IBM Safer Payments
Version 6.5

Implementation Guide

SC34-7719-00

This edition applies to IBM® Safer Payments release 6.5.x, Program Number 5725-Z82, and to all subsequent releases and modifications until otherwise indicated in new editions.

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Preface

The IBM Safer Payments Implementation Guide is valid for 6.5.0.*x*.

For more information about version numbers, see “Versioning method” on page xii.

The most current version of the Implementation Guide is available on Safer Payments on IBM Documentation.

Note: IBM Counter Fraud Management for Safer Payments was renamed to "IBM Safer Payments Implementation Guide" as of version 6.0.

Audience

The Implementation Guide is intended for system administrators and IBM Safer Payments administrators who deploy IBM Safer Payments in a PCI DSS-compliant environment.

How to use this document

The IBM Safer Payments Implementation Guide describes how to install, configure, and operate IBM Safer Payments 6.5.0.*x* in compliance with the Payment Card Industry Data Security Standard (PCI DSS).

It consists of the following sections:

- Chapter 1, “Introduction to PCI DSS,” on page 1 introduces PCI DSS and describes how to become PCI DSS compliant.
- Chapter 2, “Installation,” on page 5 describes how to install and update IBM Safer Payments.
- Chapter 3, “Basic configuration,” on page 15 and Chapter 4, “Operational configuration ,” on page 29 describe how to configure IBM Safer Payments to be PCI DSS compliant.
- Chapter 6, “Operational procedures ,” on page 53 describes how to operate IBM Safer Payments to be PCI DSS compliant.
- Chapter 5, “Key management configuration and procedures,” on page 37 describes cryptographic keys, how keys are generated, and how to enter and activate keys.
- Appendix A, “PA-DSS requirements,” on page 67 lists the relevant requirements.

If you have feedback about this document, go to Safer Payments on IBM Documentation. Go to the correct version and find the topic. Click **Feedback** and enter your comments.

Where to find more information

Numerous information resources are available to support administrators and users.

The IBM Safer Payments product information offers up-to-date news about related products and services, new functions, and other items of interest:

https://www.ibm.com/marketplace/payment-fraud-prevention

The IBM Support Portal is the central hub for support, including technical notes:

https://www.ibm.com/support/entry/portal/support

Fix Central provides fixes and updates:

https://www.ibm.com/support/fixcentral

IBM Documentation provides access to technical documentation:

Safer Payments on IBM Documentation

Versioning method

IBM Safer Payments uses a release number scheme that is based on the PA-DSS guidelines for versioning.

Versioning

Version numbers consist of four numbers that are separated by periods, for example, 6.5.0.00. Each position in the version number has a meaning:

- The first number denotes the project generation.
- The second number denotes feature releases or High Impact changes per PA-DSS.
- The third number denotes Low Impact changes per PA-DSS.
- The fourth number denotes No Impact changes. It can be one or two digits, which can also be denoted with a wildcard ("*x*"), for example, 6.5.0.*x*.

Changes in the fourth number denote changes that are not PCI relevant and therefore have no impact per the PA-DSS Program Guide.

PA-DSS change types

For more information about PA-DSS change types, see the following sections in the PA-DSS Program Guide:

- High Impact

  See *Section 5.2.3.4 "High Impact Changes"*.
- Low Impact

  See *Section 5.2.3.3 "Low Impact Changes"*.
- No Impact

  See *Section 5.2.3.2 "No Impact Changes"*.
- Administrative Changes

  See *Section 5.2.3.1 "Administrative Changes"*.

Chapter 1. Introduction to PCI DSS

The Payment Card Industry Data Security Standard (PCI DSS) is defined by the PCI Security Standards Council (PCI SSC).

The PCI DSS is a multifaceted security standard that includes requirements for security management, policies, procedures, network architecture, software design, and other critical protective measures. This comprehensive standard is intended to help organizations proactively protect customer account data.

In compliance with PCI DSS, a complementary standard framework for payment applications was established, called the "Payment Application Data Security Standard (PA-DSS)".

The documentation for PCI DSS and PA-DSS describes the relationship between PCI DSS and PA-DSS. You can download it here:

Security Standards Council Document Library

PA-DSS certification

IBM Safer Payments 6.5.*x* is not and will not be certified against PA-DSS.

This document describes how to implement IBM Safer Payments in a PCI DSS-compliant environment based on previous experience with the certified predecessor version 6.3.

For official certificate information, see the PCI website. In the **Company Name** search field, enter "IBM Safer Payments".

Applicability of PCI DSS and PA-DSS to IBM Safer Payments

IBM Safer Payments installations must be configured and operated in a way that ensures compliance with PCI DSS.

In payment card issuing, the Primary Account Number (PAN) is the defining factor to prevent fraud in a successful IBM Safer Payments operation.

PCI DSS compliance means considerable administrative work for Safer Payments licensees. A way to avoid these additional efforts is not to process and store any clear-text or encrypted PAN in Safer Payments. To achieve this, PAN numbers are hashed before they are sent to Safer Payments. Licensees who follow this path can ignore the PCI DSS specifications regarding their Safer Payments installation. This is a fairly viable approach unless you are a payment card issuer or its processor.

However, to use a partly hashed PAN throughout the whole Safer Payments installation is highly impracticable in card issuing fraud prevention. Safer Payments users need to see the clear-text PAN to retrieve additional information from other systems, talk to cardholders, analyze fraud patterns and trends, and so on. In addition, many fraud patterns can be detected and stopped only by including the PAN into Safer Payments decision models. Therefore, Safer Payments provides user access rights. For example, users with a legitimate need to work with the decrypted PAN can do so, whereas standard users see PANs only masked.

How to become PCI DSS compliant

If you decide to process PANs, PCI DSS applies to your IBM Safer Payments installation. You must ensure compliance.

To achieve compliance with version 3.2 of PA-DSS, you must configure your installation to meet the requirements. This document describes how to implement and operate IBM Safer Payments in compliance with version 3.2 of PCI DSS.

As PCI DSS compliance cannot be achieved without extra effort by the licensee. This document highlights necessary compliance measures that a licensee must implement.

Chapter 2, “Installation,” on page 5 describes actions that are required for PCI DSS-compliant installation and operation.

Chapter 5, “Key management configuration and procedures,” on page 37 provides insight into key management procedures.

Frequently used terms

Understand the terms and acronyms that are used in PCI DSS, PA-DSS, and IBM Safer Payments.

Cardholder data

- Primary Account Number (PAN)
- Cardholder name
- Expiration date
- Service code

Sensitive authentication data

- Full magnetic stripe data or equivalent on a chip
- CAV2
- CID
- CVC2
- CVV2
- PINs
- PIN blocks

Note: Sensitive authentication data is not required by IBM Safer Payments for full operational functionality. Supplying systems must be configured in a way that they do not send such data to IBM Safer Payments. If you send such data to IBM Safer Payments, your installation is not PCI DSS compliant.

Interfaces and data storage

CDC
Computational Data Cache

DDC
Disk Data Cache

EMC
External Model Component

MCI
Message Command Interface

MCI connects IBM Safer Payments to authorization systems, card management systems, and related data sources.

MDC
Memory Data Cache

IBM Safer Payments uses two types of data stores: DDC (on disk) and MDC (in memory). It maximizes data in MDC to accelerate real-time operations. On startup, data is loaded from disk into memory ("priming").

SCI

Status Control Interface

The SCI interface is used exchange status information and to dispatch control commands between IBM Safer Payments instances in a cluster. It is the only IBM Safer Payments interface that cannot be deactivated.

Chapter 2. Installation

You must install IBM Safer Payments so that it meets all PCI DSS requirements.

Installation overview

Complete the prerequisites and installation steps in the correct order.

The installation instructions assume that you install IBM Safer Payments as a cluster of multiple IBM Safer Payments instances. If you want to install IBM Safer Payments as stand-alone service, omit the installation steps for the other instances.

You must be logged in with an administrator account on your workstation to run some of the installation steps.

Note: You do not need administrator privileges to run IBM Safer Payments.

Before you begin

1. Review the system requirements. For more information, see “System requirements ” on page 5.
2. Complete the installation prerequisites. For more information, see “Installation prerequisites” on page 6.

Installing IBM Safer Payments

1. If you have an existing installation, verify the version number that you are running. Log in as root on the console and enter the following command:

   ```
   iris release
   ```

2. Read the Release Notes to find out the current major releases and fix packs that are available. Decide what major release or fix pack you need to install. Contact IBM Support if you have questions.
3. Download the installation image. For more information, see “Downloading the installation image ” on page 7.
4. Verify and extract the installation zip file. For more information, see “Verifying and extracting the installation zip file” on page 8.
5. Prepare JRE (optional). For more information, see “Preparing the Java Runtime Environment ” on page 8.
6. Run the installer. Follow the process that is correct for your situation. For more information, see:
   - “Installing IBM Safer Payments for the first time” on page 8
   - “Installing a major release” on page 11
   - “Installing a fix pack update” on page 12

System requirements

Review the system requirements before you begin the installation.

Supported platforms

IBM Safer Payments is tested for the following operating systems:

- Red Hat® Enterprise Linux® 7 (RHEL 7)
- Red Hat Enterprise Linux 8 (RHEL 8)
- Oracle Linux 7

User access is provided with all recent standard browsers. The following browsers are fully tested for compatibility:

- Microsoft Edge 79 or later
- Firefox 69 or later
- Google Chrome 64 or later

Apple Safari is partially tested for compatibility.

Screen resolution

The IBM Safer Payments user interface is designed to work with a minimum resolution of 1280×768 pixel, thus WXGA (1280×768) screen resolution is the minimum for correct page display. For power users, for example, fraud analysts, a dual monitor configuration with HDTV (1920x1080) screen resolution is the best solution. With this resolution, users can open multiple browser pages and tabs with the same session. Because of the high interactiveness of the user interface, the performance of the JavaScript engine is key to smooth operation. The Google Chrome browser provides the best user interface performance.

Installation prerequisites

Define and implement certain operational processes and periods before you install and configure IBM Safer Payments.

Define and implement operational processes

To achieve PCI DSS compliance, it is not enough to configure IBM Safer Payments as described here. You must also implement a set of operational processes within your organization for PCI DSS-compliant operation.

Important: Read the PCI DSS documentation and implement the operational processes that are described there.

Security Standards Council Document Library

Define a cryptoperiod

The cryptoperiod defines the lifetime of an encryption key. At the end of each cryptoperiod, keys must be replaced.

PCI DSS itself does not postulate a specific cryptoperiod. However, it is necessary that you as an organization define your own cryptoperiod. See “Enforcing regular key changes ” on page 49 for details.

Define a retention period

Outdated cardholder data must be securely deleted. PCI DSS itself does not postulate when cardholder data becomes outdated. However, according to PCI DSS requirement 3.1 (aligns with “Requirement 2.1” on page 68) it is necessary that you as an organization define a retention period.

You can define different retention periods for different kind of data elements:

- A retention period for transaction data, according to your business requirements.
- A longer retention period for all other data, such as cases, or event logs.

Basically, you can also define the same retention period for both types of data. Retention requirements for cases or audit trails are typically longer than five years. However, rarely is there a business need to retain transaction data for such extended periods, and memory consumption would be high given the typical transaction volumes.

Downloading the installation image

Download the installation image to begin the installation.

Before you begin

Read the Release Notes for the version that you are installing. The Release Notes explain where to get the installation image:

- Passport Advantage®

  Passport Advantage contains major releases.

- Fix Central

  Fix Central contains fix packs.

From IBM's perspective, a major release has zeros in the third and fourth positions of the version number. That means, for example, that 6.4.0.00 and 6.5.0.00 are major releases (available on Passport Advantage) and 6.3.0.03 and 6.4.2.01 are fix packs (available on Fix Central).

Every major release and fix pack is a full installation. Fix packs are cumulative. You do not need to install a major release and then install fix packs on top of it. A fix pack contains all of its fixes and all fixes for prior fix packs of that major release. For example, 6.4.2.01 includes all fixes in 6.4.2.01 as well as those in previous 6.4.x fix packs. A major release contains all of its fixes and all fixes in the last fix pack of the previous major release. For example, 6.5.0.00 includes all fixes in 6.5.0.00 as well as those in the last 6.4.x fix pack.

Downloading from Passport Advantage

Follow these steps if you are downloading the installation image from Passport Advantage:

1. Go to IBM Passport Advantage.
2. Sign in with your IBMid and password. If you are not yet registered, follow the prompts to request access.
3. Click **Software download & media access**. All entitled products are listed on the **Software Download and Media Access** page. The page provides a guided process for selecting a platform and the product version that you want to download.
4. If you are licensed for more than one product, select the program offering that you want to download.
5. Click **Download finder** to see a list of available products. Follow the on-screen prompts to select and download IBM Safer Payments.

   The download file is a tar file. The tar file name depends on the version.
6. Log in as root on the console.
7. Extract the tar file:

   ```
   tar -xf tarfilename.tar
   ```

   The result is an installation zip file that is named `SaferPayments_6_5_x_x.zip`.

Downloading from Fix Central

Follow these steps if you are installing the installation image from Fix Central:

1. Go to Fix Central.
2. Download the IBM Safer Payments installation image. It is a zip file that is named:

   ```
   SaferPayments_6_5_x_x.zip
   ```

Verifying and extracting the installation zip file

Verify the integrity of the installation zip file and extract it.

Use the preinstalled `sha256sum` tool to verify that the checksum for the zip file matches with the checksum that is provided in the Release Notes.

1. Go to the Release Notes for the release or fix pack that you are installing. Get the checksum value.
2. Log in as root on the console.
3. Run the `sha256sum` checksum tool:

   ```
   sha256sum SaferPayments_6_5_x_x.zip
   ```

4. Verify that the tool's output is the same as the checksum that is given in the Release Notes.
5. Extract the zip file to a temporary directory:

   ```
   unzip SaferPayments_6_5_x_x.zip
   ```

The following files are extracted from the zip file:

`SaferPayments.bin`
The installation image file.

`ibm_jre_8.0.2.10_linux_x64.vm`
The setup file to install LINUX IBM JRE 1.8 SR2 FP10 (64-bit). You need this file only if JVM is not installed.

For more information, see “Preparing the Java Runtime Environment ” on page 8.

`installer.properties`
The sample response file. You need this file only if you want to run the installer in silent mode.

Preparing the Java Runtime Environment

Install the Java Runtime Environment (JRE).

To run the installer, JRE must be installed on your system. If JRE is already installed, you can skip this step.

Important: The Linux IBM JRE is intended for use only with InstallAnywhere installers. Do not use it for any other purposes.

Root privileges are not needed to use Linux IBM JRE.

1. Locate the `ibm_jre_8.0.2.10_linux_x64.vm` file that is part of the download installation zip file. Use this file to install LINUX IBM JRE 1.8 SR2 FP10 (64-bit).
2. Log in on the console as root. Go to the directory where the installation zip file is located and run the following commands:

```
unzip ibm_jre_8.0.2.10_linux_x64.vm
tar xf vm.tar.Z
chmod +x jre/bin/java
chmod +x SaferPayments.bin
export PATH=`pwd`/jre/bin:$PATH
```

Note: You must set the **`export`** command with the same user as the installation user.

Installing IBM Safer Payments for the first time

Install IBM Safer Payments if you do not have an existing installation.

If you already have an existing IBM Safer Payments installation, do not follow these steps. Instead, see “Installing a major release” on page 11 or “Installing a fix pack update” on page 12.

Prerequisites

1. Follow the installation instructions up to running the installer. For more information, see “Installation overview ” on page 5.
2. Decide on the instance path. The instance path is the directory where you want to store the IBM Safer Payments instance.
3. Decide whether to run the installer in normal or silent mode.
4. Create the following user and group:

   SPUser

   SPUser is the user that runs the IBM Safer Payments instance.

   SPUserGroup

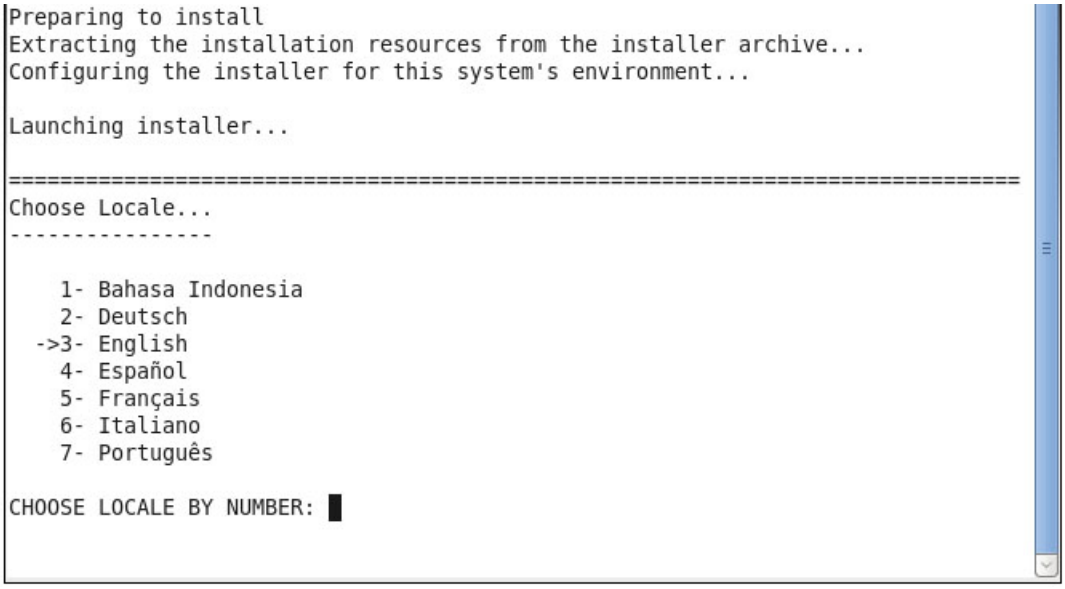
   SPUser belongs to the SPUserGroup.

Running the installer (normal mode)

Log in as root on the console. Go to the directory where the installation file is located and run the following command:

```
sh ./SaferPayments.bin
```

The installer starts in console mode:



Select a language, press the enter key, and follow the installation steps.

In the installer you can specify the following special settings:

Change license language
Even if you selected a language other than English, the English license is shown by default. To display the license in the selected language press 5 when the English license is shown.

Choose install set

Typical
If you choose `Typical`, the configuration with the type "empty" is copied to the factory reset folder. The instance path must be created manually after installation.

Starter packs
If you choose `Starter packs`, one of several custom configurations can be selected. This custom configuration is then automatically copied to the instance path.

Starter packs settings

Configuration
The IBM Safer Payments configuration that you want to start with in your instance path.

Path
The instance path. The configuration is copied to this path.

SPUser and SPuserGroup
The user and group that are created in "Prerequisites" on page 9.

Note: The chosen installation set and configuration do not affect any security or PA-DSS relevant settings. All instructions in this section and the following sections apply to all installation sets and configurations.

The following folders are created:

`/usr/bin`
The IBM Safer Payments and the **keygen** binary files are installed in this folder.

`/usr/lib64`
The AES and SQL libraries of IBM Safer Payments are located in this folder.

`/installationPath/`
The IBM Safer Payments installation directory. The default is `/opt/ibm/safer_payments/install`.

`/installationPath/inc`
The JavaScript files of IBM Safer Payments are located in this folder.

`/installationPath/factory_reset`
This folder contains an initial configuration to start IBM Safer Payments for the first time. Never change the files in this folder and always use a copy with other user privileges for your initial configuration.

Running the installer (silent mode)

In silent mode, the installer has no user interaction and is run by using a response file that contains the values for various variables.

IBM Safer Payments provides a sample response file that is called `installer.properties` with default values. To accept the license agreement, open the sample response file and set:

```
$LICENSE_ACCEPTED$=true
```

Make sure the response file and `SaferPayments.bin` are in the same directory.

Log in as root on the console. Go to the directory where the installation file is located and run the following command:

```
sh ./SaferPayments.bin -i silent
```

Completing postrequisites

Complete the postrequisites regardless of whether the installer ran in normal or silent mode. If you chose `Typical`, you must run the following commands after installation:

```
cp -R /installationPath/factory_reset/* /instancePath

chown -R SPUser:SPUserGroup /instancePath
```

Where:

- */instancePath* is the instance path, as defined in "Prerequisites" on page 9.
- *SPUser* and *SPUserGroup* are the user and group, as defined in "Prerequisites" on page 9.

Starting configuration

You are now ready to configure the system. For more information, see Chapter 3, “Basic configuration,” on page 15 and Chapter 4, “Operational configuration ,” on page 29.

Installing a major release

A major release is indicated by a change of the first or second revision number position.

In a major release, file formats might be changed so that you cannot change back to an earlier release. Also, you might not be able to install such an update immediately, that is, on a running IBM Safer Payments cluster that still fully runs during the update.

Depending on your specific application needs, it might be advisable to contact IBM support for assistance with a major release.

Before you begin:

1. Go to the Release Notes for the major release and read the "Update information".
2. Follow the installation instructions up to running the installer. For more information, see “Installation overview ” on page 5.

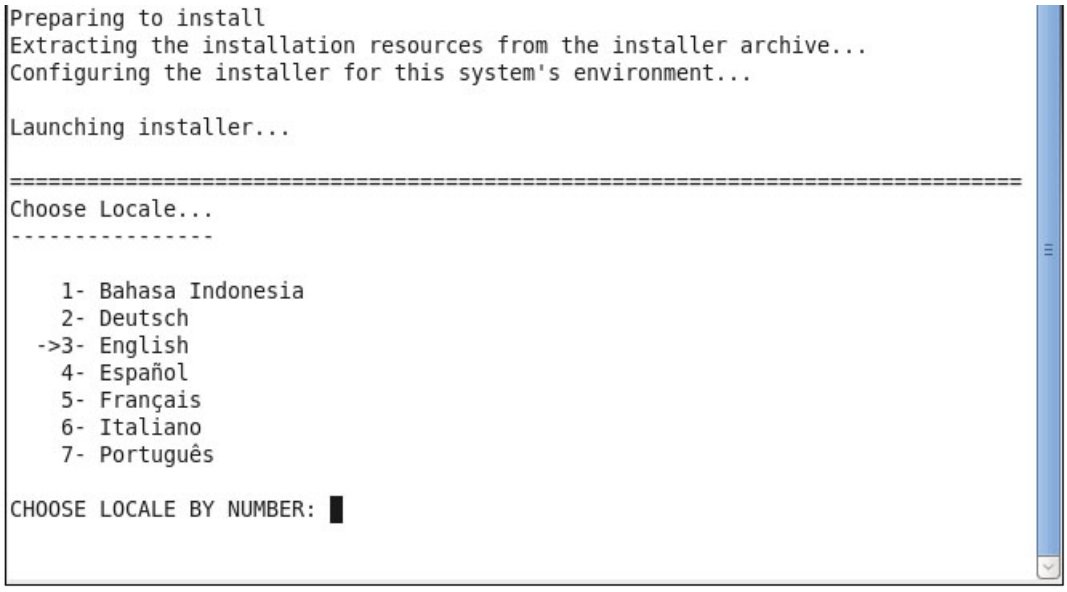
Suggested workflow to install a major release:

1. Shut down all IBM Safer Payments instances in a cluster.
2. Back up at least one instance. Use the backup to restore other instances if you need to revert the update. For more information, see:

   https://www.ibm.com/support/pages/performing-backup-ibm-safer-payments
3. Log in as root on the console. Go to the directory where the installation file is located and run the following command:

   ```
   sh ./SaferPayments.bin
   ```

   The installer starts in console mode:

4. Select a language, press the enter key, and follow the installation steps.

   Note: Do not use `Starter packs` for major releases.
5. The installer continues and finishes.

   The following folders are updated:

/usr/bin
The IBM Safer Payments and the **keygen** binary files are installed in this folder.

