation](#)
- [One Identity Community](#)



# Globalization

This section contains information about installing and operating this product in non-English configurations, such as those needed by customers outside of North America. This section does not replace the materials about supported platforms and configurations found elsewhere in the product documentation.

This release is Unicode-enabled and supports any character set. In this release, all product components should be configured to use the same or compatible character encodings and should be installed to use the same locale and regional options. This release is targeted to support operations in the following regions: North America, Western Europe and Latin America, Central and Eastern Europe, Far-East Asia, Japan. It supports bidirectional writing (Arabic and Hebrew). The release supports Complex Script (Central Asia – India, Thailand).

This release has the following known capabilities or limitations: OCR is limited to Nuance supported languages. No support for RTL languages.

## About us

One Identity solutions eliminate the complexities and time-consuming processes often required to govern identities, manage privileged accounts and control access. Our solutions enhance business agility while addressing your IAM challenges with on-premises, cloud and hybrid environments.

## Contacting us

For sales and other inquiries, such as licensing, support, and renewals, visit <https://www.oneidentity.com/company/contact-us.aspx>.

## Technical support resources

Technical support is available to One Identity customers with a valid maintenance contract and customers who have trial versions. You can access the Support Portal at <https://support.oneidentity.com/>.

The Support Portal provides self-help tools you can use to solve problems quickly and independently, 24 hours a day, 365 days a year. The Support Portal enables you to:

- Submit and manage a Service Request
- View Knowledge Base articles
- Sign up for product notifications
- Download software and technical documentation
- View how-to videos at [www.YouTube.com/OneIdentity](http://www.YouTube.com/OneIdentity)
- Engage in community discussions
- Chat with support engineers online
- View services to assist you with your product

## Third-party contributions

This appendix includes the open source licenses and attributions applicable to One Identity Safeguard for Privileged Sessions.

# GNU General Public License

Version 2, June 1991

1989, 1991 Free Software Foundation, Inc.

Free Software Foundation, Inc. 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Version 2, June 1991

## Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software - to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps:

1. copyright the software, and
2. offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

## **TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION**

### **Section 0**

This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

### **Section 1**

You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

### **Section 2**

You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of [Section 1](#) above, provided that you also meet all of these conditions:

- a. You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
- b. You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.
- c. If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user

how to view a copy of this License. (Exception: If the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

### Section 3

You may copy and distribute the Program (or a work based on it, under [Section 2](#) in object code or executable form under the terms of [Section 1](#) and [Section 2](#) above provided that you also do one of the following:

- a. Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- b. Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- c. Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

## Section 4

You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

## Section 5

You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

## Section 6

Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

## Section 7

If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

## Section 8

If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

## Section 9

The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

## Section 10

If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

## NO WARRANTY Section 11

BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

## Section 12

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER

PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

## How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the program's name and a brief idea of what it does.> Copyright  
(C) <year> <name of author>
```

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author Gnomovision comes with  
ABSOLUTELY NO WARRANTY; for details type "show w". This is free software, and you are  
welcome to redistribute it under certain conditions; type "show c" for details.
```