/usr/lib64
The AES and SQL libraries of IBM Safer Payments are located in this folder.

/installationPath/
The IBM Safer Payments installation directory. The default is `/opt/ibm/safer_payments/install`

/installationPath/inc
The JavaScript files of IBM Safer Payments are located in this folder.

/installationPath/factory_reset
This folder contains an initial configuration to start IBM Safer Payments for the first time. Never change the files in this folder and always use a copy with other user privileges for your initial configuration.

6. If you have a previous rpm installation, you must update all symbolic links (readme file and swidtag, license, inc folder) of all configurations after the installation. Go to the instance path, log in as `SPUser` on the console, and run the following commands:

```
ln -f -s /installationPath/readme readme
ln -f -s /installationPath/swidtag swidtag
ln -f -s /installationPath/license license
ln -f -s /installationPath/inc inc
```

7. Read the Release Notes to find out whether any other files must be exchanged.
8. Start all updated IBM Safer Payments instances.
9. Verify the version number. Log in and go to **Cluster** > **System monitoring** > **System internals**.

Installing a fix pack update

A fix pack update is indicated by a change of the third or fourth revision number position.

A fix pack update can be run without downtime of the online message interfaces (MCI, IBM MQ, and Kafka). If possible, reduce API activity to case investigation during the update procedure until at least two instances are updated to the new version. Doing so prevents complications during model changes, go-lives, and simulation that are caused by instances that are running on different versions. If postponing model operations is not feasible, you can choose to run model operations all the time but at your own risk.

Before you begin:

1. Go to the Release Notes for the fix pack and read the "Update information".
2. Follow the installation instructions up to running the installer. For more information, see “Installation overview ” on page 5.

Suggested workflow to install a fix pack update:

1. Disable the online message interfaces (MCI, MQI, and KMI) and incoming FLI on instance (A) that will be updated first. Move API to another instance if API is active on instance (A)
2. Ensure that the outgoing FLI buffer of instance (A) to all other instances is empty.
3. If possible, minimize the API activity from that point on to case investigation on any remote instance during the update of instance (A).
4. Shut down instance (A).
5. Back up at least one instance. Use the backup to restore other instances if you need to revert the update. For more information, see:

   https://www.ibm.com/support/pages/performing-backup-ibm-safer-payments
6. Log in as root on the console. Go to the directory where the installation file is located and run the following command:

```
sh ./SaferPayments.bin
```

The installer starts in console mode. Select a language and follow the installation steps.

7. Start instance (A) and monitor logs during startup. Contact support if unexpected errors or warnings occur that were not in the log before.
8. Clear browser cache before you log in to instance (A) (Ctrl+shift+F5 on most browsers).
9. Activate FLI on instance (A) and wait for instance (A) to receive all buffered FLI messages.
10. Disable FLI on all instances except for (A).
11. Enable API and the online message interfaces on instance (A).
12. If the update was successful, continue to the next step and update the other instances. If something went wrong, back out the update. For more information, see "Backing out a fix pack update" on page 13.
13. Disable the online message interfaces on all other instances.
14. Shut down instance (B).
15. Perform an update on instance (B) as described in step 6.
16. Start instance (B).
17. Enable FLI on instance (B) and wait for synchronization.
18. Enable the online message interfaces on instance (B) after synchronization is complete.
19. If required, you can now perform configuration and model changes on the updated instances again.
20. Shut down, update, and start instance (C) and all other instances (X).
21. Enable FLI on instances (C) and (X).
22. Enable the online message interfaces on instances (C) and (X) after synchronization is complete.
23. Verify the version number. Log in and go to **Cluster** > **System monitoring** > **System internals**.

Backing out a fix pack update

If you encounter problems while installing a fix pack update, you can revert to the previous release.

Compare the fix pack versions. If the first three version numbers are the same and only the fourth number is different, the fix packs are probably exchangeable. You can switch freely back and forth between them. If they are not exchangeable, it is stated in the Release Notes.

Choose the procedure that is correct for your situation.

Standard backout procedure

Use this procedure if:

- A healthy instance is available for the older release before the update, and
- The fix packs are exchangeable.

1. Shutdown the instance that has failed.
2. Uninstall IBM Safer Payments.
3. Install the previous version before the update.
4. Set `cfg/iris.iris` to `{\"iris\":{\"status\":\"New\"}}`
5. Restore the instance from a healthy instance that is using the previous version.
6. Contact support and provide information from logs and the cfg folder.

Backout by using backups or virtual machine snapshots

Use this procedure if:

- A healthy instance is not available for the older release before the update, or
- The fix packs are not exchangeable.

An administrator must restore the instance from a backup or snapshot that was taken of the instance before the update.

Uninstalling IBM Safer Payments

Uninstalling IBM Safer Payments uninstalls only installation files and folders, not configuration data.

Prerequisites

Decide whether to run the uninstaller in normal or silent mode.

Run the uninstaller (normal mode)

To uninstall, go to:

/installationPath/IBMSaferPayments_installation

Log in as root on the console and run the following command:

```
./uninstall_safer_payments
```

Run the uninstaller (silent mode)

In silent mode, the uninstaller has no user interaction and is run by using a response file that contains the values for various variables.

To run the silent uninstaller, go to:

/installationPath/IBMSaferPayments_installation

Log in as root on the console and run the following command:

```
./uninstall_safer_payments -i silent
```

Chapter 3. Basic configuration

Complete the basic configuration tasks to set up a IBM Safer Payments cluster.

This is a one-time task. Do it only after you install IBM Safer Payments for the first time.

IBM Safer Payments provides a built-in PCI DSS compliance report that lists all relevant configuration settings that must be changed to achieve PCI DSS compliance. For more information, see "Running the PCI DSS compliance report" on page 62.

Checking the ephemeral port range

Use ports outside your system's ephemeral port range.

To check the ephemeral port range, run the following command from the console:

```
sysctl -A | grep ip_local_port_range
```

Starting the first cluster instance

Start the first cluster instance and prepare the other instances to be configured.

The browser-based IBM Safer Payments user interface is used to configure a cluster. To access it, you must start the first cluster instance.

1. To start the first cluster instance, run the following commands from the console on the server:

   ```
   su SPUser
   cd /instancePath/cfg
   iris id=i createinstances=n
   ```

   - */instancePath* is the path, where the instance configuration is stored.
   - *SPUser* is the user, which runs the instance.
   - *i* must be a unique ID of the instance you are currently installing. Preferably, start your first instance with 1. That is, if you set up three instances in total, use IDs 1, 2, and 3.
   - *n* is the number of instances that you want to create.
2. Check the system event log messages on the console window, and verify that they indicate a proper start of the cluster instance. That is, no warning (W), error (E), or fatal (F) type messages.

   Exception: The `status.iris` file does not exist yet and is being created during the first start. An E155 message is created during the first start, followed by a message that the file was created. Therefore, this error message is expected.
3. Depending on the configuration of the server that you are installing on, you might have to configure the firewall open port, the API port for HTTP access of the browser. The default HTTP port of the first instance is "8001".

   Open a browser and enter:

   ```
   http://127.0.0.1:8001
   ```
4. The user interface login page is displayed.
5. Enter **user** as login and **12345678** as password. You are prompted to change the password of this account immediately.

   Note: To comply with PA-DSS requirement 3.1, you must create new personalized users for your configuration and disable the default configuration user.
6. Log in with one of your new users and continue the configuration.

7. The full user interface is displayed.
8. Click the **Cluster** tab.
9. The **Cluster Settings** section shows a table with one row for each instance.

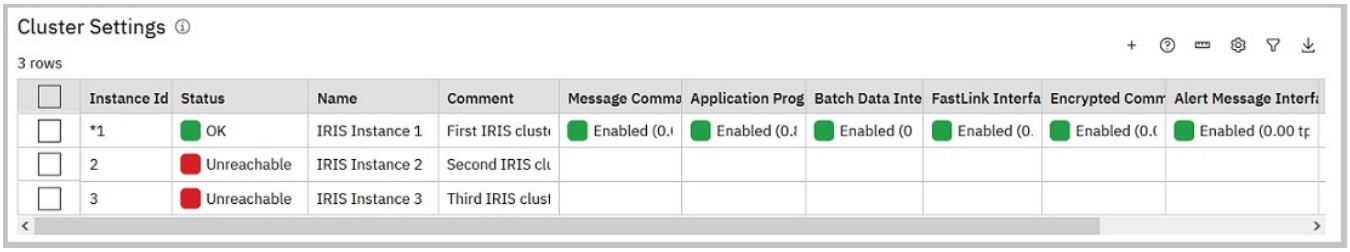


Figure 1. Cluster settings

10. Click anywhere in the row (except the checkbox) to open the configuration details of an instance. Customize all cluster settings, including changing the IP addresses and ports, enabling SSL encryption as described in "Configuring SSL encryption" on page 17, limiting IP address ranges, and changing local file storage locations as described in "Configuring cardholder data storage locations" on page 24.

    Make the appropriate settings for all cluster instances, not only the instance you are currently working on, even if the others are not yet physically set up.

    Note: Changes to the local file storage are processed after a restart of a IBM Safer Payments instance. Thus, you can move the files while the instance is offline. All changes to the interfaces are processed immediately when the settings are saved.

Since IBM Safer Payments was started without a previous configuration, it uses default settings for the number of cluster instances you specified with the `createinstances` command.

To use all IBM Safer Payments interfaces, it might be required to open more ports in your firewall. By default IBM Safer Payments uses the following ports:

- 8001 - Application Programming Interface
- 27921 - Fast Link Interface
- 27931 - Status Control Interface
- 27941 - Encrypted Communication Interface

Note: If you plan to use an IBM MQ or Kafka server to deliver data to IBM Safer Payments, you must correctly set up your firewall.

Configuring the Message Command Interface

The Message Command Interface (MCI) connects IBM Safer Payments to authorization systems, card management systems, and related data sources.

The MCI can have multiple endpoints, which can be configured independently. Each of them has a unique TCP port on the system.

Go to **Cluster** > **Interfaces** > **Inbound** to add new endpoints. You can configure business and performance settings. If you cannot view or edit the page, check how **Inbound Endpoint configuration** global privilege is defined for your user. For more information, see "Setting user privileges" on page 56.

The endpoints are not open until they are added to any IBM Safer Payments instances in **Cluster** > **Settings** > **Message Command Interface**. All security-related settings for MCI endpoints are defined there. For information about how to configure them for PCI DSS compliance, see "Configuring SSL encryption" on page 17.

Configuring SSL encryption

Meet the PA-DSS requirements for SSL encryption and configure the encryption correctly.

Note: TLS is the successor of SSL. The term *SSL* is used to refer to the secure communication technologies within IBM Safer Payments. In the IBM Safer Payments interfaces, all equivalent elements are named SSL.

For PCI DSS-compliance, follow these guidelines when you enable SSL encryption:

- The API must be encrypted to securely transmit passwords.
- All MCI endpoints must be encrypted when cardholder data is sent over public networks.
- The ECI must be enabled for synchronization of encryption keys between cluster instances.
- SSL and early TLS are not considered strong cryptography. Payment applications must not use, or support the use of, SSL or early TLS. Therefore, TLS 1.0 and 1.1 must be disabled for API, MCI, and ECI.

Note: The FLI and SCI do not support SSL encryption but instead encrypt attribute data based on the encryption settings defined in IBM Safer Payments.

For each interface that uses SSL encryption, encrypted SSL certificate files must be provided. IBM Safer Payments needs two files to support an encrypted connection. The server certificate and the private key in PEM format. The storage location of these files can be configured on the **SSL Settings** page. See "Creating certificates with OpenSSL" on page 21 for details on how to create the required certificates.

1. In the user interface, click the **Cluster** tab.

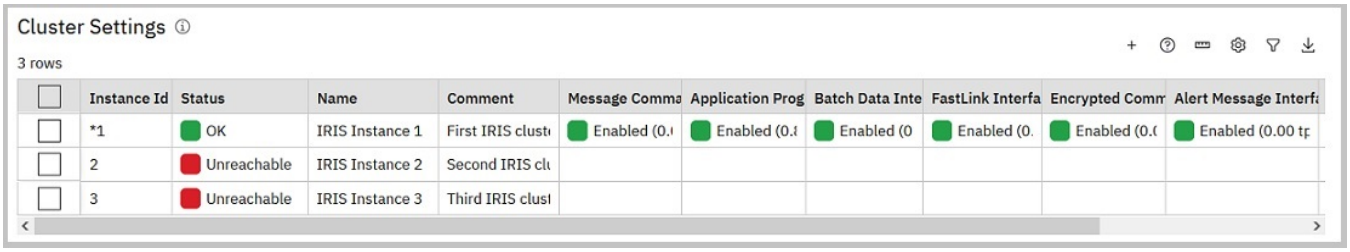


Figure 2. Cluster settings

2. Click the first instance of the **Cluster Settings** table.
3. Scroll down to the **Interfaces** section. Click the **Application Programming** tab.

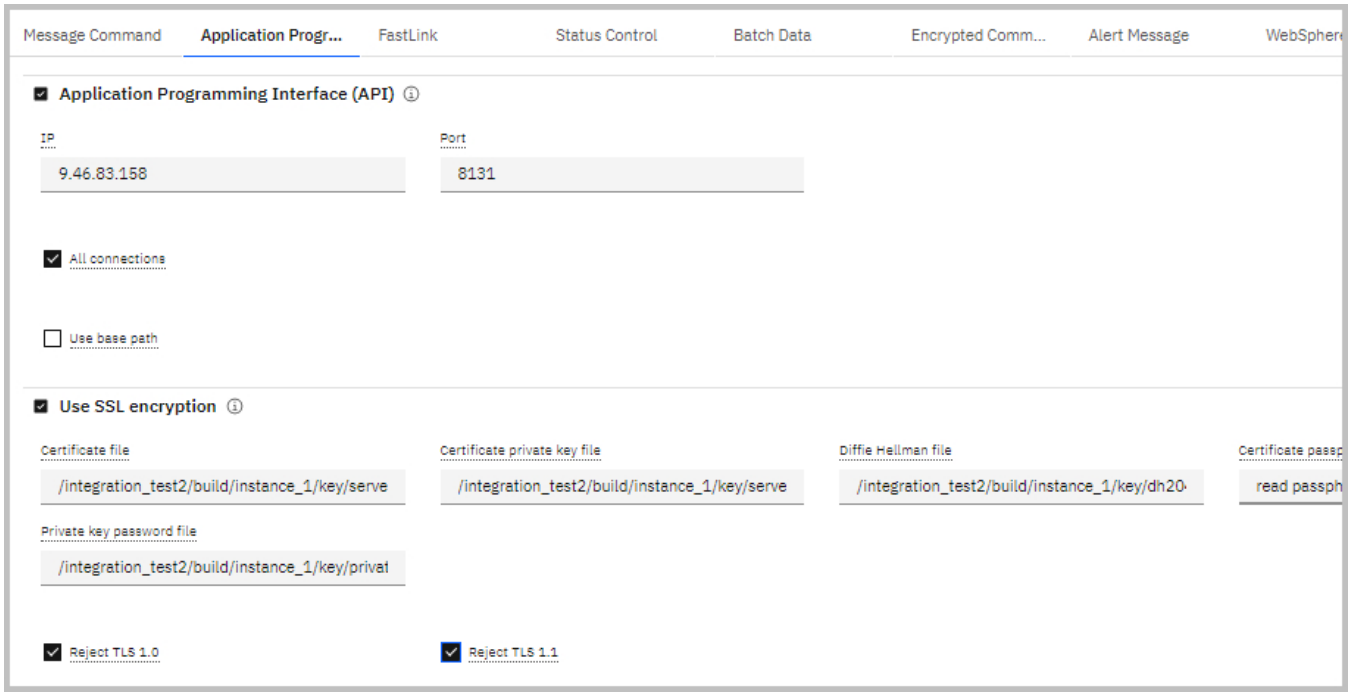


Figure 3. API - SSL settings

4. Select the **application programming interface (API)**, **Reject TLS 1.0**, and **Reject TLS 1.1** checkboxes.

   Add the file paths for the **Certificate file**, **Certificate private key file**, and **Diffie Hellman file**.
5. Click the **Encrypted Communication** tab. Click the **Encrypted Communication Interface (ECI)**, **Reject TLS 1.0**, and **Reject TLS 1.1** checkboxes.

   Add the file paths for the **Certificate file**, **Certificate private key file**, and **Diffie Hellman file**.
6. Click the **Message Command** tab. Click the **Message Command Interface (MCI)**, **Reject TLS 1.0**, and **Reject TLS 1.1** checkboxes.

   Add the file paths for the **Certificate file**, **Certificate private key file**, and **Diffie Hellman file**.

   Repeat for each endpoint.
7. Repeat these steps for each instance.

Note:

- SSL settings are individual for each instance because different instances running on different computers with different IP addresses require different certificates.
- Enabling SSL encryption and changing the settings takes effect immediately.
- From now on you are prompted to enter the certificate passphrase on the console during startup for each instance. See “Starting and stopping instances” on page 53 for details.

Sending cardholder data over public networks

If cardholder data is to be sent over public networks, IBM Safer Payments must also validate the SSL certificates, and multi-factor authentication is enforced for the API.

If cardholder data is to be sent over public networks, IBM Safer Payments must validate the SSL client certificates for MCI and ECI. Furthermore, API access needs to be secured by using multi-factor authentication. Use either a third-party solution, for example, VPN, or activate the validation of individual API client certificates as the second authentication factor.

Ensure that the **Validate client certificate CN** option is enabled. This enforces individual certificates for each user. Each user certificate must use the user's login name as the common name (CN).

Note: Before you activate this option, create client certificates at least for IBM Safer Payments administrators. For more information, see “Creating certificates with OpenSSL” on page 21.

To change the API, MCI, and ECI settings open the instance configuration for each cluster instance.

1. Click the **Cluster** tab.
2. Select a cluster instance.
3. Scroll down to the **Message Command Interface (MCI)** section and select the **Validate client certificate** checkbox for each endpoint.
4. Enter the correct path to the CA certificate file in **Client CA certificate file**.

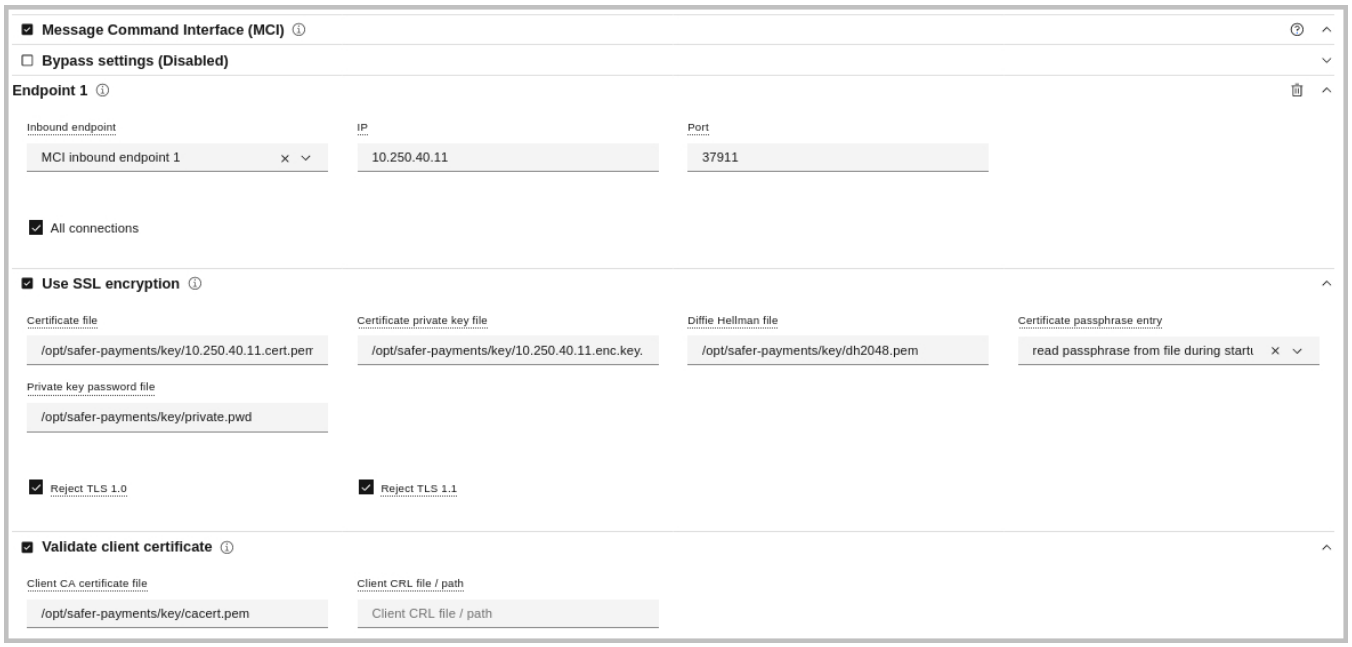


Figure 4. Message Command Interface (MCI) section

5. Click the **Application Programming** tab. Select the **Validate client certificate** checkbox.

   Note: You need a client CA certificate for each IBM Safer Payments instance, and a corresponding certificate for each service consumer that is used to access IBM Safer Payments.
6. Enter the correct path to the CA certificate file in **Client CA certificate file**.

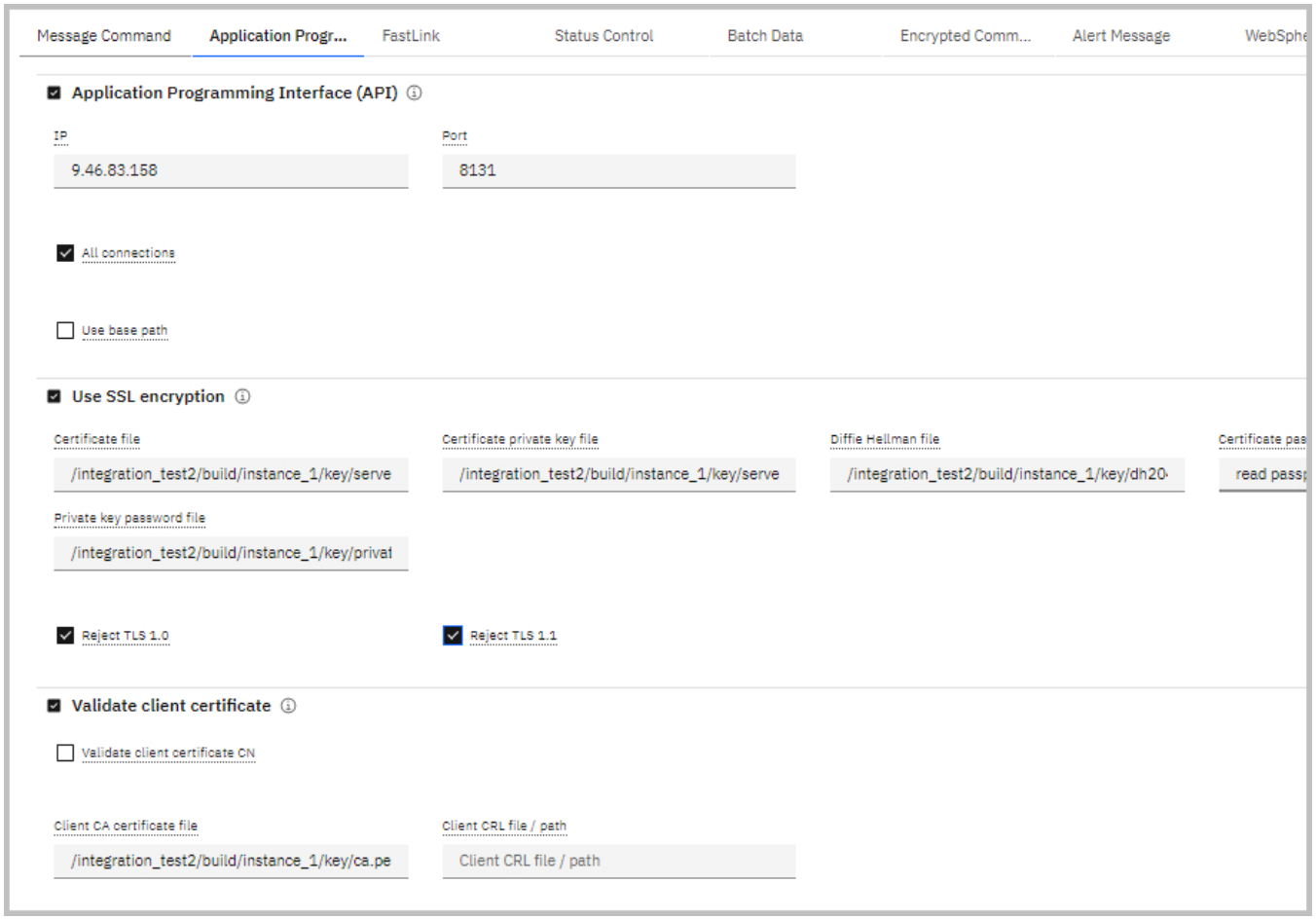


Figure 5. Application Programming Interface (API) section

7. Click the **Encrypted Communication** tab. Scroll down within the instance settings to the **Encrypted Communication Interface** section.

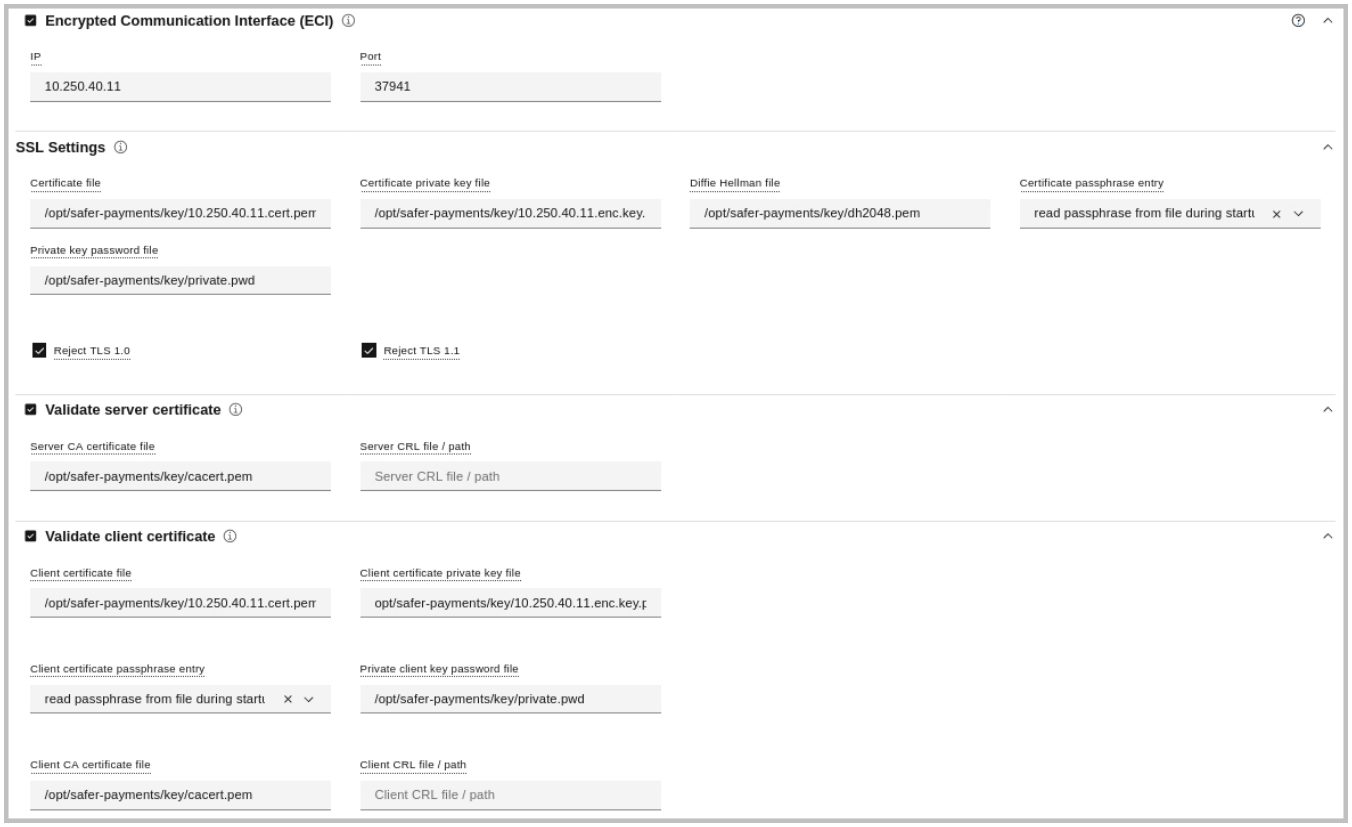


Figure 6. Encrypted Communication Interface (ECI) section

8. Select the **Validate server certificate** and **Validate client certificate** checkboxes.

   Note: You need both a server and client CA certificate for each IBM Safer Payments instance, and a corresponding client certificate.

   The encrypted private key is usually stored within the client certificate file but can optionally be stored in a separate file. The **Client certificate private key file** entry points to the correct location.
9. Place the files in the `/key/` directory of the instance.
10. Optionally, **Server CRL file / path** and **Client CRL file / path** can be used to define certificate revocation lists.

Creating certificates with OpenSSL

Complete these steps to create certificates with OpenSSL.

Important: Ask your security expert to review and run these steps. The steps can differ on different platforms. Complete the steps at your own risk.

The following settings are adapted for IBM Safer Payments.

1. Create a configuration file.

   The `caconfig.cnf` file is the default config file for the certificate authority (CA). It has the following content:

```
#.................................
[ ca ]
default_ca = CA_default
[ CA_default ]
dir = .
certs = $dir/certs
crl_dir = $dir/crl
database = $dir/index.txt
new_certs_dir = $dir/newcerts
certificate = $dir/certs/cacert.pem
```

```
serial = $dir/serial
crl = $dir/crl/crl.pem
private_key = $dir/private/cakey.pem
#RANDFILE = $dir/private/.rand
x509_extensions = usr_cert
crl_extensions = crl_ext
default_days = 3650
#default_startdate = YYMMDDHHMMSSZ
#default_enddate = YYMMDDHHMMSSZ
default_crl_days = 183
#default_crl_hours = 24
default_md = sha256
preserve = no
#msie_hack
policy = policy_match

[ policy_match ]
countryName = match
#stateOrProvinceName = match
#localityName = match
organizationName = match
commonName = supplied
emailAddress = optional

[ req ]
default_bits = 4096 # Size of keys
default_keyfile = key.pem # name of generated keys
distinguished_name = req_distinguished_name
default_md = sha256 # message digest algorithm
attributes = req_attributes
x509_extensions = v3_ca
#input_password
#output_password
string_mask = nombstr # permitted characters
req_extensions = v3_req

[ req_distinguished_name ]
countryName = Country Name (2 letter code)
countryName_default = DE
countryName_min = 2
countryName_max = 2
#stateOrProvinceName = State or Province Name (full name)
#stateOrProvinceName_default = RLP
#localityName = Locality Name (city, district)
#localityName_default = Coblence
organizationName = Organization Name (company)
organizationName_default = IRIS
organizationalUnitName = Organizational Unit Name (department, division)
organizationalUnitName_default = Fraud Prevention
commonName = Common Name (hostname, IP, or user name)
commonName_max = 64
commonName_default = 192.168.1.1
emailAddress = Email Address
emailAddress_max = 40
emailAddress_default = support@iris.de

[ req_attributes ]
#challengePassword = A challenege password
#challengePassword_min = 4
#challengePassword_max = 20
#unstructuredName = An optional company name

[ usr_cert ]
basicConstraints= CA:FALSE
subjectKeyIdentifier=hash
authorityKeyIdentifier=keyid,issuer:always
#nsComment = ''OpenSSL Generated Certificate''
#nsCertType = client, email, objsign for ''everything including object signing''
subjectAltName=email:copy
issuerAltName=issuer:copy
#nsCaRevocationUrl = http://www.domain.dom/ca-crl.pem
#nsBaseUrl =
#nsRenewalUrl =
#nsCaPolicyUrl =
#nsSslServerName =

[ v3_req ]
basicConstraints = CA:FALSE
keyUsage = nonRepudiation, digitalSignature, keyEncipherment

[ v3_ca ]
subjectKeyIdentifier = hash
```

```
authorityKeyIdentifier = keyid:always,issuer:always
basicConstraints = CA:TRUE
#keyUsage = cRLSign, keyCertSign
#nsCertType = sslCA, emailCA
#subjectAltName=email:copy
#issuerAltName=issuer:copy
#obj=DER:02:03

[ crl_ext ]
#issuerAltName=issuer:copy
authorityKeyIdentifier=keyid:always,issuer:always
#.................................
```

2. Create Diffie-Hellman files.

```
$ openssl dhparam -out dh2048.pem 2048
```

3. Create CA.

```
$ mkdir ~/myca
$ cd ~/myca
$ mkdir private certs newcerts conf export crl
$ echo "01" > serial
$ touch index.txt
$ vim conf/caconfig.cnf (Step 1)
$ openssl req -new -x509 -extensions v3_ca -keyout private/cakey.pem -out
certs/cacert.pem -days 3650 -config conf/caconfig.cnf
   → PW: xxxxxxxx
```

Note: Create a strong password and distribute it only to entitled people.

4. Create signed server certificate and private server key.

   You need one certificate/key for each IBM Safer Payments instance. Run the following commands one time for each instance and replace *SERVER_IP* with the IP address or hostname of the server.

```
$ openssl req -new -nodes -config conf/caconfig.cnf -out SERVER_IP.req.pem
-keyout private/SERVER_IP.key.pem
   → CN: SERVER_IP
$ openssl ca -config conf/caconfig.cnf -out newcerts/SERVER_IP.cert.pem
-infiles SERVER_IP.req.pem
```

5. Create signed client certificate and private client key.

   For MCI and ECI, you need at least one client certificate for each instance. Run the command twice per instance with unique file names and make sure that you enter unique common names when prompted.

   If you want to use multi-factor authentication by using API client validation, you might want to create one extra client certificate per user. For these certificates, make sure that the common name matches the users login.

```
$ openssl req -new -nodes -out filename.req.pem -keyout private/filename.key.pem
-days 3650 -config conf/caconfig.cnf
(for MCI) -> CN: CLIENT_IP_OR_NAME
(for ECI) -> CN: IRIS_SERVER_NAME
(for Browser) -> CN: LOGIN
$ openssl ca -out newcerts/filename.cert.pem -days 3650 -config conf/caconfig.cnf
-infiles filename.req.pem
```

6. Encrypt certificates.

   To encrypt certificates for secure storage on the Safer Payment instances, run the following command:

```
openssl rsa -des3 -in private/<filename>.key.pem -out private/<filename>.enc.key.pem
```

   It is a best practice to do this for both client and server certificates.

7. Create a certificate revocation list.

```
vim certs/ca.crl
vim crl.confg
```

The following code is the content of `crl.config`:

```
[ ca ]
default_ca      = CA_default                    # the default ca section

[ CA_default ]
dir             = ./                            # where everything is kept
database        = $dir/index.txt                # database index file.
certificate     = $dir/certs/cacert.pem         # the CA certificate
crl             = $dir/certs/ca.crl             # the current CRL
private_key     = $dir/private/cakey.pem        # the private key
default_crl_days = 183
```

```
$ openssl ca -config conf/caconfig.cnf -gencrl -out crl/crl.pem
```

8. Configure client-side certificates in web browsers.

   Use the following command to convert pem certificate to p12:

   ```
   openssl pkcs12 -export -out newcerts/filename.cert.p12 -inkey private/filename.key.pem
   -in newcerts/filename.cert.pem -certfile certs/cacert.pem
   ```

   Next, import the client-side certificates in your browser.

Configuring cardholder data storage locations

Meet the PA-DSS requirements for cardholder data storage locations and configure the locations correctly.

PA-DSS requirement 9 mandates that cardholder data must not be stored on a server that is connected to the internet.

To comply with this requirement, you must complete one of the following steps:

- Disable access from the internet to the server that hosts the IBM Safer Payments instances. Remote VPN access (PA-DSS requirement 10) is not considered as access from the internet, if the VPN tunnel does not end directly on a server that hosts the instances.
- Place the data storage directories on a separate server computer that is not connected to the internet and in a different network zone. If you want to use a storage area network (SAN) instead, more measures might be needed to achieve PCI DSS compliance. Contact your local Qualified Security Assessor (QSA) for details.

Note:

- You must disable the **locate** commands for the separate server computer. For more information, see “Disabling locate for folders” on page 30.
- Changes to the file storage locations are processed after an instance is restarted. Thus, you can move the files while the instance is offline.

Configuration steps

IBM Safer Payments can store cardholder data in a number of locations. To identify and adjust these locations, complete the following the steps.

1. Go to the user interface.
2. Click the **Cluster** tab.
3. Select a cluster instance from the table.

4. Scroll down to the **Storage** section.
5. For each cluster instance, the following directory locations can contain encrypted cardholder data:

Table 1. Default cardholder storage locations

Path name (default)	PAN stored as	PAN contained in
Archive (arc)	encrypted	archived cases
Configuration	encrypted	conditions
Disk data cache (DDC)	encrypted	attributes and indices
Email (eml)	masked, PANs are potentially also encrypted	notifications and case actions
FLI buffer (fli)	encrypted	FLI messages
Investigation (inv)	encrypted	cases
Log (log)	masked	log messages
User (usr)	encrypted	user preferences
Relational database interface (rdi)	masked	DML statements

6. You can now change the directory locations according to your configuration.

   Note: The locations are different for each instance. You must adjust the locations individually for each cluster instance.

Exporting data by using external Python programs

IBM Safer Payments can be configured to feed data to external Python programs, which in turn can store that data on the local or a remote machine. If sensitive data is involved, more measures must be taken to protect that stored data. See “Python code execution” on page 66 for details.

Data export jobs

Use the data export jobs to export transaction data to a csv file. For example, you can use it as training data for an external AI model. Because of this use case, data export jobs offer the option to export encrypted data like PANs as clear text, masked, or hashed. See Figure 7 on page 25 for an example of those settings.

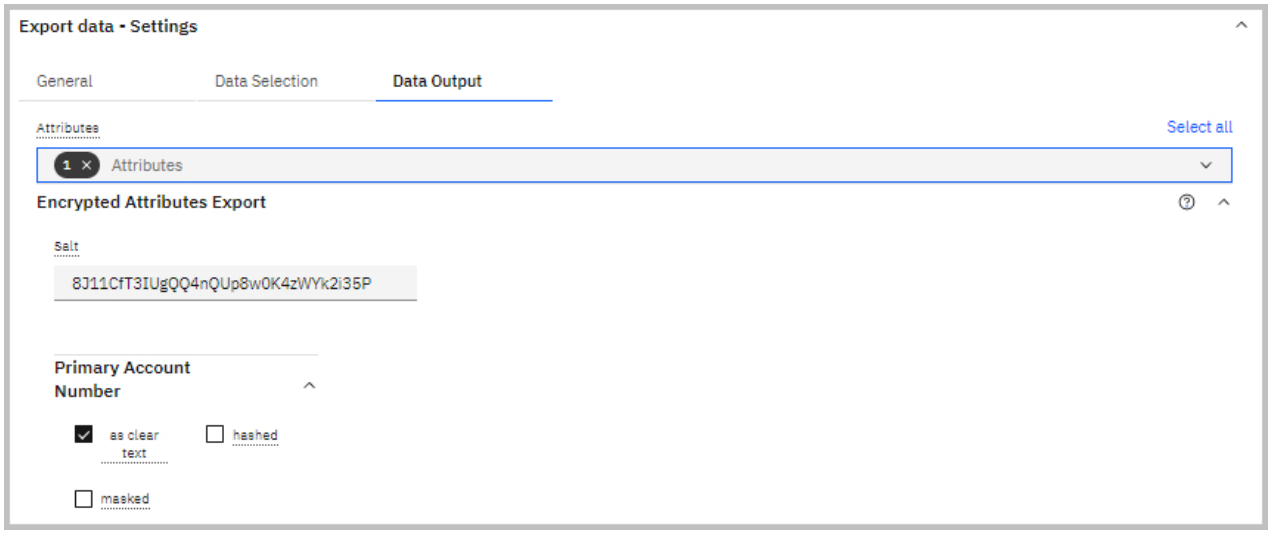


Figure 7. Data export options for encrypted attributes

The SHA256 hashing algorithm is used. The job definition includes a salt that is added to the exported values before the hashing algorithm is applied. This salt is usually randomly generated by using the boost library but can also be generated by a user. The salt is stored encrypted on disk and can be viewed only in the user interface if the user has the global privilege to change job definitions. If a user doesn't have the privilege, the salt is not delivered to the user interface, and the field shows a random value with no meaning.

Whenever sensitive data is exported as clear text, you must make sure that the resulting export file is securely stored according to PCI DSS requirements 3.4.1, 3.5, 3.6, and all applicable subrequirements.

Attention: Users without the global privilege to view unmasked data inside the application can still gain access to such data in clear text by accessing an exported file if that file is not properly protected.

When hashing is used together with masking, you must be aware that an attacker who gains access to the exported file and knowledge of the salt is able to reconstruct the plain text version of this data.

Simulation Query Data Export

Use the simulation query to export transaction data to a .csv file. As with data export jobs, this data might be used to train an external AI model. For data that is encrypted in IBM Safer Payments, it is possible to export the data as clear text, masked, or hashed.

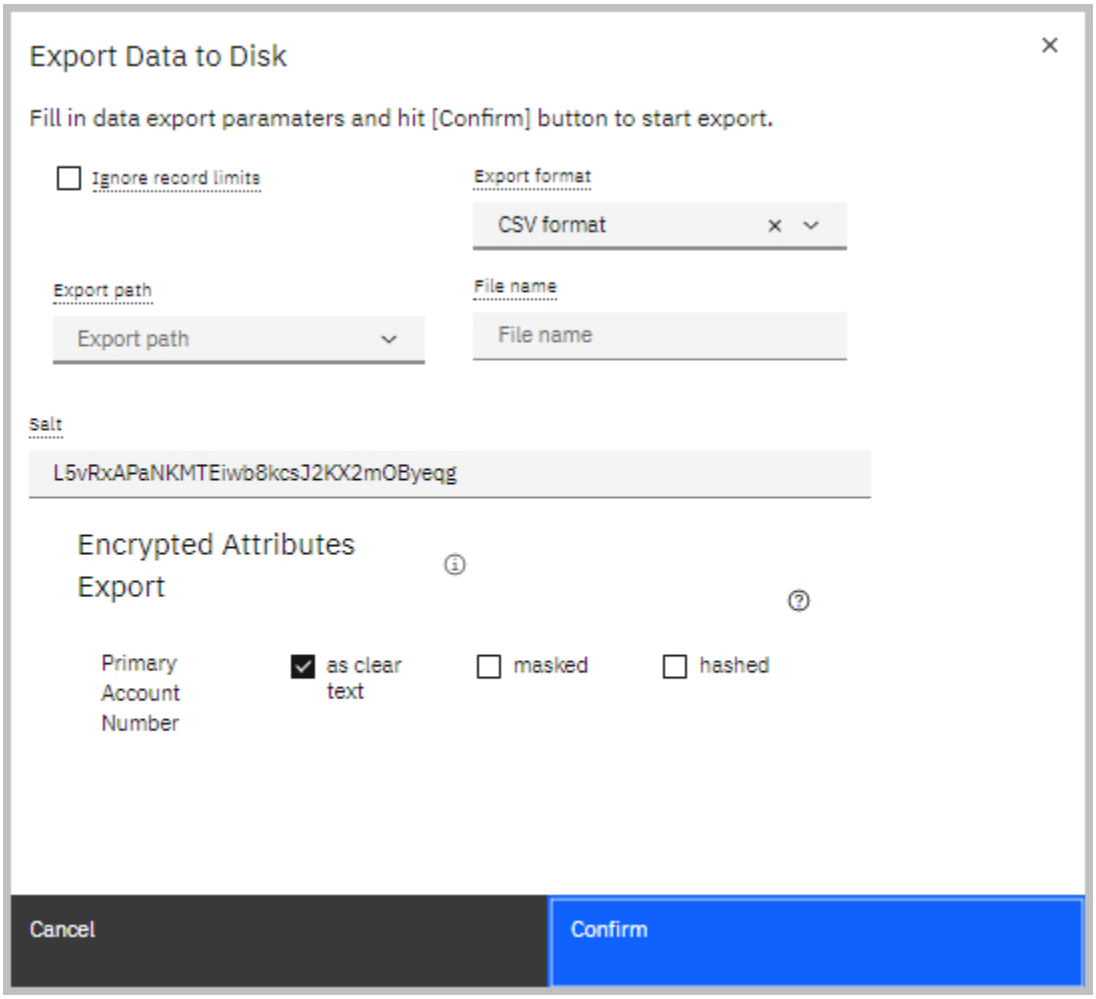


Figure 8. Simulation query data export options for encrypted attributes

The SHA256 hashing algorithm is used, and as with data export jobs, the salt is usually generated randomly by using the boost library but can also be specified by a user. The salt is stored encrypted on disk and can be accessed in IBM Safer Payments only by users who have the privilege to see unmasked

data. You can set this in the user account settings. Users without this privilege can use only reduced simulation query data export options.

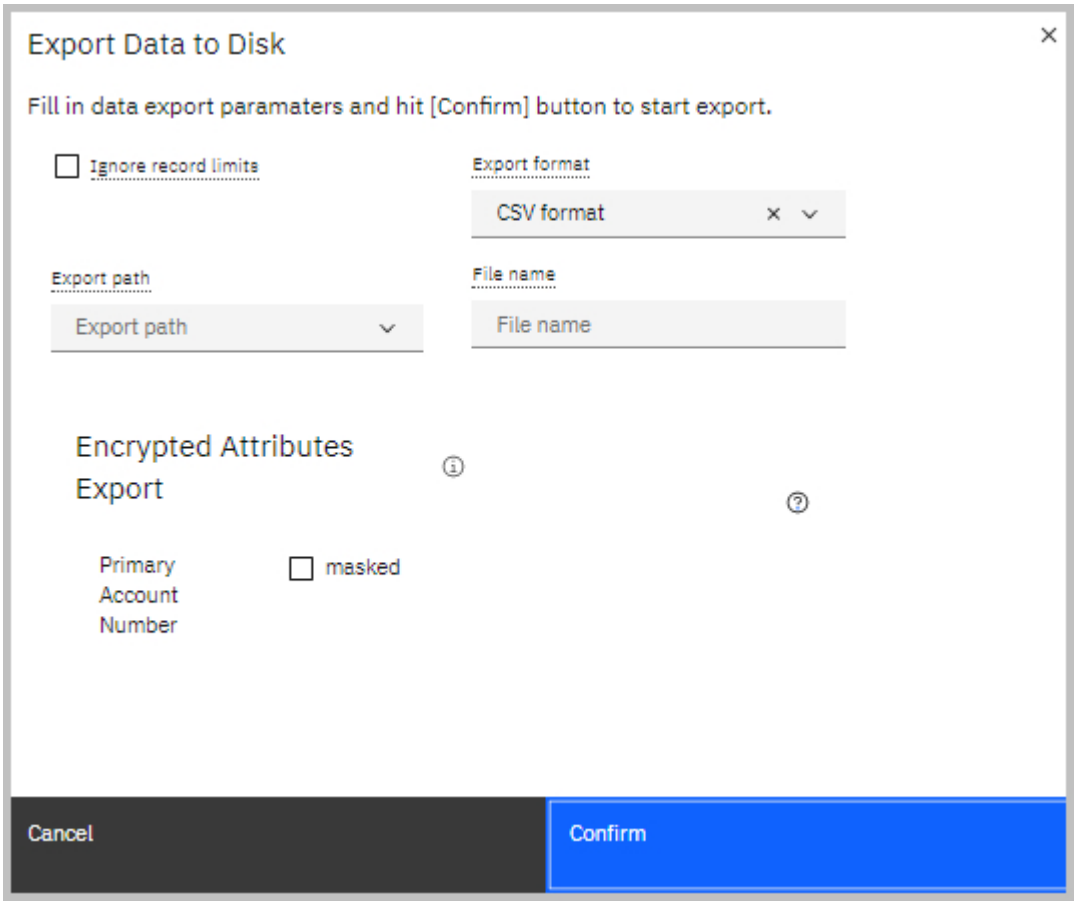


Figure 9. Reduced Simulation query data export options for users without the privilege to see unmasked data

When sensitive data is exported as clear text, PCI DSS Requirements 3.4.1, 3.5, 3.6, and all applicable subrequirements mandate that the export file is securely stored.