The hypothetical commands "show w" and "show c" should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than "show w" and "show c" ; they could even be mouse-clicks or menu items-- whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program "Gnomovision"  
(which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989 Ty Coon, President of Vice
```

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.



# GNU Lesser General Public License

Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.

Free Software Foundation, Inc. 51 Franklin Street, Fifth Floor Boston, MA 02110-1301 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.

## Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method:

1. we copyright the library, and
2. we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the Lesser General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

# TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

## Section 0

This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

## Section 1

You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

## Section 2

You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of [Section 1](#) above, provided that you also meet all of these conditions:

- a. The modified work must itself be a software library.
- b. You must cause the files modified to carry prominent notices stating that you

changed the files and the date of any change.

- c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, [Subsection 2d](#) requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

### Section 3

You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

### Section 4

You may copy and distribute the Library (or a portion or derivative of it, under [Section 2](#)) in object code or executable form under the terms of [Section 1](#) and [Section 2](#) above provided that you accompany it with the complete corresponding machine-readable source code,

which must be distributed under the terms of [Section 1](#) and [Section 2](#) above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

## Section 5

A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. [Section 6](#) states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under [Section 6](#).)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of [Section 6](#). Any executables containing that work also fall under [Section 6](#), whether or not they are linked directly with the Library itself.

## Section 6

As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be

distributed under [Section 1](#) and [Section 2](#) above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

- b. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.
- c. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in [Subsection 6a](#), above, for a charge no more than the cost of performing this distribution.
- d. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- e. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

## Section 7

You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

- a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.
- b. Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

## Section 8

You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

## Section 9

You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

## Section 10

Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

## Section 11

If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

## **Section 12**

If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

## **Section 13**

The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

## **Section 14**

If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

## **NO WARRANTY Section 15**

BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

## **NO WARRANTY Section 16**

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO



LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

## How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the library's name and a brief idea of what it does.> Copyright (C)  
<year> <name of author>

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details.

You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990 Ty Coon, President of Vice

That's all there is to it!

## License attributions

### OpenSSL

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<https://www.openssl.org/>). This product includes cryptographic software written

by Eric Young (eay@cryptsoft.com)

## Botan cryptographic library license

Botan <http://botan.randombit.net/> is distributed under these terms:

Copyright

1999-2013,2014 Jack Lloyd

2001 Peter J Jones

2004-2007 Justin Karneges

2004 Vaclav Ovsik

2005 Matthew Gregan

2005-2006 Matt Johnston

2006 Luca Piccarreta

2007 Yves Jerschow

2007-2008 FlexSecure GmbH

2007-2008 Technische Universitat Darmstadt

2007-2008 Falko Strenzke

2007-2008 Martin Doering

2007 Manuel Hartl

2007 Christoph Ludwig

2007 Patrick Sona

2010 Olivier de Gaalon

2012 Vojtech Kral

2012-2014 Markus Wanner

2013 Joel Low

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions of source code must retain the above copyright notice, this list of conditions, and the following disclaimer.

Redistributions in binary form must reproduce the above copyright notice, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF

SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

**Copyright 2020 One Identity LLC.**

**ALL RIGHTS RESERVED.**

This guide contains proprietary information protected by copyright. The software described in this guide is furnished under a software license or nondisclosure agreement. This software may be used or copied only in accordance with the terms of the applicable agreement. No part of this guide may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording for any purpose other than the purchaser's personal use without the written permission of One Identity LLC .

The information in this document is provided in connection with One Identity products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of One Identity LLC products. EXCEPT AS SET FORTH IN THE TERMS AND CONDITIONS AS SPECIFIED IN THE LICENSE AGREEMENT FOR THIS PRODUCT, ONE IDENTITY ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ONE IDENTITY BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ONE IDENTITY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. One Identity makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. One Identity does not make any commitment to update the information contained in this document.

If you have any questions regarding your potential use of this material, contact:

One Identity LLC.  
Attn: LEGAL Dept  
4 Polaris Way  
Aliso Viejo, CA 92656

Refer to our Web site (<http://www.OneIdentity.com>) for regional and international office information.


**Patents**

One Identity is proud of our advanced technology. Patents and pending patents may apply to this product. For the most current information about applicable patents for this product, please visit our website at <http://www.OneIdentity.com/legal/patents.aspx>.

**Trademarks**

One Identity and the One Identity logo are trademarks and registered trademarks of One Identity LLC. in the U.S.A. and other countries. For a complete list of One Identity trademarks, please visit our website at [www.OneIdentity.com/legal](http://www.OneIdentity.com/legal). All other trademarks are the property of their respective owners.

**Legend**

-  **WARNING:** A WARNING icon highlights a potential risk of bodily injury or property damage, for which industry-standard safety precautions are advised. This icon is often associated with electrical hazards related to hardware.
  
-  **CAUTION:** A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.