Attention: Users without the global privilege to view unmasked data inside the application can still gain access to such data in clear text by accessing an exported file if that file is not properly protected.

When hashing is used with masking, be aware that an attacker who gains access to the exported file and knowledge of the salt can reconstruct the plain text version of the data.

Configuration change journal

The configuration change journal is an optional type of log file that can be enabled on **Administration** > **System** > **Configuration** > **Misc** > **Miscellaneous**. If enabled, all changes to elements are written in clear-text to a log file.

The purpose of the configuration change journal is to transfer configuration changes from one IBM Safer Payments environment to another. Since the environments do not share encryption contexts, the files are stored as unencrypted. The storage location of configuration change journals is configured for each individual cluster instance on **Cluster** > **System monitoring** > **Settings**. In PCI DSS-compliant deployments, it is a best practice not to enable the configuration change journal. If it is enabled, the storage locations on all instances must be protected according to PCI DSS requirements 3.4.1, 3.5, 3.6, and all applicable subrequirements. If enabled, the PCI DSS compliance report includes a message.

Copying settings to other instances

After you create the initial instance, copy the configuration of the first instance to the other instances to create the cluster.

After you configure the initial cluster configuration as described in “Starting the first cluster instance ” on page 15, you must shut down the first instance.

1. Click the **Cluster** tab.
2. Click the checkbox for an entry.
3. Click the 

(Shutdown) icon.
4. Copy the files `cluster.iris`, `settings.iris`, and every file that starts with `inbound_endpoint` from the `cfg` subdirectory of the first instance to the `cfg` subdirectories of all the other instances.
5. Delete the entire contents of the `fli` directory of the instance that you used to create the files.
6. You must also assign SSL certificate files to each instance, as described in “Configuring SSL encryption” on page 17.
7. After you copy the configuration files to the other instances, you can start these instances as described in “Starting and stopping instances” on page 53.

Note: Do not send any cardholder data to IBM Safer Payments. Configuration according to PCI DSS requirements is not yet complete.

Chapter 4. Operational configuration

After you finish the basic configuration, configure the system for operational use.

Configuring event logging

IBM Safer Payments generates log files for auditing and troubleshooting purposes.

In standard operations, these log messages are written to files where they can be viewed either directly by using a text editor, by system tools, or IBM Safer Payments itself. Log messages are needed because users typically do not have access to the IBM Safer Payments server.

IBM Safer Payments contains a fully configurable event logging engine that supports three types of logging targets. The system and audit logs are IBM Safer Payments logs. That is, IBM Safer Payments has built-in viewer facilities to read these log messages.

System log
The system log informs about events relevant to technical operations of IBM Safer Payments.

Audit log
The audit log traces relevant user activities.

Operating system logs
Operating system logs are sent to the operating system. In Linux operating systems such as RHEL, IBM Safer Payments feeds operating system log messages to the local `syslogd` as "`IRIS_`*n*", where *n* is the ID of the IBM Safer Payments instance as defined by the command-line parameter. Operating system logging is mandatory in PCI DSS-compliant environments to facilitate centralized logging, and must be activated by selecting the **Enable operating system logging** checkbox in the system configuration.

Make sure that all PCI DSS relevant log messages are forwarded to centralized logging as described in "Changing log message settings" on page 55.

Note: If you use an IBM MQ or Kafka server to deliver data to IBM Safer Payments, you must ensure that all relevant log messages are forwarded as well.

Configuring disk swapping

Configure the operating system to protect data in swap files.

IBM Safer Payments is designed not to be swapped out by the operating system. However, the operating system itself determines whether IBM Safer Payments memory is swapped to disk.

If IBM Safer Payments memory is swapped out to disk, PAN data that is decrypted in RAM might temporarily be written to the swap file on disk. You must wipe all swap data securely after each new system restart or use an encrypted swap disk. You must also disable indexing of file contents.

For more information about decreasing the swappiness of the system, see "Decreasing swappiness" on page 33.

Wipe swap disk script

Note: Use this approach only, if swap disk encryption is not possible for certain reasons.

1. To find out the correct path of your swap disk partition enter:

```
# fdisk -l#
cat /proc/swaps
```

2. If you have your swap partition name, write a short script that runs on every startup by using `sswap`, where */dev/sdaX* must be replaced by the path that is shown in the previous step.

```
# swapoff /dev/sdaX
# sswap -vll /dev/sdaX
# swapon /dev/sdaX
```

3. Add this code to a script. For example, to: `/usr/local/sbin/wipeSwap.sh`

```
chmod +x /usr/local/sbin/wipeSwap.sh
```

4. Add the script name `/usr/local/sbin/wipeSwap.sh` at the end of your init script `/etc/rc.local`.

Encrypt swap disk

With this preferred approach, you do not have to wipe out your swap on each system start.

1. Edit `/etc/fstab` to reflect the changes. Comment or delete previous swap entries before you add the new entry.

```
# vim /etc/fstab
/dev/mapper/swap none swap defaults 0 0
```

2. Create a `/etc/crypttab` file, and add the swap parameters.

```
# vim /etc/crypttab
swap /dev/volume /dev/urandom swap,cipher=aes-cbc-essiv:sha256
```

   Depending on your volume, group names, and layout, change the path to suit your needs. In most cases, you must replace only *volume* with the path that you commented or deleted in step 1. During startup, the encryption system then uses AES and SHA256 bit encryption with a random key. A new key is generated each time that the server is started.
3. Restart the server to enable swap disk encryption.
4. Verify that swap disk encryption is enabled with the **lsblk** command.

```
# lsblk
```

Disabling locate for folders

Disable the locate deamon for IBM Safer Payments folders.

The **locate** daemon creates a database with file contents. Make sure that at least one applies:

- **locate** is not installed.
- **locate** is disabled on the operating system.
- All IBM Safer Payments folders are excluded from the **locate** search paths.

To change the **locate** search paths, edit the `/etc/updatedb.conf` file and add the IBM Safer Payments folder to **PRUNEPATHS**.

Assuming PRUNEPATHS is set to:

```
PRUNEPATHS="/afs /media /net /sfs /tmp /udev /var/cache/ccache
/var/spool /var/tmp"
```

And you installed IBM Safer Payments to `/instancePath` as described in "Installing IBM Safer Payments for the first time" on page 8.

Change PRUNEPATHS to:

```
PRUNEPATHS="/afs /media /net /sfs /tmp /udev /var/cache/ccache
/var/spool /var/tmp /instancePath"
```

Note:

- If you adapted IBM Safer Payments file storage locations during cluster configuration as described in "Configuring cardholder data storage locations" on page 24, you must also add folders that are used outside `/instancePath` to PRUNEPATHS. Keep in mind that file locations can be configured differently per cluster instance.
- If any such folders are located on separate servers, adjust PRUNEPATHS on those servers as well.

Changing operating system settings

Make changes to the operating system settings before you use IBM Safer Payments.

1. Log in as root.
2. The default number of maximum open file descriptors on CentOS/RHEL systems is 1024 per process for normal users. To verify the limit that is valid for your system, run the following command:

   ```
   # cat /proc/sys/fs/file-max
   ```

3. Open the file `/etc/security/limits.conf`.
4. If the recommended limit of 16384/32768 is valid for your system, add the following lines:

   ```
   SPUser hard nofile 32768
   SPUser soft nofile 16384
   ```

   Where *SPUser* is the name of the user account that you intend to run IBM Safer Payments under.
5. To enable IBM Safer Payments to run priority-based thread scheduling, you must also add the following line:

   ```
   SPUser - rtprio 20
   ```

6. IBM Safer Payments starts numerous CPU threads for parallel processing of messages and simulations. To ensure that the operating system can handle all threads, you must increase the number of maximum user processes. To do so, also add the following line:

   ```
   SPUser - nproc 8192
   ```

7. IBM Safer Payments locks some regions in memory to prevent sensitive data like encryption keys from being swapped to disk. To allow this, ensure that the `RLIMIT_MEMLOCK` resource limit has at least 16MB. Add the following lines:

   ```
   SPUser hard memlock 16384
   SPUser soft memlock 16384
   ```

8. Summary of necessary changes to `/etc/security/limits.conf`. In this example, the user name of the process that is running IBM Safer Payments is *SPUser*.

   ```
   SPUser hard nofile 32768
   SPUser soft nofile 16384
   SPUser - rtprio 20
   SPUser - nproc 8192
   SPUser hard memlock 16384
   SPUser soft memlock 16384
   ```

9. Save `/etc/security/limits.conf` and restart.
10. Verify the new settings (optional). Run:

    ```
    ulimit -a
    ```

Firewall settings

Before you start IBM Safer Payments, check your firewall settings to allow IP messaging between the cluster instances and other systems.

To change your local firewall settings, use **firewall-cmd** on RHEL.

For more information about how to secure your operating system, see:

- RHEL 7

  https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Security_Guide/index.html

- RHEL 8

  https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/8/html/securing_networks/using-and-configuring-firewalld_securing-networks

- Oracle Linux 7

  https://docs.oracle.com/cd/E52668_01/E54670/E54670.pdf

Configuring deferred writing and ultra-large memory

Transparent Huge Pages (THP) is a Linux memory management system that reduces the overhead of Translation Lookaside Buffer (TLB) lookups on machines with large amounts of memory by using larger memory pages.

Ultra-large main memory configurations and deferred writing are configured in the user interface in **Administration** > **System Configuration** > **Deferred Writing**. If you are using it on Linux operating systems, you might experience faster restarts and more stable latencies when transparent huge pages are disabled. Transparent huge pages might block the memory for seconds when it is defragmenting the RAM. During defragmentation, it is not possible to make even small memory allocations.

Be careful with this setting. It can also result in slower overall message computation when deferred writing is disabled.

To disable transparent huge pages temporarily, run the following command:

```
echo never > /sys/kernel/mm/transparent_hugepage/defrag
echo never > /sys/kernel/mm/transparent_hugepage/enabled
```

Next, restart IBM Safer Payments. To check whether transparent huge pages are disabled, run the following command:

```
cat /sys/kernel/mm/transparent_hugepage/enabled
```

The output is:

```
always madvise [never]
```

In RHEL, you can disable transparent huge pages with the command **tuned**.

See https://access.redhat.com/solutions/1320153 for details.

You can query the current active profile with:

```
# tuned-adm active
Current active profile: latency-performance
```

To create a customized profile, create a new directory in the `/etc/tuned` directory with the wanted profile name.

```
# mkdir /etc/tuned/myprofile-nothp
```

Next, create a new `tuned.conf` file for *myprofile*`-nothp`, and insert the new tuning information.

```
# cat /etc/tuned/myprofile-nothp/tuned.conf
[main]
include= latency-performance
```

```
[vm]
transparent_hugepages=never
```

Next, make the script executable:

```
# chmod +x /etc/tuned/myprofile-nothp/tuned.conf
```

Next, enable *myprofile*:

```
# tuned-adm profile myprofile-nothp
```

The change takes effect immediately and persists after the system is rebooted.

Increasing virtual memory map size

Linux restricts the maximum number of memory maps per process. The default is 65535 on RHEL.

This value might be enough for most Linux applications, but depending on the IBM Safer Payments configuration and internal data allocation sizes, IBM Safer Payments might need more memory maps. If the application reaches its maximum number of memory maps, the error message "cannot allocate memory" and other errors occur even if enough free RAM is available in the system. To avoid this situation, run:

```
echo 1048576 > /proc/sys/vm/max_map_count
```

This command temporarily applies the new maximum number of virtual memory maps to 1048576. If you want to increase the value permanently, you must add this value as `vm.max_map_count=1048576` to the file `/etc/sysctl.conf` after server restart. To check whether the configuration was applied correctly run:

```
cat /proc/sys/vm/max_map_count
```

If you have a large configuration, monitor the current number of memory maps during high load. If the number of memory maps exceeds half of its maximum value, increase this value. To monitor the number of memory maps for your IBM Safer Payments process, run:

```
cat /proc/IRIS_PID/maps | wc -l
```

Decreasing swappiness

IBM Safer Payments produces larger latencies if the system uses swap memory.

Therefore, it is a best practice to reduce the swappiness on a Linux system.

- To temporarily change the setting, run:

  ```
  sysctl -w vm.swappiness=1
  ```

- To permanently change the setting, add:

  ```
  vm.swappiness=1
  ```

  to `/etc/sysctl.conf`

Configuring miscellaneous settings

Configure several miscellaneous settings to meet various PA-DSS requirements.

1. In the user interface, click the **Administration** tab.
2. Locate the **User Accounts** section.

Figure 10. User accounts settings

3. Select the **Password must contain lowercase**, **Password must contain uppercase**, and **Password must contain digits** checkboxes.
4. Click the **Interfaces** tab and scroll down to the **Application Programming Interface** section.

Figure 11. API settings

5. Select the **Cross-site request forgery protection** checkbox. Make sure that **Session timeout (seconds)** is set to a value of 900 seconds or less.

   Note: If you want to use tested default and secure HTTP headers, ensure that **Use custom HTTP headers** is disabled.
6. Scroll up to locate the **Message Tracing** section under **Message Command Interface**.

Figure 12. Message Tracing settings

7. Select `Disabled` from the **Dump message data** drop-down list.

   Note: Dump message data needs to be disabled to comply with PA-DSS requirement 2.3.
8. Scroll down to locate the **MQ Interface** section.

Figure 13. MQ Interface settings

9. Select `Disabled` from the **Dump message data** drop-down list.

   Note: Dump message data needs to be disabled to comply with PA-DSS requirement 2.3.
10. Scroll down to the **Kafka Interface** section.
11. Select `Disabled` from the **Dump message data** drop-down list.

    Note: Dump message data needs to be disabled to comply with PA-DSS requirement 2.3.

12. Click the **Misc** tab and scroll down to the **Miscellaneous** section.
13. Verify that **SSL cipher list** has the following entries:

```
ECDHE-ECDSA-AES128-GCM-SHA256:ECDHE-RSA-AES128-GCM-SHA256:ECDHE-ECDSA-AES256-GCM-
SHA384:ECDHE-RSA-AES256-GCM-SHA384:ECDHE-ECDSA-CHACHA20-POLY1305:ECDHE-RSA-CHACHA20-
POLY1305:DHE-RSA-AES128-GCM-SHA256:DHE-RSA-AES256-GCM-SHA384
```

Note: This list might be outdated because new security leaks were discovered in the meantime. The OpenSSL website provides regular security advisories, including information about potential security leaks.

http://www.openssl.org/

Implementing malware scanning on files

It is a best practice to implement a third-party antivirus tool to scan case attachment files for malware when they are uploaded.

Users can upload various types of files as case attachments, including malicious files. IBM Safer Payments does not validate case attachment files before they are uploaded. It also does not interpret or execute the uploaded files. Scanning the uploaded files for malware is outside the scope of IBM Safer Payments.

To mitigate the risk and protect the server where IBM Safer Payments is installed, implement a third-party antivirus scanning tool on the operating system level.

Case attachments are stored in the `inv/inv[mandator UID]/` folder. The file name format is `investigation_attachment_[timestamp]_[case UID]_[attachment number].iris`. The UIDs and attachment numbers in the file name are padded with leading zeros.

Do not run the scanning tool on any other IBM Safer Payments folders or files. It can negatively affect the operation of IBM Safer Payments.

Chapter 5. Key management configuration and procedures

Determine the type of data encryption key that is used and then configure the system for that type.

Data encryption in IBM Safer Payments uses AES-256 data encryption keys, which are referred to as master keys.

After a master key is in IBM Safer Payments, it must be activated to be used for data encryption and decryption operations.

Two types of master keys are available:

- KMIP master keys

  For more information, see “Key management (KMIP)” on page 37.
- **keygen** master keys

  For more information, see “Key management (keygen) ” on page 38.

Key management (KMIP)

If KMIP master keys are used, data encryption keys are stored on an external server that supports the Key Management Interoperability Protocol (KMIP) version 1.1.

IBM Safer Payments retrieves the keys over a secure connection at run time. The process is triggered by a user through the user interface.

Configuring key management to use KMIP master keys

Complete the following steps to use KMIP master keys:

1. Enable and configure global data encryption settings. For more information, see “Enabling and configuring global data encryption settings” on page 44.
2. Set up key entry and key management users. For more information, see “Setting up key entry and key management users” on page 45.
3. Prepare a KMIP master key for activation. For more information, see “Preparing a KMIP master key for activation” on page 38.
4. Activate a KMIP master key. For more information, see “Activating a KMIP master key” on page 38.
5. Enable cardholder data encryption. For more information, see “Enabling cardholder data encryption” on page 46.
6. Enforce regular key changes. For more information, see “Enforcing regular key changes ” on page 49.

For information about resolving problems that might occur, see “Troubleshooting key management” on page 51.

After the system is operational, the following maintenance tasks can be completed as needed:

- Revoke keys. For more information, see “Revoking Keys” on page 51.
- Change the master key. For more information, see “Changing the master key” on page 51. .

Preparing a KMIP master key for activation

Configure a KMIP master key.

1. Click the **Administration** tab.
2. Select **Key management** > **Encryption keys** from the navigation menu.
3. Click the + (Create new KMIP master key) icon. A new form opens.
4. Enter the relevant configuration settings for your KMIP key. The settings define, for example, the server to connect to and the certificates that are used for authentication.

   To use an existing key from the KMIP server, enter its identifier in **Key ID on server**. If you want IBM Safer Payments to create a new key on the KMIP server, leave the field empty.
5. Save the master key.

Activating a KMIP master key

To activate a KMIP master key, a secure connection to the KMIP server must be established.

1. Log in as a user with the global privilege to activate keys.
2. Click **Administration**.
3. Select **Key management** > **Encryption keys** from the navigation menu.
4. Click the table row of the KMIP master key that you want to activate.
5. On the KMIP master key form, click the ▷ (Activate key) icon. When prompted, enter the passphrase for the client certificate private key file.

   IBM Safer Payments connects to the KMIP server and retrieves the key.

Key management (keygen)

If **keygen** is used, IBM Safer Payments uses key triplets that are generated by the **keygen** program.

Overview

The keys are stored on the file system in encrypted form. IBM Safer Payments reads those files and decrypts the key at run time by having two keyholders enter passphrases through the user interface.

The **keygen** program is provided as part of the IBM Safer Payments software delivery.

The **keygen** program uses master public keys to encrypt a random generated master key from which in subsequent steps any number of usage keys are generated. The master public key consists of two arbitrary passphrases of arbitrary length that are chosen by two master key holders. The encrypted master key is generated as a file that must be stored in a safe location.

When new usage keys are generated, **keygen** is called with the encrypted master key. The master key is decrypted by the two master key holders who enter their passphrases. Now the entry of two usage public keys creates a usage key triplet. The usage key triplet consists of two arbitrary passphrases of arbitrary length that are chosen by two usage key holders.

Each usage key triplet consists of the following subkeys:

- One usage private triplet subkey that is manually distributed to all instances of a IBM Safer Payments cluster by the administrator.
- One left public subkey that is known only to one usage key holder.
- One right public subkey that is know only to another usage key holder.

To activate a usage key triplet, the IBM Safer Payments instance must have the usage private key available locally. The two public keys must be available either locally entered by the usage key holders, or

received from another instance of the cluster. The private triplet subkeys are never transmitted between the instances. Therefore, the parts of a key are never located on the same medium.

IBM Safer Payments can keep multiple active and nonactive key triplets in the key management function, and can switch between the active ones. A nonactive triplet would be one where a subkey is not provided yet. While only one of the key triplets can be active at a time, it makes no difference, which of the key triplets is the active one.

Note: Generally, access to keys must be limited to the fewest number of custodians that are necessary. Also, keys must be stored securely in the fewest possible locations and forms. The licensee must ensure that such organizational duties are completed.

Note: Key triplets are differentiated by their number.

Key concepts

Key management that uses the **keygen** program has the following features:

- You must generate master keys.
- The master keys are stored at a safe place and are never used by the IBM Safer Payments software.
- The master keys are used to generate usage keys and an empty no-fly list.
- Only usage keys and the no-fly list are used by the IBM Safer Payments software.
- If you want to obtain a PA-DSS certification in the future, keep in mind that any storage media that is used to store or distribute keys is in scope of PA-DSS requirement 2.5.2.
- When the storage media is no longer required, it must be securely wiped or destroyed. For more information, see “Running a secure wipe tool” on page 58.
- You must protect and store all keys securely.

Master key generation process

Master keys are generated and encrypted by the **keygen** program.

Figure 14 on page 39 shows the computational actions that are involved in master key generation.

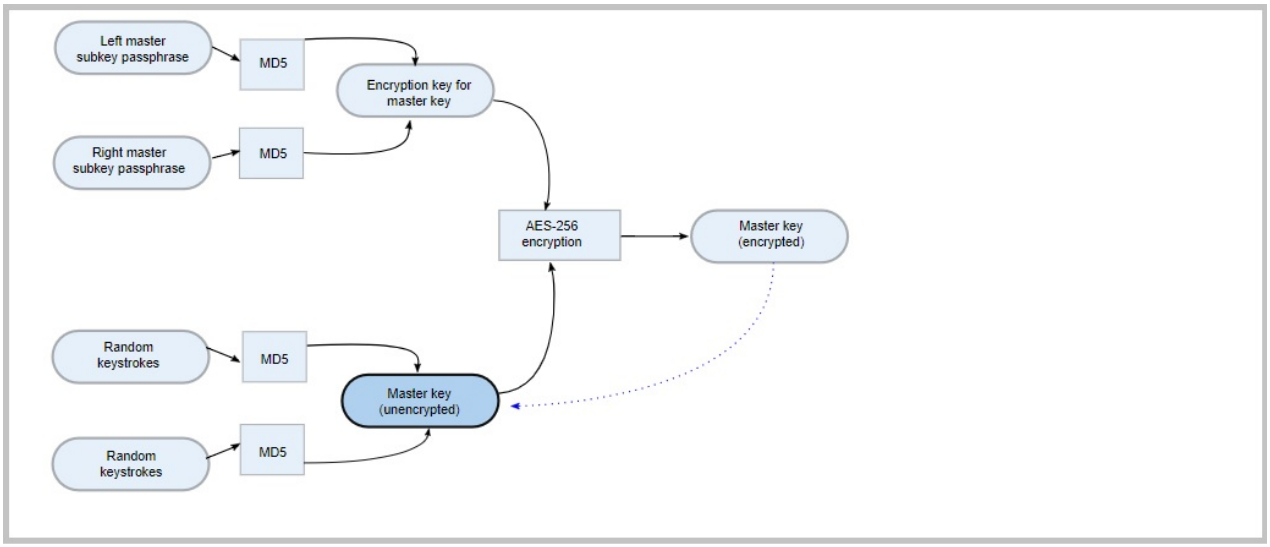


Figure 14. Master key generation process

The master key that is used by IBM Safer Payments to encrypt and decrypt data is generated by two sets of at least 80 random characters that are hashed by MD5, creating a 256-bit length root key. The two sets of random characters are each generated by combining at least 40 random keystrokes from a user with 40 machine-generated random characters. This master key is never stored or made accessible to users.

Rather, using the two passphrases of the key holders, the master key is encrypted with the AES-256 algorithm.

Important: Using the two passphrases, the encrypted master key can be decrypted. This is illustrated in Figure 14 on page 39 with the dotted line.

The encrypted master key is stored in a safe place and is used, together with the passphrases of the key holders, to create the usage key triplets. The usage key triplets are the only keys that are used during IBM Safer Payments operations.

This is also the reason why the key generator is provided as a separate utility program rather than a part of IBM Safer Payments. Not even the encrypted master key must ever be stored on the IBM Safer Payments server host. Use a different computer to create the encrypted master key, store it in a safe place, and generate usage key triplets when needed.

Usage key triplet generation process

Usage key triplets are generated by the **keygen** program.

The usage key triplet generation requires the left and right master key passphrases, and thus the presence of the key holders. Two key holders for the two public subkeys of each usage key triplet are also required. The key holders can be the same persons.

Figure 15 on page 40 illustrates the process.

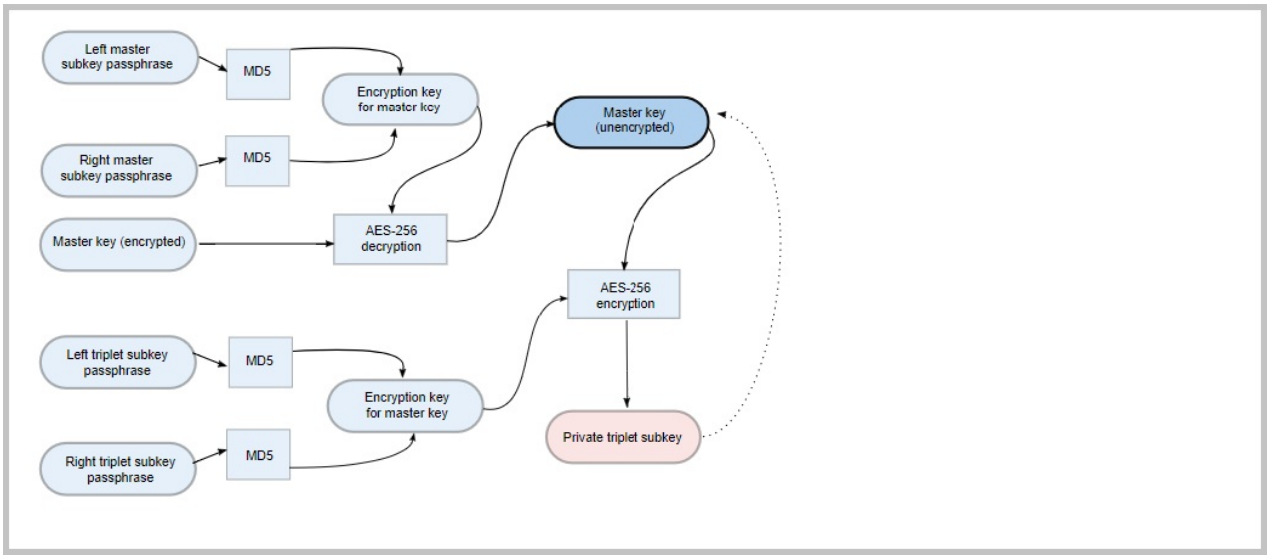


Figure 15. Private triplet subkey generation process

The encrypted master key is read from file and by using the two master passphrases is decrypted in main memory only. From this decrypted version of the master key, each usage key triplet is generated by encrypting the master key with a new pair of passphrases.

The result of this process is the private triplet subkey, which must be stored in the key directory of the IBM Safer Payments installation. The file system of the IBM Safer Payments server host is a protected area, which provides an added level of security.

A good key generation practice is to generate a number of usage key triplets in advance and then use them when they are needed.

Important: IBM Safer Payments can reconstruct the master key in main memory from each private triplet subkey by using the two public subkeys for decryption.

Configuring keygen key management

Complete the configuration steps in the correct order.

1. Complete the prerequisites. For more information, see “Prerequisites for keygen” on page 41.
2. Generate master keys. For more information, see “Generating the master key” on page 41.
3. Generating usage key triplets. For more information, see “Generating usage key triplets” on page 42.
4. Distribute the key triplet files to every instance. For more information, see “Distributing keys” on page 42.
5. Enable and configure global data encryption settings. For more information, see “Enabling and configuring global data encryption settings” on page 44.
6. Set up key entry and key management users. For more information, see “Setting up key entry and key management users” on page 45.
7. Prepare a master key for activation. For more information, see “Preparing a keygen master key for activation ” on page 43.
8. Activate a master key. For more information, see “Activating a keygen master key ” on page 43.
9. Enable cardholder data encryption. For more information, see “Enabling cardholder data encryption” on page 46.
10. Enforce regular key changes. For more information, see “Enforcing regular key changes ” on page 49.

For information about resolving problems that might occur, see “Troubleshooting key management” on page 51.

After the system is operational, the following maintenance tasks can be completed as needed:

- Revoke keys. For more information, see “Revoking Keys” on page 51.
- Change the master key. For more information, see “Changing the master key” on page 51. .

Prerequisites for keygen

Set up hardware and obtain the **keygen** program.

Setting up hardware

Use a separate PC that is not connected to the internet to generate keys. To not block a complete PC for the occasional key generation process, you can use a PC that is started from an OS boot CD. The advantage is that even if you disconnect the PC temporarily from the internet, no malware logged your data.

Note: You can use RHEL/CentOS 64-bit OS.

Obtaining the keygen program

The **keygen** program is provided as part of a IBM Safer Payments installation and is located in `/usr/bin/keygen`. Its integrity is checked when you download the installation image. For more information, see “Downloading the installation image ” on page 7.

Copy the contents to a portable memory location such as a memory card or USB stick.

Generating the master key

Use the **keygen** program to generate master keys.

To generate the master key, run the following command from the console:

```
keygen master <masterkeypath> <tripletkeypath> <master_key_id>
```

- *masterkeypath* is the location on your portable memory device where you want to store the master key.
- *tripletkeypath* is the location on your portable memory device where you want to store the triplet keys. The triplet keys are later physically distributed to the IBM Safer Payments instances.

- *master_key_id* is the numeric ID for the new generated master key. Every master key that is used by your IBM Safer Payments installation must have its unique ID.

The key generator guides you through the process of generating a master key. You need two master key holders for this process and the `masterkeypath` and `tripletkeypath` subdirectories must exist.

The master key is stored as `masterkeypath/master_key_private_<master_key_id>.iris`" and is created together with `tripletkeypath/revoked_keys.iris`.

The file `revoked_keys.iris` is used during the operation of IBM Safer Payments to store a no-fly list of keys that IBM Safer Payments must never use. To verify authenticity of the `revoked_keys.iris` file, it must be generated together with the initial master key.

Note: The file `revoked_keys.iris` is distributed with the initial key distribution to the IBM Safer Payments instances. The file `master_key_private_<master_key_id>.iris` must never be distributed to IBM Safer Payments instances, or anywhere outside the portable memory device location. Never replace an existing `revoked_keys.iris` file in the `key` folder of your configuration. If you change to a usage key from another master key by using the user interface, `revoked_keys.iris` is reencrypted as well.

If the two master key holders activate the master key that you generated, you can generate any number of usage keys.

You can now directly proceed to "Generating usage key triplets" on page 42, or shut down the PC and store the portable memory device at a safe place until you need to generate usage keys.

Generating usage key triplets

Use the **keygen** program to generate usage key triplets.

To generate the usage key triplets, run the following command from the console:

```
keygen triplet <masterkeyfilepath> <tripletkeypath>
```

- *masterkeyfilepath* is the file location of your master key. This location must include the file name of the master key.
- *tripletkeypath* is the location on your portable memory device where you want to store the usage key triplets. The usage key triplets are later physically distributed to the IBM Safer Payments instances. When the first key ID is specified, keys are not generated in *tripletkeypath*.

The key generator guides you through the process of generating a usage key triplet. You need two master key holders and two usage key holders for this process.

The **keygen** program generates the file `tripletkeypath/key_<usage_key_id>.iris`.

You can repeat this process at any time to generate the number of usage key triplets that you need. The master key holder passphrases do not have to be entered for each usage key triplet generation, unless you quit the key generator.

If you generated all the usage key triplets you need, shut down the PC and store the portable memory device at a safe place until you need to generate more usage keys.

Distributing keys

Copy the result of key generation to IBM Safer Payments instances.

All the `key_n.iris` files (private triplet subkeys) that you want to use with your IBM Safer Payments installation must be copied manually from the portable memory device to the `key` subdirectories of all IBM Safer Payments instances.

If you copy usage key triplets to running instances, you must reload the keys as described in "Preparing a keygen master key for activation " on page 43. IBM Safer Payments reloads keys automatically whenever it restarts. Do not overwrite or replace the `revoked_keys.iris` or the `key_n.iris` files in the `key` subdirectory.

The first time that you distribute keys to instances, you must include the file `revoked_keys.iris` that was generated during the initial creation of the master key. This file stores the no-fly list of revoked keys. Never overwrite this file manually after it is delivered to the instances. Make sure that this file is writable for IBM Safer Payments to revoke keys or to reencrypt the file. For example, if you change to another master key.

The content of the encrypted `revoked_keys.iris` files might differ on each instance after you reencrypt or revoke a key. As the encryption of this file adds a random token, the encrypted result differs on each instance. Nevertheless, the stored no-fly list is always the same.

When you copy the files to the `key` subdirectories, change the user and group access privileges so that only the IBM Safer Payments process user can access the files.

Leave a copy of the usage key triplet files on the portable memory device so that you have a reference of generated keys. You must protect and securely store the device.

Preparing a keygen master key for activation

Load previously distributed usage key triplets into IBM Safer Payments.

1. Click the **Administration** tab.
2. Select **Key management** > **Encryption keys** from the navigation menu.
3. Click the (Reload private keys from disk) icon to reload private keys from disk.

   The previously distributed key triplets are loaded into IBM Safer Payments.

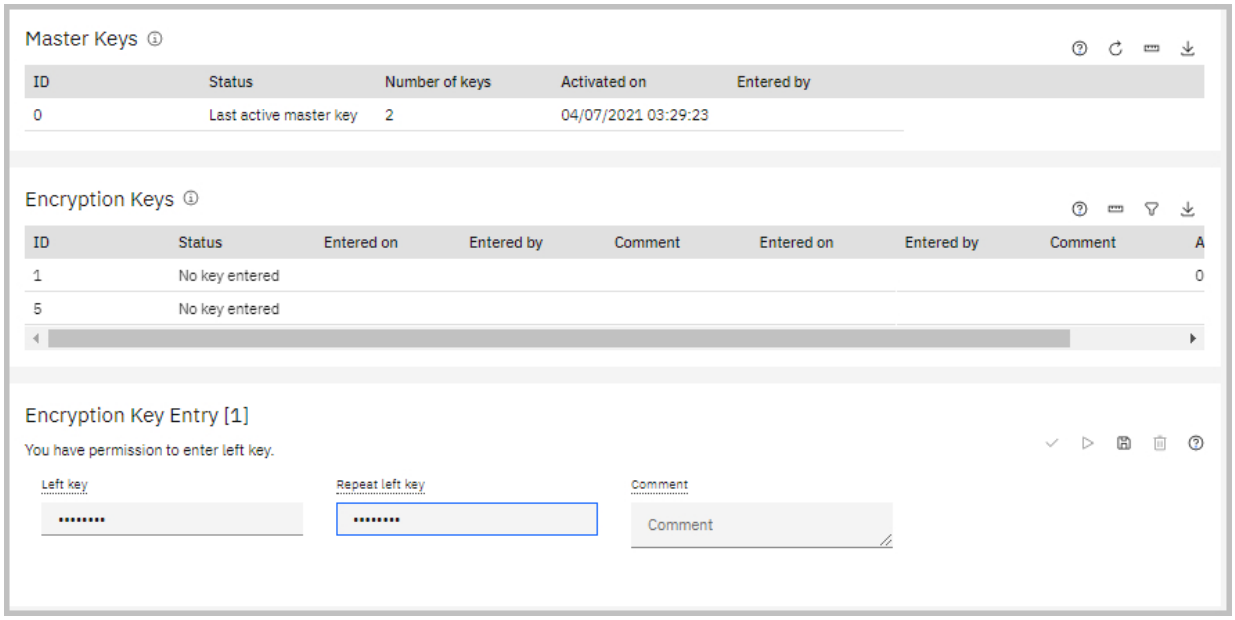
Activating a keygen master key

Activate distributed keys in IBM Safer Payments.

To activate a `keygen` master key, the two passphrases must be entered for one of its key triplets by using the user interface.

1. Assuming you are the left key holder, log in.

   The user interface opens and the **General Settings** for the left key user are displayed.
2. Click **Administration**. The **Key management** > **Encryption keys** form displays.
3. In the **Master Keys** section, click the row of the master key instance you want to activate.
4. In the **Encryption Keys** section, click the row of the key instance you want to activate.



5. In the **Left key** field, enter your key and repeat it for verification.

6. Click the (Save) icon.
7. Repeat the steps for the right key holder.
8. The user who has the global privilege to activate key must log in and go to **Administration > Encryption keys**.
9. In the **Encryption Key Entry** section, click the (Activate key) icon.

You can prepare more than one key for activation, and users with respective privileges can switch between them by activating a key.

If a key is revoked, the key file is automatically securely erased on all IBM Safer Payments instances in a cluster. The revoked key is also added to the no-fly list to ensure that this key cannot be active again in IBM Safer Payments.

Instances in a cluster share the passphrases over their encrypted network connection (ECI). The private triplet subkey of the usage key triplet is transferred manually by the operator. Therefore, the private key and the public keys never travel together on the same medium. Thus, spying out only one of the channels does not deliver sufficient information to decrypt IBM Safer Payments.

Because instances share the public keys, the key holders do not have to enter them each time an instance is started. If one instance is still running in the cluster, passphrases do not have to be reentered. Only when you start the first instance, passphrases must be entered.

You can simultaneously start all instances because in key-entry mode the user interface is partially active to allow for key entry. When keys are entered on any instance of the cluster, they are shared within the cluster. The instances start, which can take a few minutes.

Note: A key is automatically deactivated if you activate another key.

Enabling and configuring global data encryption settings

Enable data encryption and configure global settings.

1. In the user interface, click the **Administration** tab.
2. Select **System** > **Configuration** from the navigation menu.
3. Click the **System** tab. Scroll down to the **Encryption** section.

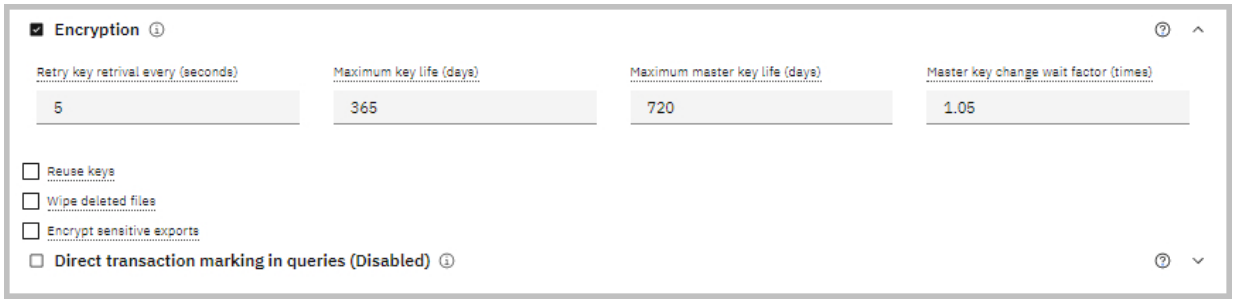


Figure 16. Encryption section

4. Clear the **Reuse keys** checkbox.
5. Select the **Wipe deleted files** and **Encrypt sensitive exports** checkboxes.

Encryption covers the actual production data and certain parts of the configuration where PANs are expected, for example, in conditions and audit trails. Other parts of the configuration are not encrypted. You must never store clear PAN in any name or comment field of IBM Safer Payments.

The PA-DSS standard recommends defining a maximum cryptoperiod after which a key must be replaced with a new one. For more information, see “Enforcing regular key changes ” on page 49.

According to PA-DSS requirement 2.3, PANs must be rendered unreadable anywhere that they are stored. Therefore, you must enable **Encrypt sensitive exports**.

Setting up key entry and key management users

Set up user accounts that have sufficient privileges to manage data encryption.

If you use KMIP, define a user with the privilege to configure keys and to activate keys. Therefore, you need at least one user.

If you use the **keygen** program, define a left key user, a right key user, and a user with activate privileges. Therefore, you need at least two users.

Key management privileges can be granted to the key holders or any other user account.

1. In the user interface, click the **Administration** tab.
2. Select **User management** > **Accounts** from the navigation menu.
3. Click + (New user account) to create a new user account.
4. The **New User Account** form is displayed.

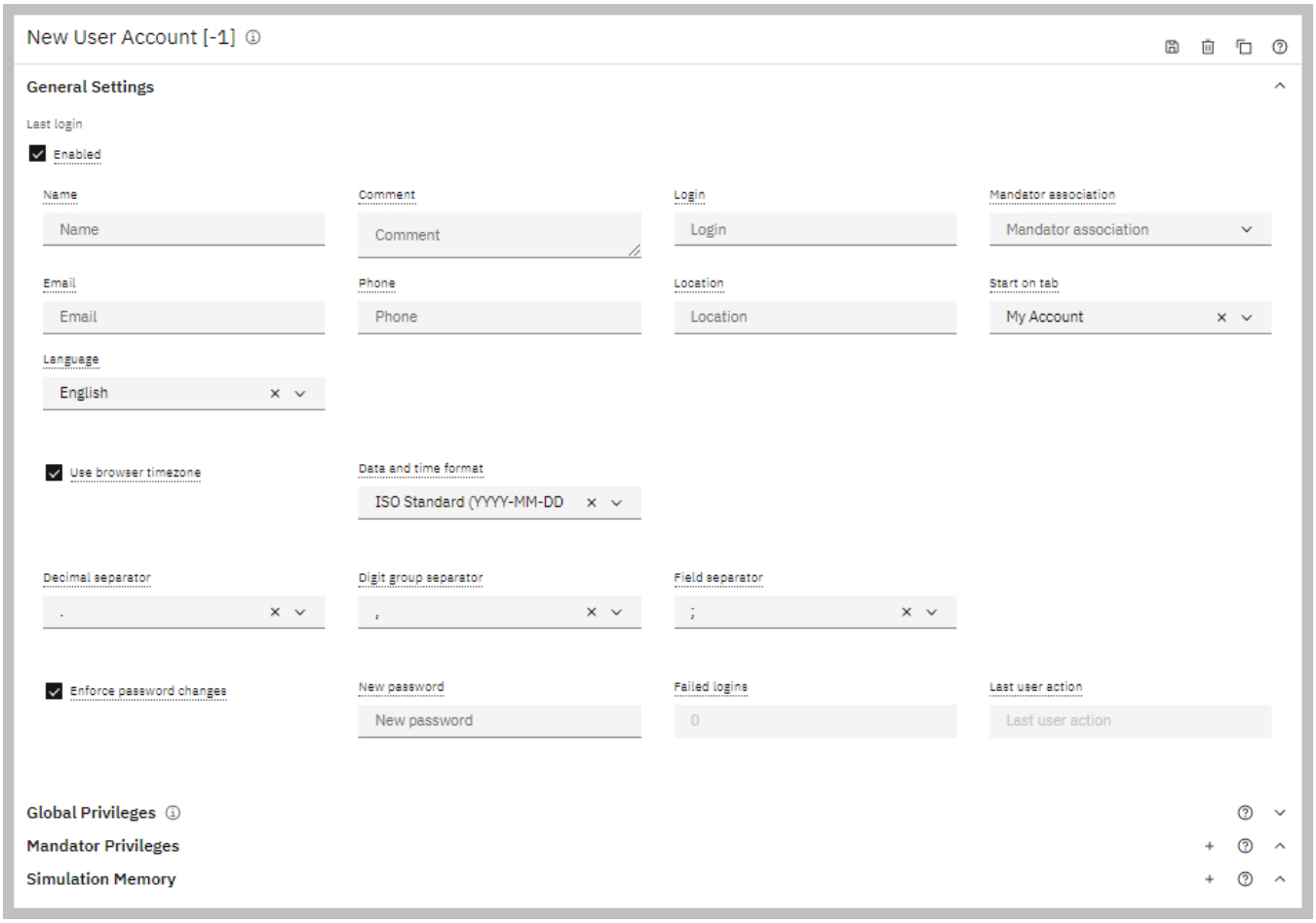


Figure 17. New User Account form

5. Select a mandator in **Mandator association**.
6. Select the **enforce password changes** checkbox.
7. If the **keygen** program is used, at least two key holders are required. Each one must have its own user account.
   a. For the first user, in the **Global Privileges** section, select **left public key entry** in the **Key entry** field.
   b. Repeat the previous steps and create a second user account. For the second user, select the **right public key entry** in the **Key entry** field.

Note: You cannot assign both left and right public key entry privileges to a single user.

8. If KMIP is used, in the **Global Privileges** section, select **configures keys** in the **Key management** field.
9. To allow the user account to activate any type of master key, select **activate keys** in the **Key management** field.
10. To allow the user account to rotate master keys, select **change masterkey** in the **Key management** field. For more information, see “Changing the master key” on page 51.
11. Save the user account.

Enabling cardholder data encryption

Create encrypted attributes to hold sensitive cardholder data.

In the next step, you must activate PA-DSS compliant encryption of cardholder data to be stored in IBM Safer Payments. To comply with PA-DSS requirement 1, do not process sensitive authentication data.

If you intend to store the Primary Account Number (PAN) in IBM Safer Payments, you must enable encryption for this data attribute in IBM Safer Payments as defined in PA-DSS requirement 2.3.

Attribute names can be chosen freely in IBM Safer Payments. However, in this documentation, the attribute for the Primary Account Number is named "PAN".

1. Log on with a user account that has at least the following privileges:

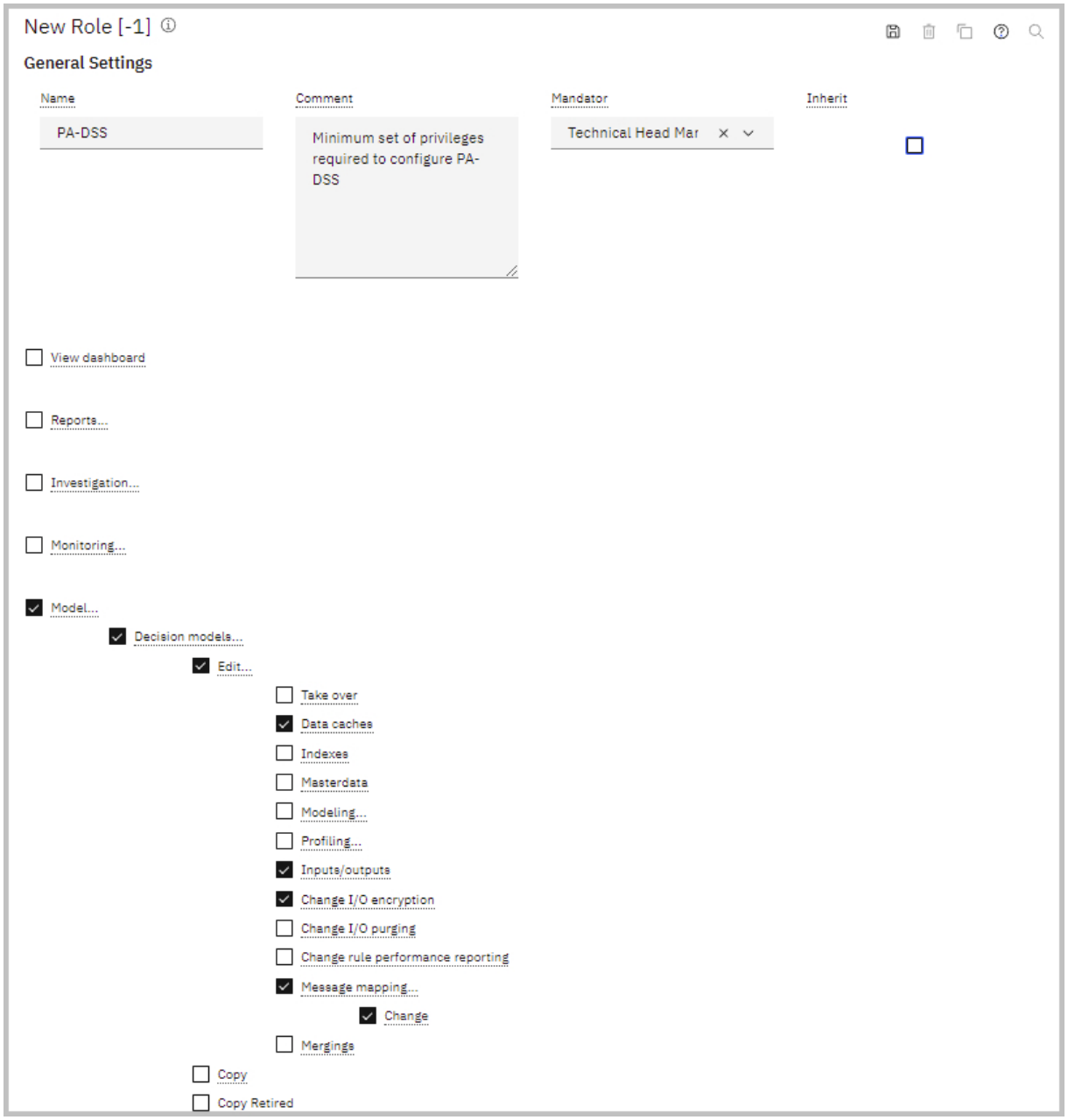


Figure 18. Role settings required for cardholder data encryption

Note: Refer to the online documentation for details about user access administration.

For more information about logging on, see “Starting the first cluster instance ” on page 15.

2. Click the **Model** tab.

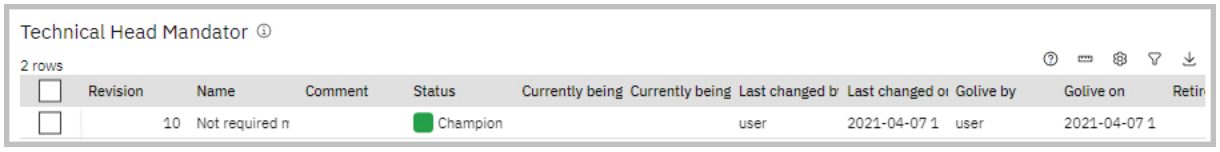


Figure 19. Model - Technical Head Mandator

3. Click the checkbox for the **Champion** entry.
4. Click the Copy (Copy) icon.
5. Click the newly created **Challenger** entry.

6. Select **Data model** > **Inputs** from the navigation menu.

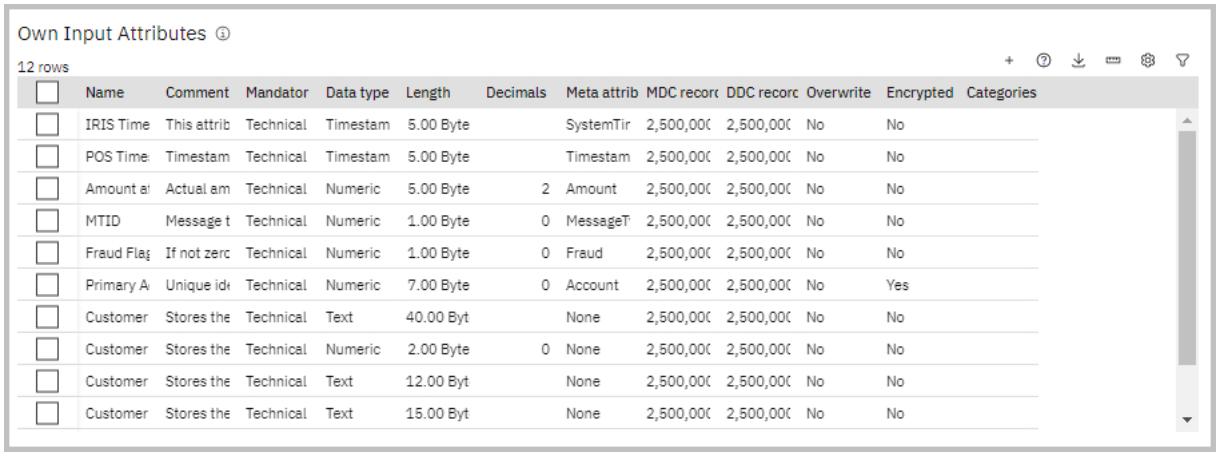


Figure 20. Own Input Attributes

7. Click the + (New input) icon to create a new attribute.
8. The **New Attribute** form opens.

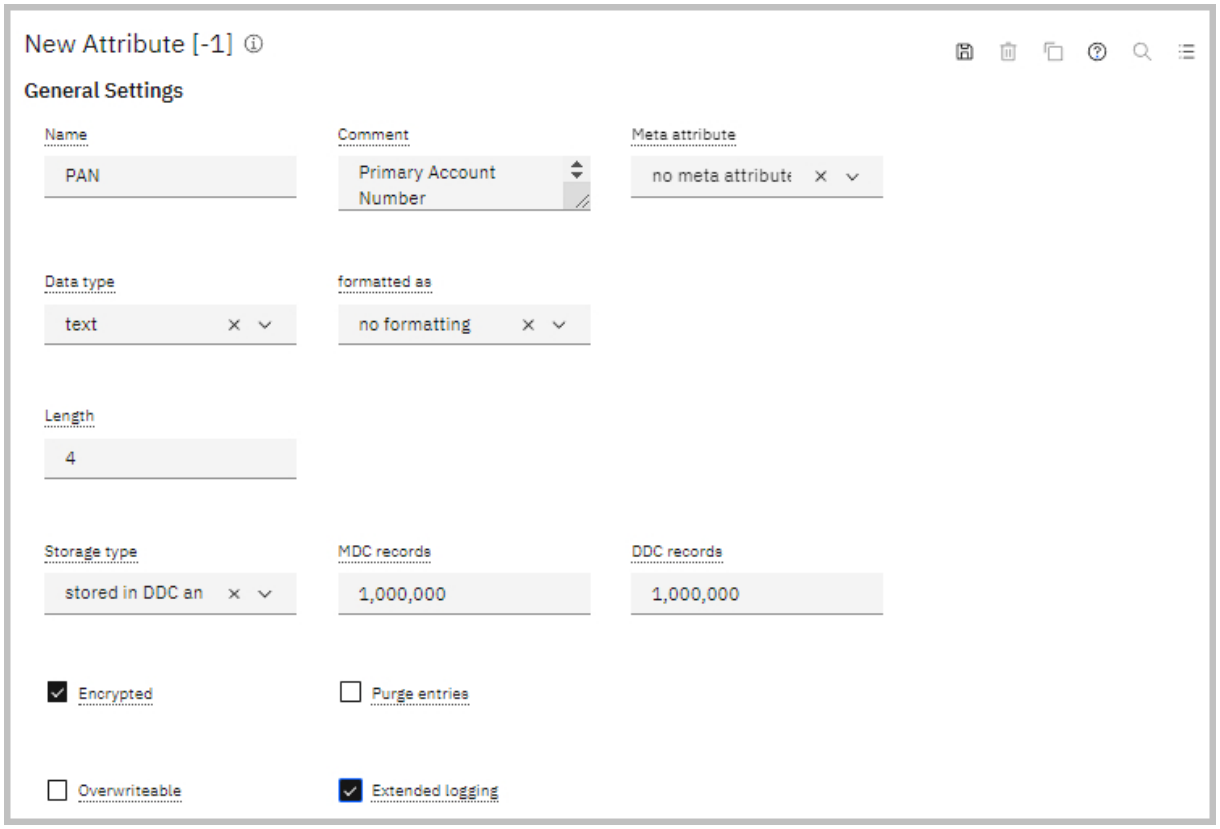


Figure 21. New attribute form

Note: To be PA-DSS-compliant, you must now enable encryption for the PAN attribute. For all other sections not relevant for PA-DSS, refer to the online documentation.

9. Enter **PAN** in the Name field and select the checkbox in the **Encrypted** field. Complete the remaining fields as needed to meet your requirements.
10. Click the (Save) icon to save the new attribute.
11. You can now define other attributes that are required for your specific IBM Safer Payments application. To comply with PA-DSS, make sure that no sensitive authentication data is defined.

12. Next, select **Review overview** > **General** from the navigation menu.

Figure 22. Activate changed revision

13. Click the ▷ (Golive) icon. The decision model is now being activated and all data that is stored in the PAN attribute is encrypted.

Enforcing regular key changes

Ensure that keys are rotated at the end of their lifetime.

Regular key changes are recommended.

The National Institute of Standards and Technology (NIST) has developed guidelines for key management. Use them to define the correct key retention periods for your organization.

You can download the *NIST Special Publication 800-57* from NIST: http://csrc.nist.gov/publications/PubsSPs.html#SP%20800

Based on the NIST guidelines, the recommended maximum key life is 120 days and maximum master key life is three years.

Important: Retirement or replacement of keys is required if the integrity of the key is weakened or keys are suspected of being compromised.

Define maximum key life

Follow these steps to define the maximum key life and the maximum master key life:

1. In the user interface, click the **Administration** tab.
2. Select **System** > **Configuration** from the navigation menu. Click the **System** tab.
3. Scroll down to the **Encryption** section.

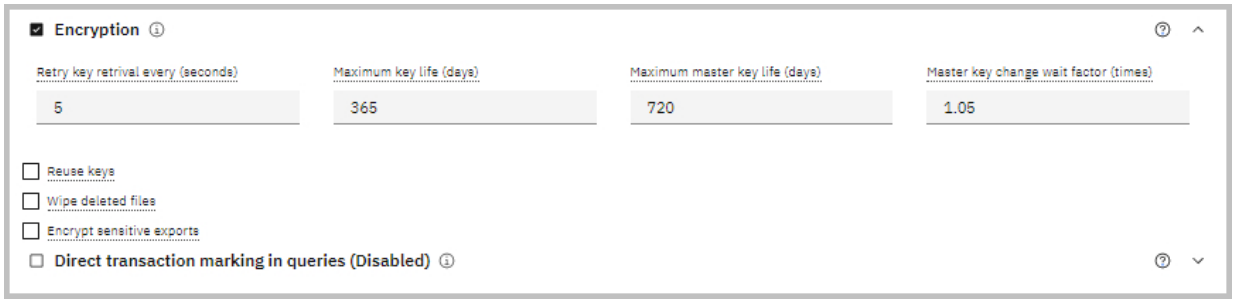


Figure 23. Encryption section

4. In the **Maximum key life (days)** field, enter the number of days you defined in your organization.

If the maximum key life is reached and no key is changed during this period, IBM Safer Payments automatically shuts down.

Set maximum key life alerts

Safer Payments provides a **Status Alarm Indicator** (SAI) that alerts if the end of the maximum key life approaches. SAI alerts can be sent to the Safer Payments dashboard and can be distributed by email, or log messages.

You must define the following two status alarm indicators:

- One for the encryption key, it must have the alarm type **encryption key remaining lifetime**.
- One for the master key, it must have the alarm type **master key remaining lifetime**.

1. On the Safer Payments user interface, click the **Administration** tab.
2. Select **Dashboard settings** > **Status alarm indicators** from the navigation menu.
3. From the **Status Alarm Indicators** table, click the + (New status alarm indicator) icon to create a new status alarm indicator.

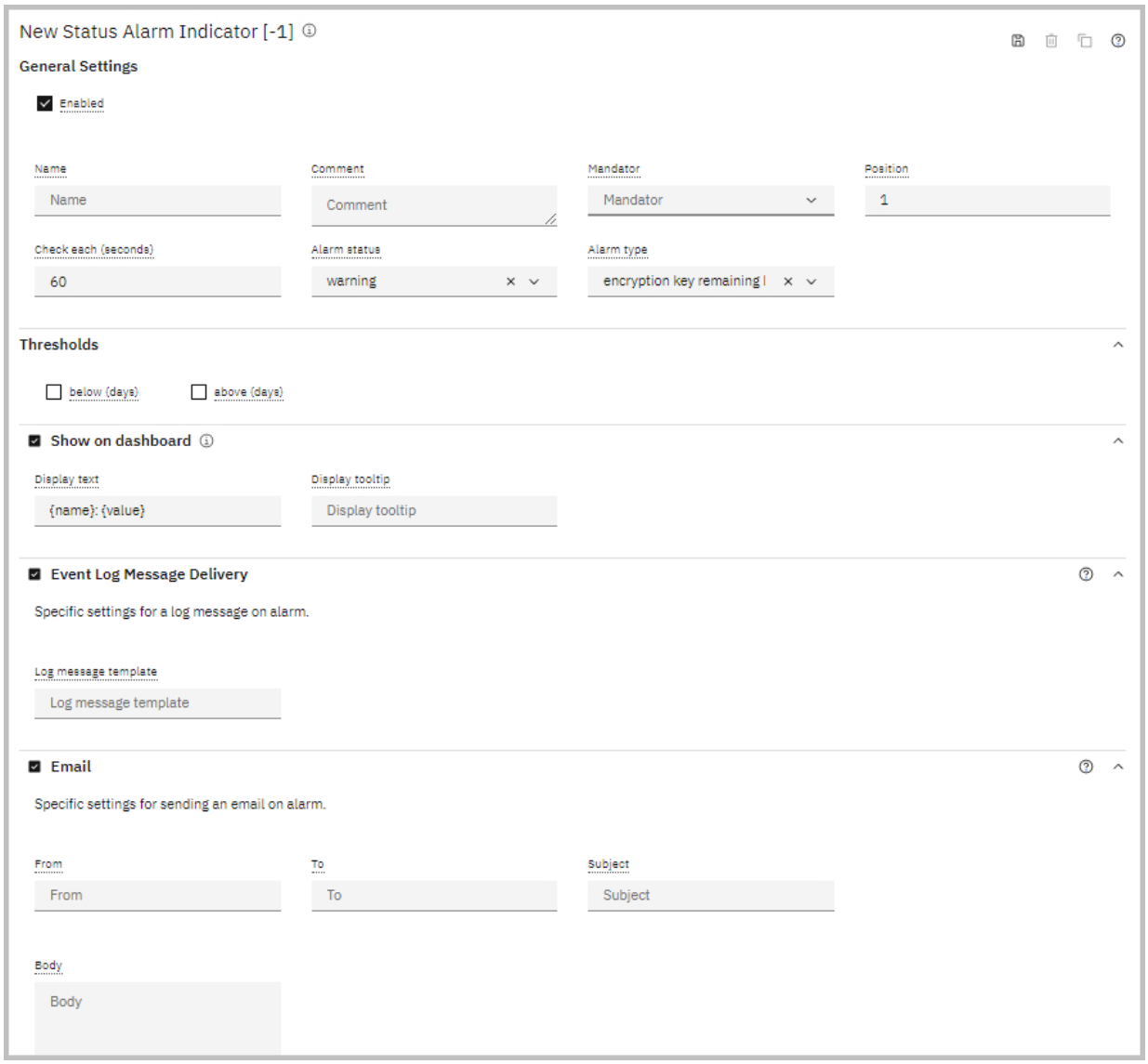


Figure 24. New Status Alarm Indicator form

Figure 24 on page 50 shows an exemplary SAI definition for monitoring the last encryption key change.

This SAI assumes a maximum key life of 120 days. If the current key is valid for only 10 more days a warning is displayed on the dashboard, a mail is sent out, and a log message is created.

Revoking Keys

Authorized users can revoke cryptographic keys in the **Encryption Key Entry** form.

Only inactive keys can be revoked.

For keygen master keys, each individual usage key triplet can be revoked by using the respective button on the **Encryption key entry** form.

If a usage key triplet is revoked, IBM Safer Payments securely deletes it from disk, and removes the two passphrases from main memory in all cluster instances.

However, you must manually delete the revoked keys from all other storage locations by using a secure wipe tool. For example, the media used for key distribution. For more information, see “Running a secure wipe tool” on page 58.

For KMIP master keys, the master key itself can be revoked by using the respective button on the **KMIP master key** form. When a KMIP master key is revoked, it is deactivated on the KMIP server and configuration is removed from IBM Safer Payments including the key material that is stored in secure memory.

Changing the master key

Change the master key near the end of the current master key's lifetime.

Carefully consider when to change the master key. During the change of the master key, all cluster instances become inactive.

While it is still possible to score transactions, you cannot change the configuration or investigate cases during the change process. The change affects all data that is stored in IBM Safer Payments, which means such a change process can take several hours to complete.

Changing the master key requires the global privilege to change the master key. This privilege must be granted to the user in advance.

1. In the user interface, click the **Administration** tab.
2. Click **User management** > **Accounts** from the navigation menu. Select your user.
3. Scroll down to the **Global Privileges** section.
4. In the **Key Management** field, select **activate and revoke keys and view encryption management, and change master key**.
5. Save your changes.

Follow these steps to change the master key:

1. Generate a new master key. For more information, see “Preparing a keygen master key for activation ” on page 43 or “Preparing a KMIP master key for activation” on page 38.
2. Activate the new master key. For more information, see either “Activating a keygen master key ” on page 43 or “Activating a KMIP master key” on page 38.

   The master key change process starts.

Troubleshooting key management

You might need to resolve issues and errors that occur during key generation, activation, and distribution.

- If you use a Flash-based portable memory device, which most USB sticks or SD cards are, it is difficult to securely erase data from them. Therefore, you must store the portable memory device in a safe location for the entire time that the master key is valid. If you ever need to erase the master key on such a portable memory device, the safest way is physical destruction.
- If IBM Safer Payments cannot locate the `revoked_keys.iris` file during startup, or if the file is tampered with, IBM Safer Payments creates a log message and shuts down immediately.

- If IBM Safer Payments finds an active key that is on the no-fly list, IBM Safer Payments securely deletes the key from the `key` subdirectory and shuts down immediately. If the key is not active, IBM Safer Payments creates a log message, securely deletes the key from the `key` subdirectory, and continues with startup.
- If you run a key reload from the **Encryption Keys** page of the user interface, the following problems can occur:
  - If IBM Safer Payments cannot locate the `revoked_keys.iris` file, or the file is tampered with, an error message on the user interface and a log message are created, reloading is stopped, yet operations resume.
  - If IBM Safer Payments finds keys that are on the no-fly list, the keys are securely deleted from the `key` subdirectory, an error message on the user interface and a log message are created.

Chapter 6. Operational procedures

Various procedures need to be run during regular operation of IBM Safer Payments.

Starting and stopping instances

Starting and stopping instances is part of regular operations.

Start an instance

Open a console window on the server and run:

```
iris console id=i
```

from /*instancePath*/cfg.

- The `console` parameter activates event log message output on the console window.
- */instancePath* is the path where you want the instance configuration to be stored.
- The parameter *i* is the ID of the instance that you want to start.

  Note: Both the instance path and instance ID were defined in "Starting the first cluster instance " on page 15.

IBM Safer Payments starts. You must enter the SSL certificate password when you are prompted.

Each instance now attempts to fetch the password for the encryption keys from its sister instances. If no other instances are running yet, the encryption keys must also be entered before full operation can start. For more information about key entry and activation, see "Activating a keygen master key " on page 43 or "Activating a KMIP master key" on page 38.

Stop an instance

To stop an instance, you can use a SIGTERM command. IBM Safer Payments catches SIGTERM signals and performs a clean shutdown, similar to the API shutdown command.

Open a console window on the server and run:

```
killall iris
```

To immediately stop a IBM Safer Payments process, you can use the SIGKILL signal. Use the SIGKILL signal if IBM Safer Payments does not properly shut down after a SIGTERM command.

Open a console window on the server and run:

```
killall -9 iris
```

Deleting outdated index entries

Configure secure deletion of outdated entries.

For certain functions, IBM Safer Payments requires indexing certain data attributes.

If you require an index on the PAN attribute, old index attributes must be securely deleted after the retention period defined in "Installation prerequisites" on page 6.

IBM Safer Payments can be configured to securely delete outdated index entries automatically, by enabling the outdated entries setting.

1. In the user interface, click the **Model** tab.

2. Click the checkbox for the **Champion** entry.
3. Click the  (Copy) icon.
4. Click the newly created **Challenger** entry.
5. Click **Data model** > **Indexes** on the navigation menu.
6. From the **Own Indexes** section, click the **PAN** entry.

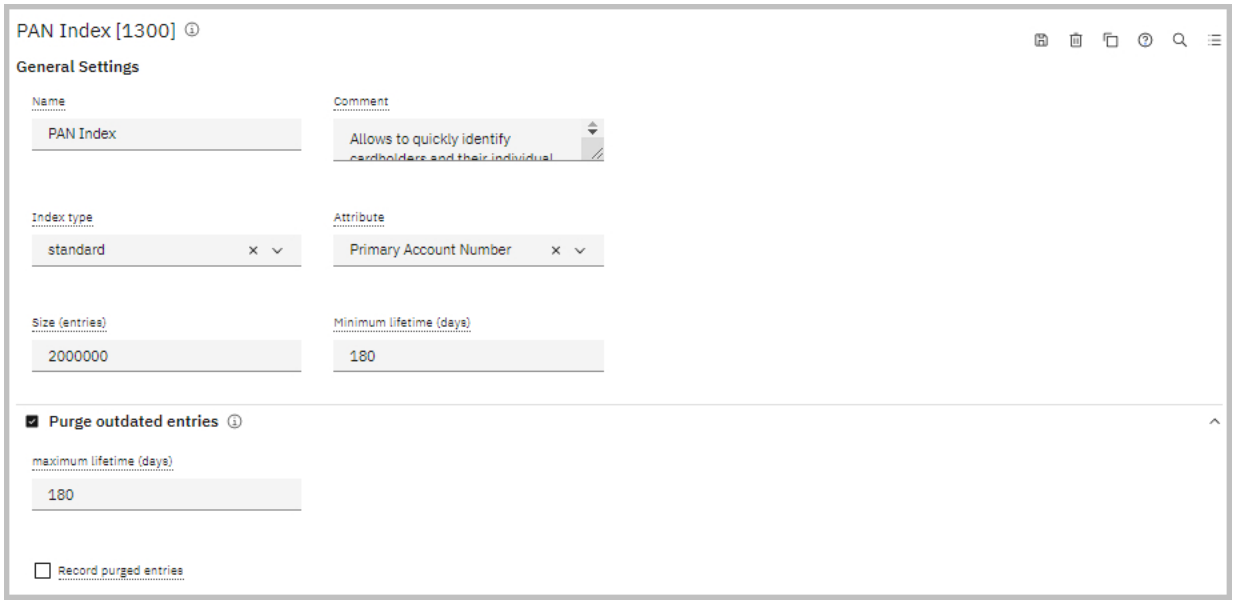


Figure 25. PAN Index section

7. Select the **Purge outdated entries** checkbox and enter a maximum lifetime.

Archiving cases

If you enable case investigation, configure cases to be archived no later than the end of the retention period.

Cardholder data must be securely deleted after the retention period ends. For more information about defining the retention period, see “Installation prerequisites” on page 6.

1. In the user interface, click the **Administration** tab.
2. Select **System** > **Configuration** from the navigation menu.
3. Click the **Investigation & queries** tab. Click the **Case Investigation** checkbox.

Figure 26. Case investigation settings section

4. In the **Archive cases after (days)** field, you must enter a value that is equal or smaller to the retention period that you defined.

According to PA-DSS requirement 2.3, PANs must be rendered unreadable anywhere that they are stored. Case attachments are stored decrypted. You must implement proper operational procedures to ensure that no PANs are stored in a case attachment or you must disable case attachments.

Changing log message settings

Configure log messages to meet PA DSS requirements.

To change the log message settings, you must complete the following steps:

1. In the user interface, click the **Cluster** tab.
2. Select **System monitoring** > **Event log messages** from the navigation menu.

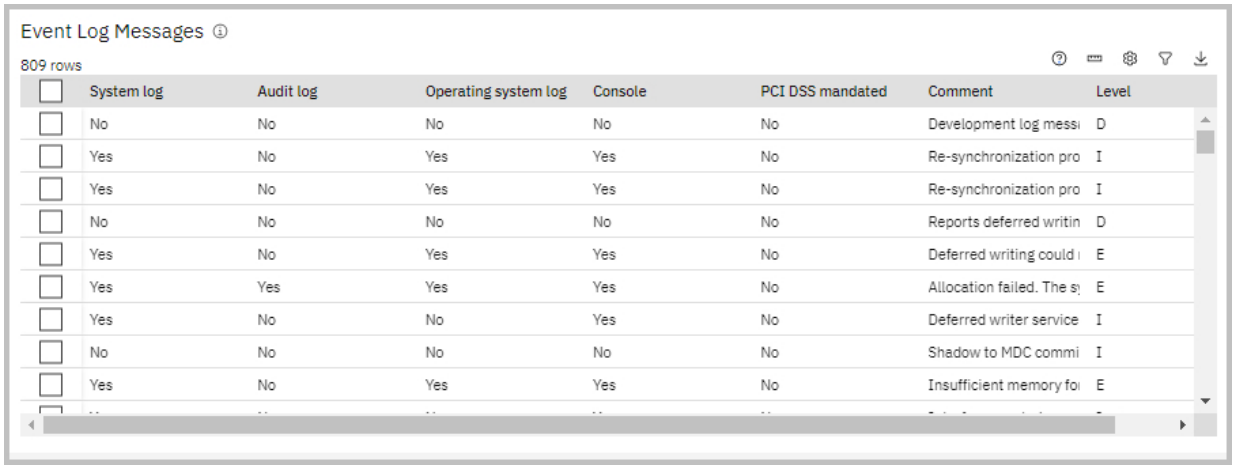


Figure 27. Event Log Message settings

3. Click a log row, for example 9, to adjust the settings. Repeat for each log message individually.

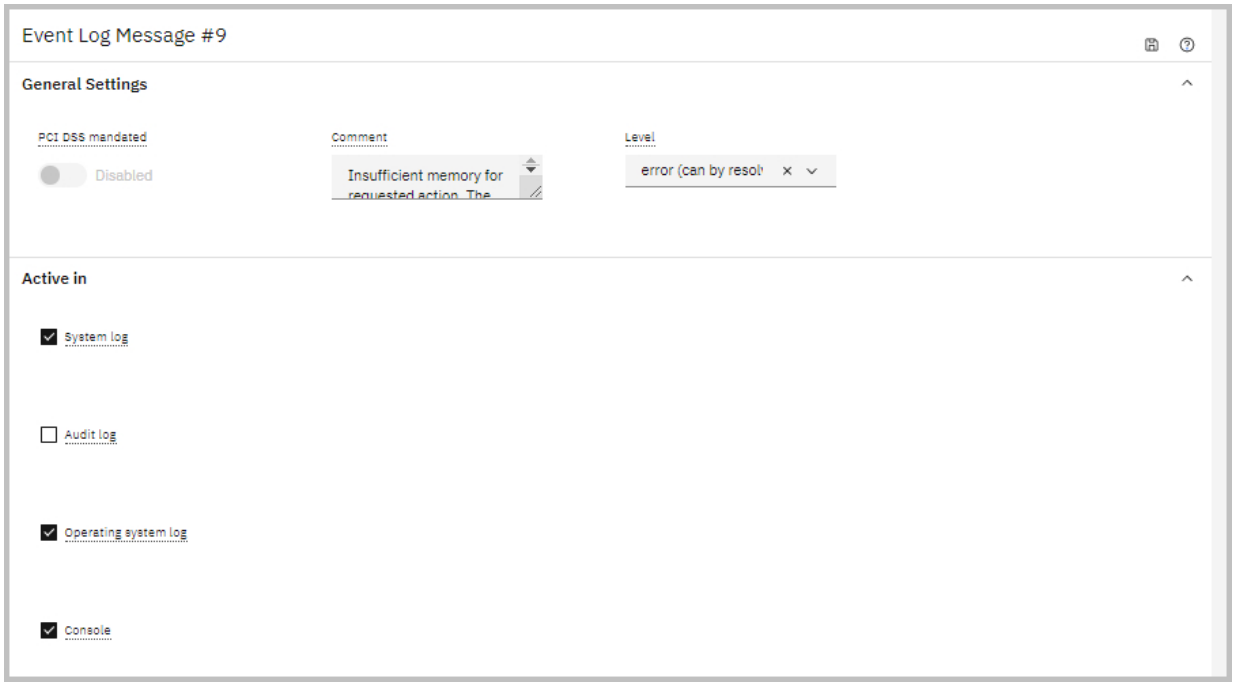


Figure 28. Event log message 9

4. Make your changes and click the (Save) icon.

Note: Your central log server must collect all relevant log messages from the system log. You must implement an operational process within your organization to collect the relevant logs from the operating systems logs.

For PCI DSS compliance, a minimum set of log messages must be forwarded to centralized logging. To do so, the **Operating system log** checkbox must be selected for each message. The following log messages are mandatory for PCI DSS compliance:

14, 15, 16, 17, 38, 41, 70, 71, 90, 91, 92, 93, 100, 129, 131, 157, 194, 195, 196, 197, 198, 199, 200, 201, 209, 210, 211, 212, 213, 229, 251, 322, 324, 325, 364, 365, 366, 367, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 417, 418, 419, 420, 425, 426, 427, 428, 429, 430, 434, 435, 436, 437, 448, 449, 456, 457, 460, 461, 462, 463, 468, 471, 490, 508, 509, 510, 511, 517, 518, 519, 520, 523, 524, 530, 531, 535, 536, 537, 541, 542, 543, 565, 573, 575, 577, 578, 580, 581, 585, 586, 587, 591, 594, 595, 598, 599, 819, 834

These log messages are by default set to the correct values after the initial installation of IBM Safer Payments. To enable more log messages for centralized logging, select the **Operating system log** checkbox for each corresponding message.

Note: If you disable these log messages, your are not PCI DSS compliant.

Archiving and backing up

Determine a schedule to archive and back up data in IBM Safer Payments.

IBM Safer Payments does not automatically remove archived cases, log messages, and so on, from the file system.

PCI DSS requires purging cardholder data after the customer-defined retention period. Therefore, the licensee must implement a backup process for those files, and ensure that the archived files are purged before the end of the retention period.

For information about directory locations that might contain encrypted cardholder data, see “Configuring cardholder data storage locations” on page 24. Backup and purge processes apply to these folders.

Note: Backups must be handled according to PCI DSS requirements.

Setting user privileges

Ensure that only user accounts with a legitimate business need are allowed to access sensitive data.

According to PCI DSS, the PAN must be displayed masked only, unless there is a legitimate business need to see the full PAN.

Full PAN visibility is controlled by the **Mask level** global privilege for each user.

1. In the user interface, click the **Administration** tab.
2. Select **User management** > **Accounts** from the navigation menu. Select a user.
3. Scroll down to the **Global Privileges** section.

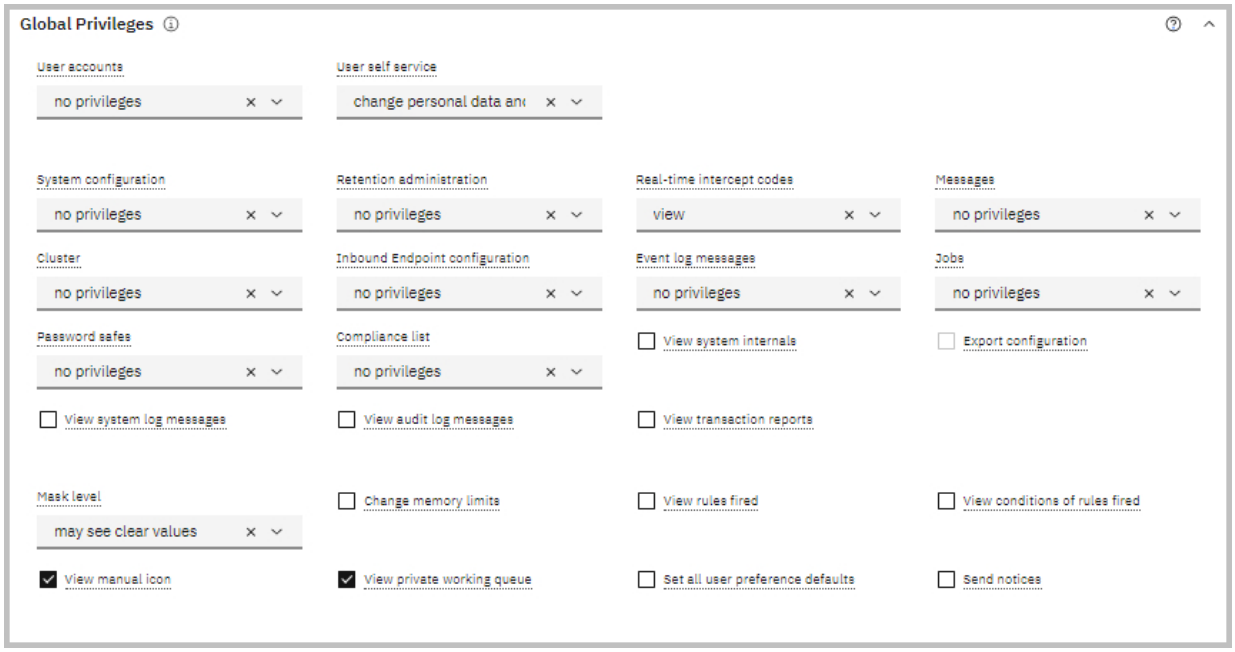


Figure 29. Global privileges section

4. Select **may see clear values** in **Mask level**.

In addition to global privileges, certain functions of IBM Safer Payments can be accessed only by users with a legitimate business need. You can grant certain privileges to such users. More precisely, model revisions, report, and query definitions must be viewed only by privileged users. However, nonprivileged users can still run reports and queries.

1. In the user interface, click the **Administration** tab.
2. Select **User management** > **Roles** from the navigation menu.
3. Click the user role that you want to change in the roles table.
4. Change the privileges according to your requirements by selecting the appropriate checkboxes.

Enabling masking of sensitive data

Enable masking to protect sensitive data when it is displayed or sent.

1. In the user interface, click the **Administration** tab.
2. If you are using the relational database interface, you must enable masking values of encrypted attributes.
   a. Select **Mandators** > **Settings**. Select a mandator.
   b. Scroll down to the **Relational Database Interface** section.

Figure 30. Relational Database Interface settings

   c. Select the **Mask encrypted values** checkbox.

   Note: Repeat for all mandators.

3. Click the **Cluster** tab and select **Interfaces** > **Outgoing channel configurations** from the navigation menu.
4. For every outgoing channel configuration, select the **Mask values** checkbox unless you have a business need not to do so.

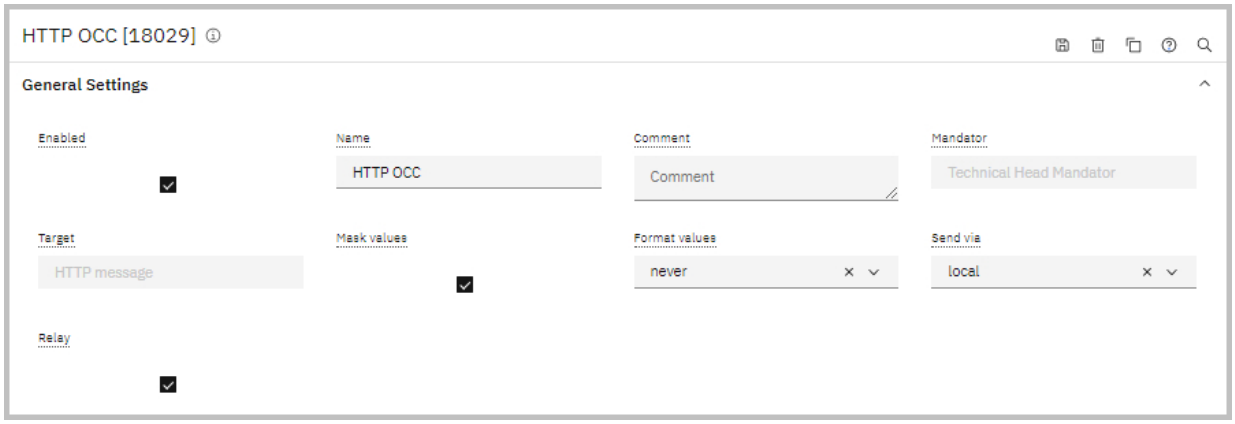


Figure 31. Outgoing channel configuration settings

Note: If you disable the **Mask values** option make sure that only notifications, case actions, and external queries with a business need are associated with that outgoing channel configuration. If you store unmasked data that is received from an outgoing channel configuration, you must make sure to protect it according to PCI DSS requirements 3.4.1, 3.5, 3.6 and all applicable subrequirements.

Running a secure wipe tool

Various PCI DSS requirements mandate the use of a secure wipe tool to securely delete sensitive authentication data and cardholder data from disk.

According to PA-DSS requirement 1.1.4, the disk wipe tool must be in accordance with industry accepted standards for secure deletion. The National Security Agency, for example, maintains a list of approved products.

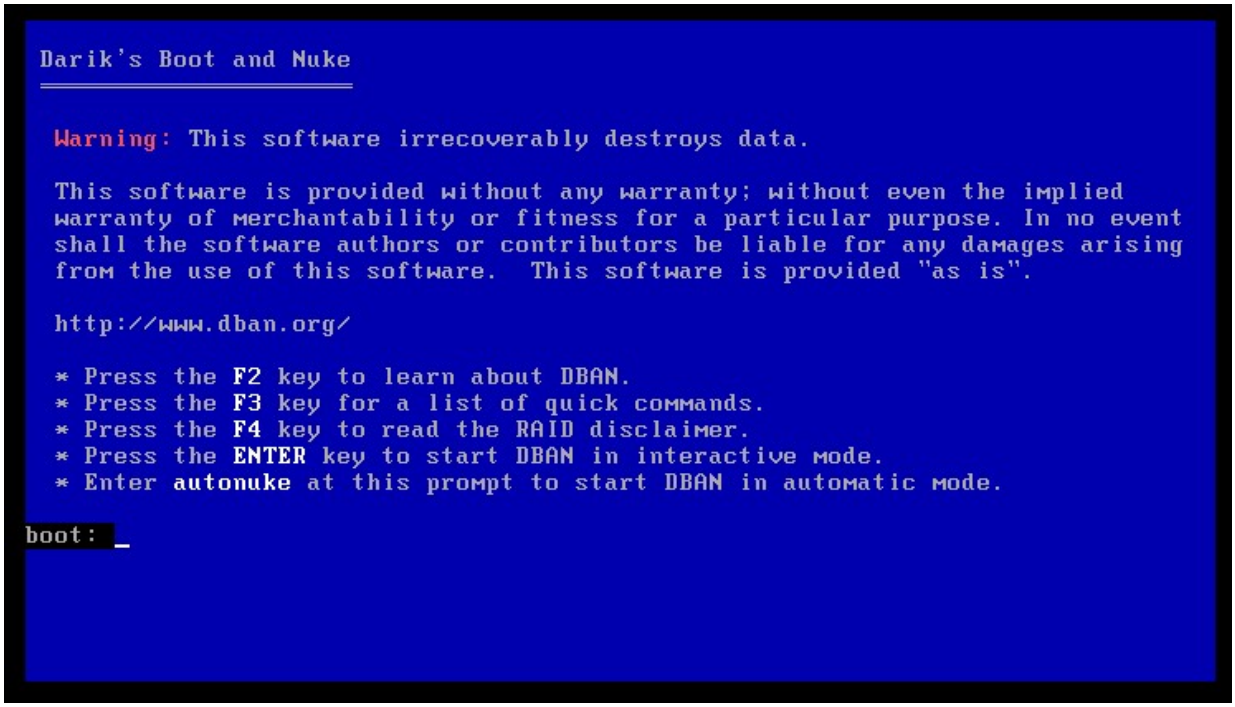
To securely wipe entire hard disks, use the "DBAN" tool.

To securely delete single files or directories, use the Linux tool "Wipe".

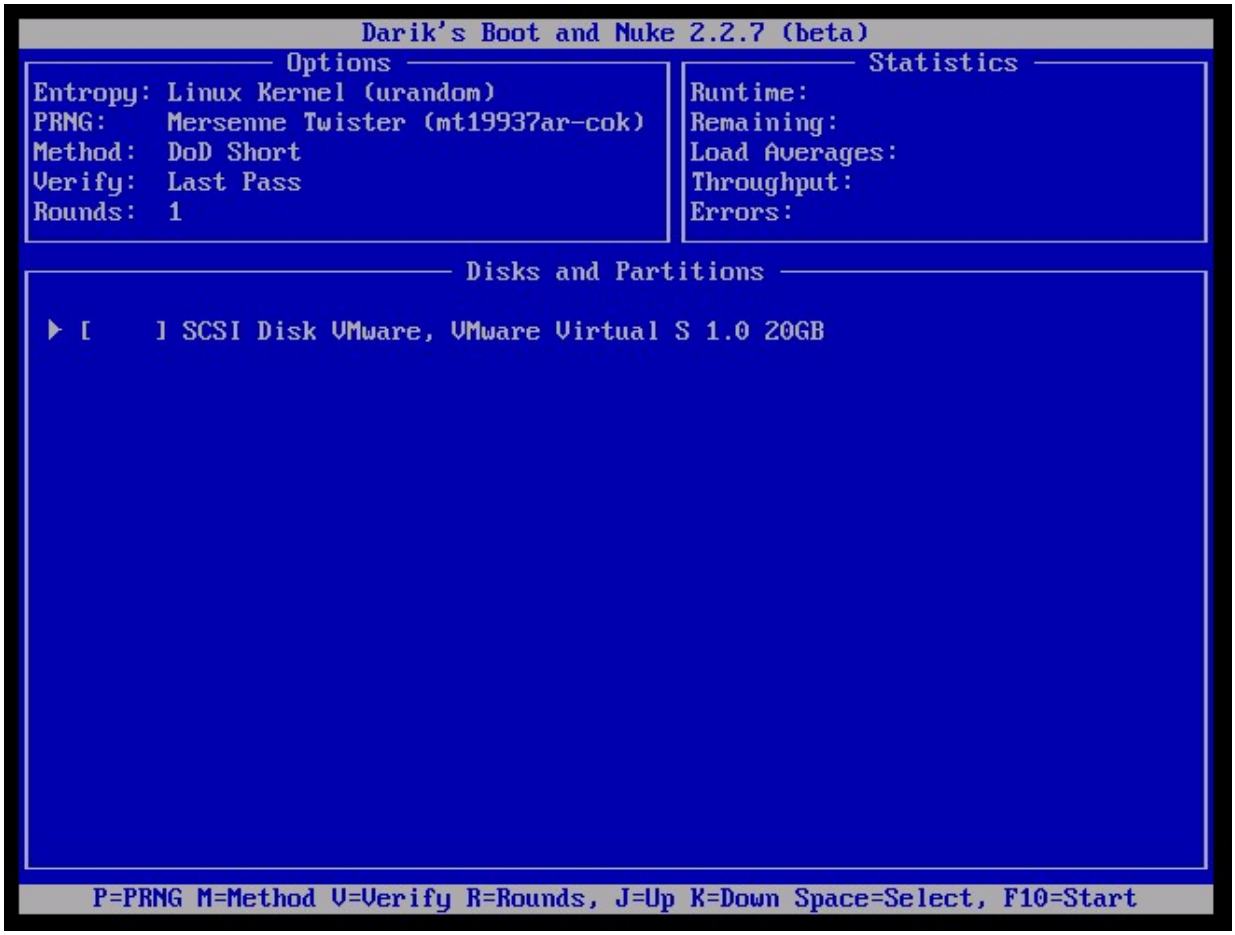
Running the DBAN tool

You can download DBAN from http://www.dban.org/.

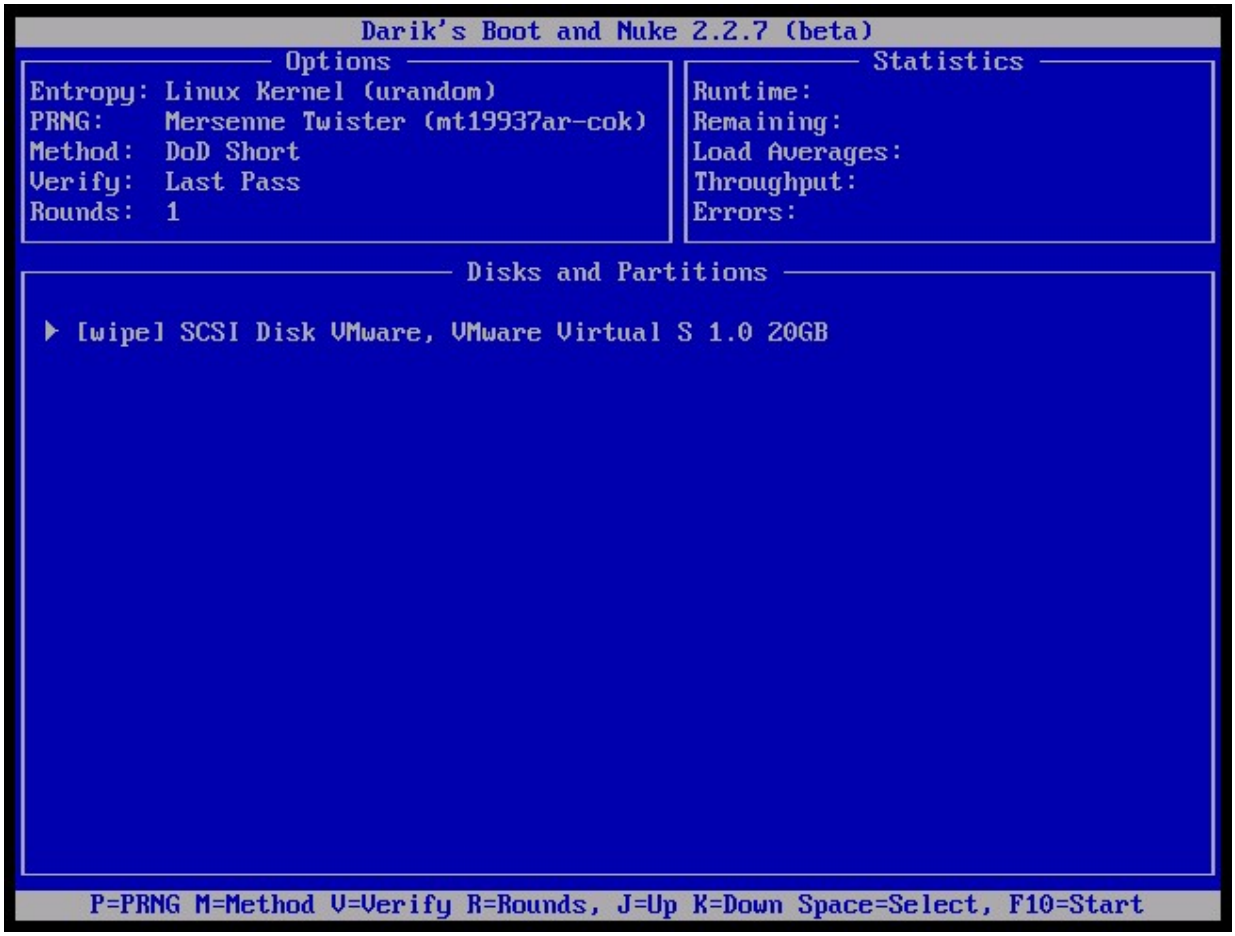
1. Create a CD with the ISO image of DBAN.
2. Boot the computer that hosts the device you want to wipe securely.
3. Press the **ENTER** key to start DBAN in interactive mode.



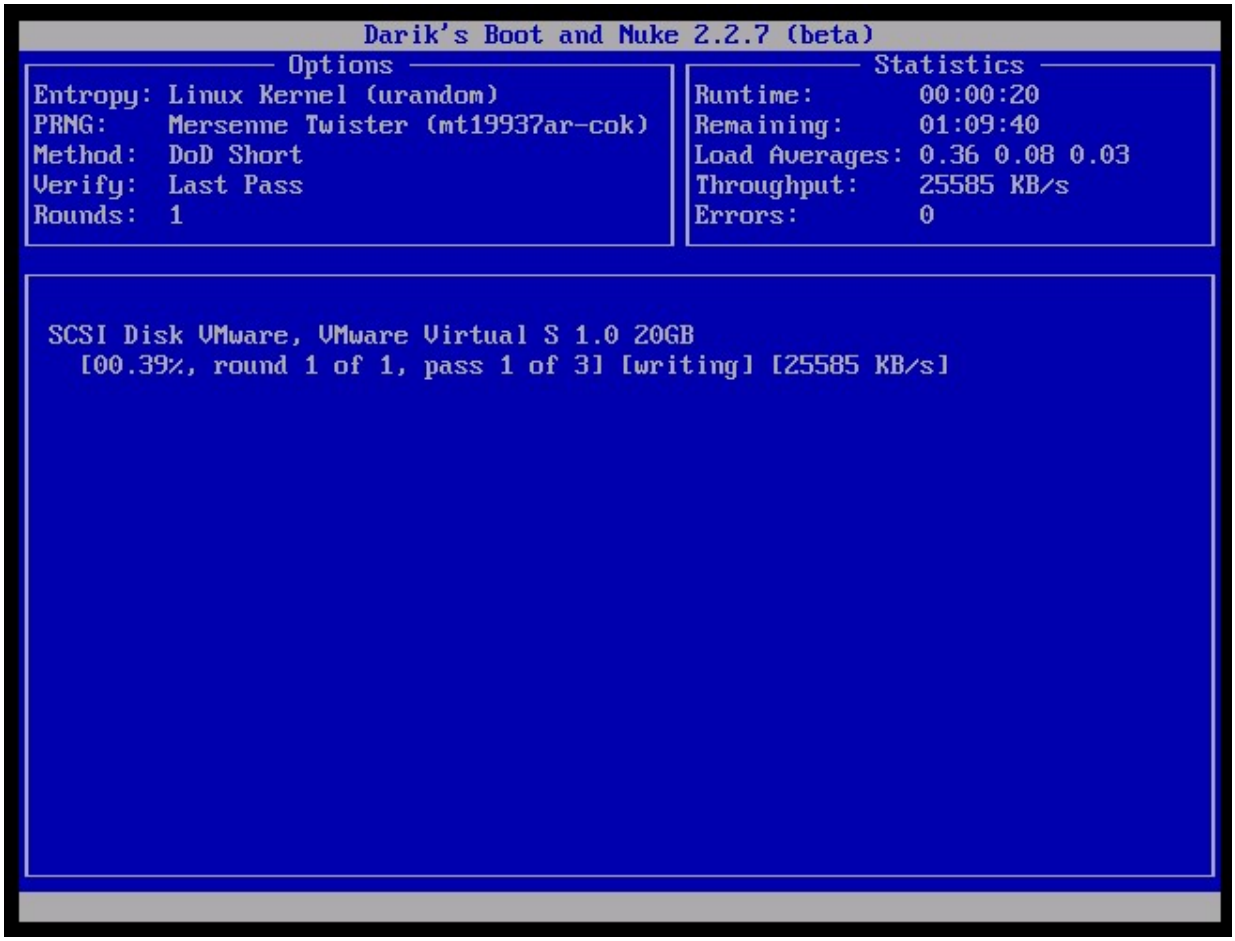
4. Type M and select the **DoD Short** method.



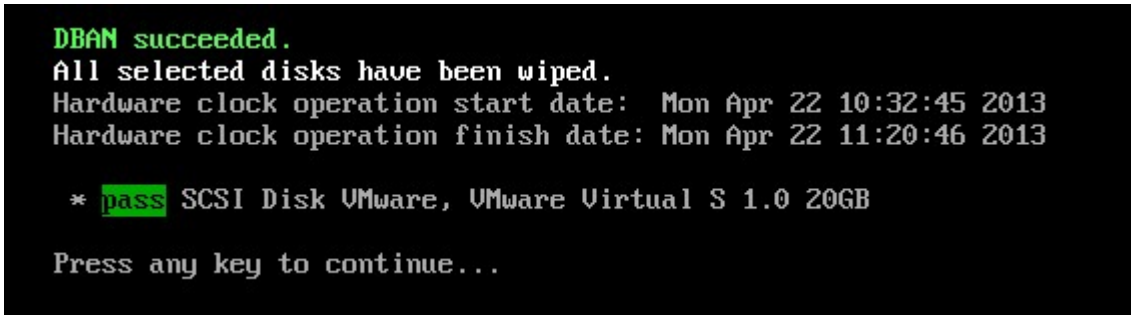
5. Select the disk or partition you want to wipe by using the up (J) and down (K) keys to move to the entry.
6. To confirm your selection, press the space bar.
7. To start wiping the disk, press F10.



8. The disk is now being wiped.



9. Make sure a dialog is displayed that confirms a successful wipe.



Using the Wipe tool

Download Wipe from http://wipe.sourceforge.net/.

Use the Wipe tool to securely delete single files or directories.

For example, to securely delete the file *myfile.txt*, run:

```
wipe -Sr -p3 myfile.txt
```

Decommission a instance or cluster

If a cluster instance or an entire cluster is decommissioned, you must securely delete all cardholder data by using a disk wipe tool.

IBM Safer Payments stores cardholder data in several locations. These locations are identified and configured as described in "Configuring cardholder data storage locations" on page 24.

Archived data and backups that are created by third-party applications are not in reach of the IBM Safer Payments software itself. Therefore, they are not securely deleted automatically by IBM Safer Payments. This aspect of this requirement must be met by organizational procedures.

Running the PCI DSS compliance report

Use the built-in PCI DSS compliance report to verify PCI DSS compliance.

IBM Safer Payments provides a built-in PCI DSS compliance report that lists all relevant configuration settings that must be changed to achieve PCI DSS compliance.

1. In the user interface, click the **Administration** tab.
2. Click the  (Report PCI DSS compliance) icon to create the report.

The generated report lists potential issues with PCI DSS compliance for the current configuration of IBM Safer Payments.

Use this report to configure IBM Safer Payments according to the PCI DSS requirements. For information about system configuration, see the online help.

Chapter 7. Extensions for IBM Safer Payments

With the following extensions, IBM Safer Payments can be used in combination with other technologies that can be installed alongside IBM Safer Payments on a IBM Safer Payments server.

Security settings and logging for those software components must be set up for each of the software products in accordance to PCI DSS.

IBM MQ interface

IBM Safer Payments can be dynamically linked to a local IBM MQ client to retrieve data from remote IBM MQ servers.

For more information about IBM MQ in general, see IBM Documentation. If the IBM MQ client library is installed on a local IBM Safer Payments instance, IBM Safer Payments loads the library at run time. It uses settings in the cluster configuration to connect to remote IBM MQ servers. If no IBM MQ client is installed or loading of the IBM MQ client library fails, the function is not available.

The settings for connections to IBM MQ servers are made in **Cluster** > **Settings** > **WebSphere MQ Interface**. Each IBM Safer Payments instance can connect to multiple queues on multiple remote IBM MQ queue managers, which are identified by a queue manager name, a target IP, and a target port. Security settings are defined in the definition of an IBM MQ channel to the queue manager. Whenever an IBM MQ connection is used to transport sensitive data over a public network, use of the **Use SSL encryption** option is mandatory for PCI DSS compliance. Also, on the IBM MQ server side, all connection channels to a queue must be configured to use TLS 1.2 using cipher specifications listed here.

The IBM Documentation article Connecting a client to a queue manager securely describes the process of a creating a key repository that is required for the **Use SSL encryption** option in IBM Safer Payments. It also describes the configurations that are necessary on the server side to make sure that authentication by using the key repository is being enforced.

IBM MQ is a product that is developed independently from IBM Safer Payments, it cannot be guaranteed that the provided configuration options are always sufficient. Therefore, it is necessary to constantly monitor the IBM MQ documentation for changes to the software and the security of the used cipher suites for potential security leaks.

Custom parser library

IBM Safer Payments can be dynamically linked to a local library that encapsulates custom parser functionality.

Since the source code within this library is user-defined, it is not part of Safer Payments. To use a custom library in accordance with PCI DSS, its code must be developed and audited separately. If no custom parser library is installed and linked to the IBM Safer Payments library path on the IBM Safer Payments server, the functionality is not available.

Single sign-on by using Kerberos

IBM Safer Payments allows SSO login by using Kerberos.

Extra setup steps on the IBM Safer Payments server, outside of the IBM Safer Payments configuration, must be completed.

- Your IBM Safer Payments configuration must be connected to an existing LDAP (or Active Directory) server. After turning on LDAP in **Administration** > **System Configuration**, you can select the **Allow Single Sign On** option.

- You must create a keytab file on your Kerberos (or Active Directory) server and deploy it to all IBM Safer Payments servers that are used for API access.
- You must change some system configuration files on the IBM Safer Payments server to point to your Kerberos (or Active Directory) server.
- Finally, every user must run a setup step on the web browser to allow the browser to pass the users authentication parameters to the server.
- For more information about the setup process, see **Administration** > **System Configuration** > **LDAP** in the online help.

Note: SSO is not required for operation in accordance to PA-DSS.

Single sign-on by using a custom HTTP header

IBM Safer Payments can be integrated into a single sign-on environment by using a custom HTTP header.

IBM Safer Payments can be used with any authentication protocol. It does not need to directly support any of the authentication protocols. Therefore, it can typically be integrated in any single sign-on environment. The authentication is handled by the authentication server, for example, ISAM, OIDC, OAuth, SAML, and so on. If the user is successfully authenticated, all requests to IBM Safer Payments need to be enriched by a configurable custom HTTP header that must contain the user name of the authenticated user. The HTTP communication should be secured by mutual authentication between IBM Safer Payments and the authentication proxy server. If the user name exists within IBM Safer Payments, the authentication is successful. If not, access with the user name is not possible.

Note: External authentication services are out of scope of IBM Safer Payments. If you opt to implement the authentication by using a custom HTTP header, you must implement proper procedures to secure this feature against unauthorized access. Enabling this authentication method triggers a notification inside the IBM Safer Payments PCI report. You must ensure the integrity and the safety of the networks that are used for this process. To initially set up IBM Safer Payments, the integrated login mechanism must be used.

Preliminary considerations

If you choose to use a custom HTTP header for user authentication, you must ensure that the external authentication server addresses all applicable PCI DSS requirements to achieve compliance. IBM Safer Payments must be set up to perform a client certificate validation on the API to secure the communication between the application and the external authentication server. See “Configuring SSL encryption” on page 17 for details.

Before you activate the custom HTTP header authentication in IBM Safer Payments, you must configure the external authentication server to properly send the required HTTP header to the application. Otherwise, you are no longer able to login and must manually revert the configuration change on the file system.

Note: The user creation workflow in IBM Safer Payments must be used to create more users. PA-DSS requirement 3.2 mandates the usage of unique user IDs for each user.

Setting up custom HTTP header authentication in IBM Safer Payments

1. In the user interface, click the **Administration** tab.
2. Select **System** > **Configuration** from the navigation menu.
3. Locate the **Authentication Settings** section.

Figure 32. Authentication Settings

4. First, select `OIDC claim` from the **Authentication method** drop-down list. Then specify the **Token name** and the **Username attribute**.

   In the **Token name** field, you must specify the name of the HTTP header field that contains the JSON payload. Whereas in the **Username attribute** field, you must specify the identifier inside the JSON payload that contains the user's login name.

5. Save your changes.

   Attention: Check the token name and the username before saving, or you are locked out of IBM Safer Payments.

After this system configuration is saved, IBM Safer Payments accepts user logins by using the custom HTTP header. Other authentication mechanisms are no longer possible until you change the authentication settings again.

Figure 33 on page 65 shows an example HTTP header.

```
{
  "login_name": "jsmith@exampleMail.com",
  "last_name": "Smith",
  "first_name": "Jane",
  "id": "cl.jsmith",
  "internal_id": "25",
  "emails": {
    "personal": "jsmith@personalMail.com",
    "business": "jsmith@businessMail.com"
  },
  "phone_numbers": {
    "business": "555-555-1234"
  }
}
```

Figure 33. Example HTTP header

If you enable the custom HTTP header as an authentication method, a notification will be added to the built-in PCI report.

Python code execution

IBM Safer Payments can feed data to external Python programs that are out of scope of IBM Safer Payments.

If you use external Python programs to store sensitive data outside of IBM Safer Payments, you must protect this data by fulfilling PCI DSS requirements 3.4.1, 3.5, 3.6, and all applicable subrequirements.

To help identify such cases, the IBM Safer Payments PCI DSS report warns you about model revisions (including challenger revisions) that use external Python programs that reference encrypted attributes.

Important: Python programs are run by the same user that runs IBM Safer Payments. The Python program has the same operating system privileges as that user. Therefore, the permissions of that user must be as restrictive as possible. The IBM Safer Payments user privilege to edit mandators must also be used sparsely as those users are able to upload Python code into the application.

Kafka

IBM Safer Payments can be connected to a Kafka cluster to retrieve messages from Kafka topics.

The settings for connections to a Kafka cluster are made in **Cluster** > **Settings** > **Kafka Instance** and **Cluster** > **Interfaces** > **Inbound**. Each IBM Safer Payments instance can connect to multiple topics on multiple remote Kafka clusters, which are identified by a target IP and port, and a topic name. Security settings are defined in the definition of the Kafka topic on the **Inbound Interface** page and in the definition of the **Kafka Endpoint** on the **Cluster Settings** page. Whenever a Kafka connection is used to transport sensitive data over a public network, use of the **Use SSL encryption** option is mandatory for PCI DSS compliance. Also, on the Kafka server side, all connection channels to a broker must be configured to use TLS 1.2 using cipher specifications listed here.

For more information about Kafka, see the Apache Kafka website.

The *Kafka documentation* describes the process of creating a certificate and key that can be used for a Kafka broker. The *librdkafka documentation* describes the process of creating a client certificate that is required for the **Use SSL encryption** option in IBM Safer Payments. Apache Kafka is a product that is developed independently from IBM Safer Payments. As such, it cannot be guaranteed that the provided configuration options are always sufficient. Therefore, it is necessary to constantly monitor the Kafka documentation for changes to the software and the security of the used cipher suites for potential security leaks.

Persistent connections

Use a persistent connection channel to an external system to avoid the overhead of creating and destroying a connection for every message.

IBM Safer Payments uses a persistent connection outgoing channel type inside the model in the form of external model components and the "forward to external system" option within masterdata elements. Both of these can be used to enhance transaction scoring by using information that is retrieved from external systems. To not impose limits on these use cases, neither the external model component nor the masterdata perform special handling on encrypted attributes. The values of these attributes are always sent in clear-text.

This means that when an external model component or masterdata is set up to send sensitive data over a public network, the corresponding persistent connections must enable the **Use SSL encryption** option to protect the data transfer using certificates.

Appendix A. PA-DSS requirements

Understand how IBM Safer Payments addresses and fulfills individual PA-DSS requirements and subrequirements.

Requirement 1: Do not retain full track data, card verification code or value (CAV2, CID, CVC2, CVV2), or PIN block data

Details about how requirement 1 and subrequirements 1.1, 1.1.4, and 1.1.5 are fulfilled.

Requirement 1.1

Do not store sensitive authentication data after authorization (even if encrypted). If sensitive authentication data is received, render all data unrecoverable upon completion of the authorization process. Sensitive authentication data includes the data as cited in the following Requirements 1.1.1 through 1.1.3.

Such data is not required by IBM Safer Payments for full operational functionality. To meet this requirement, supplying systems must be configured in a way that they do not send such data to IBM Safer Payments. If you send such data to IBM Safer Payments, your installation is not PCI DSS compliant.

Requirement 1.1.4

Securely delete any track data (from the magnetic stripe or equivalent data contained on a chip), card verification values or codes, and PINs or PIN block data stored by previous versions of the payment application, in accordance with industry-accepted standards for secure deletion, as defined, for example by the list of approved products maintained by the National Security Agency, or by other State or National standards or regulations.

Note: This requirement applies only if previous versions of the payment application stored sensitive authentication data.

Such data is not required by IBM Safer Payments for full operational functionality. To meet this requirement, supplying systems must be configured in a way that they do not send such data to IBM Safer Payments. If you send such data to IBM Safer Payments, your installation is not PCI DSS compliant.

If you are migrating from competing software that stores sensitive authentication data, such data must be removed. Any disk space that is previously used for storing sensitive authentication data must be deleted securely by using a disk wipe tool. For more information, see “Running a secure wipe tool” on page 58.

Removal is necessary for PCI DSS compliance.

IBM Safer Payments itself securely wipes any files that store encrypted attributes when they are deleted from the user interface.

Requirement 1.1.5

Do not store sensitive authentication data on vendor systems. If any sensitive authentication data (pre-authorization data) must be used for debugging or troubleshooting purposes, ensure the following:

- Sensitive authentication data is collected only when needed to solve a specific problem.
- Such data is stored in a specific, known location with limited access.
- The minimum amount of data is collected as needed to solve a specific problem.
- Sensitive authentication data is encrypted with strong cryptography while stored.
- Data is securely deleted immediately after use, including from:

- Log files
- Debugging files
- Other data sources received from customers

Such data is not required by IBM Safer Payments for full operational functionality, and would contradict with fully meeting Requirement 1.

Requirement 2: Protect stored cardholder data

Details about how requirement 2 and subrequirements 2.1, 2.2, 2.3, 2.4, 2.5, and 2.6 are fulfilled.

Requirement 2.1

Software vendor must provide guidance to customers regarding secure deletion of cardholder data after expiration of customer-defined retention period.

Cardholder data that exceeds the customer-defined retention period must be securely deleted. According to PCI DSS Requirement 3.1, each licensee must define a retention period.

Data that is stored in the Disk Data Cache (DDC) of IBM Safer Payments is automatically securely deleted. It is stored in a ring buffer type memory that overwrites itself when its capacity limit is reached. Therefore, in consequence, it is necessary that the DDC capacity limit is aligned with, or less than the retention period. IBM Safer Payments provides the configuration option, and it is the responsibility of the licensee to configure IBM Safer Payments accordingly.

However, this is not the case with indexes. If an index is created on an attribute that contains cardholder data, the "purge after" setting must be made accordingly with the definition of the index. IBM Safer Payments deletes such index entries automatically and securely. For more information, see "Deleting outdated index entries" on page 53.

Cardholder data can be used as part of conditions in the IBM Safer Payments configuration. Therefore, it is possible that the cfg directory also contains encrypted cardholder data.

IBM Safer Payments fully controls and protects cardholder data within its reach. Therefore, no special configuration is required regarding underlying software or systems (such as the operating system) to prevent inadvertent capture or retention.

Archived data and backups that are created by third-party applications are not in reach of the IBM Safer Payments software itself. Therefore, they cannot be securely deleted automatically by IBM Safer Payments. This aspect of this requirement must be met by organizational procedures.

For more information about how to securely delete cardholder data, see "Running a secure wipe tool" on page 58.

Certain operating system functions might also store encrypted cardholder data outside the reach of IBM Safer Payments. For more information about how to avoid this, see "Configuring disk swapping" on page 29 and "Disabling locate for folders" on page 30.

You can freely define the storage locations of cardholder data within IBM Safer Payments. For more information, see "Configuring cardholder data storage locations" on page 24.

Data that is created via external Python scripts is out of scope of IBM Safer Payments. If Python scripts are used in combination with cardholder data or encrypted attributes, organizational procedures must be implemented to cover this aspect.

Requirement 2.2

Mask PAN when displayed (the first six and last four digits are the maximum number of digits to be displayed), such that only personnel with a legitimate business need can see more than the first six/last four digits of the PAN.

Note: This requirement does not supersede stricter requirements in place for displays of cardholder data. For example, legal or payment card brand requirements for point-of-sale (POS) receipts.

If a PAN is displayed in full or only masked is determined by a user account privilege. Because the masking is run at the IBM Safer Payments server, unmasked PAN never make it outside IBM Safer Payments via the API. It is thus impossible for a non-authorized user to gain access to the full PAN numbers.

The licensee must implement proper operational procedures that ensure only users with "legitimate business need to see full PAN" are granted the respective privilege. IBM Safer Payments allows for granting this privilege on a per-user basis.

IBM Safer Payments displays PANs in the following components:

- Queries: PANs are masked depending on the user privilege.
- Defined risk lists: PANs are masked depending on the user privilege.
- Conditions: PANs are masked depending on the user privilege. Conditions can be found in many IBM Safer Payments definitions in the sections administration, model, monitoring, investigation, and report.
- Logs: PANs are always masked independent from the user privileges.

For more information, see “Setting user privileges” on page 56.

Requirement 2.3

Render PAN unreadable anywhere it is stored (including data on portable digital media, backup media, and in logs) by using any of the following approaches:

- One-way hashes based on strong cryptography (hash must be of the entire PAN).
- Truncation (hashing cannot be used to replace the truncated segment of PAN).
- Index tokens and pads (pads must be securely stored).
- Strong cryptography with associated key-management processes and procedures.

Any storage of PANs uses 256-Bit AES encryption. This includes transaction attributes, indexes, and cases. Encryption is turned on by the respective configuration option after which the respective PAN attribute encryption setting must be turned on.

In IBM Safer Payments you can export data to store outside the payment application by CSV-exports and by the RDI interface.

If you use the RDI, you thus must render all PANs unreadable. For more information about how to configure masking for RDI, see “Configuring miscellaneous settings” on page 33.

If you use CSV-exports, you must enable encryption for sensitive exports. For more information about how to configure IBM Safer Payments encryption, see “Enabling cardholder data encryption” on page 46.

Even if debugging functions are enabled, PANs are never included in debugging logs. This is ensured by the design of the software and cannot be changed by configuration options.

Requirement 2.4

Payment application must protect keys used to secure cardholder data against disclosure and misuse.

Note: This requirement applies to keys used to encrypt stored cardholder data, as well as to key-encrypting keys used to protect data-encrypting keys. Such key-encrypting keys must be at least as strong as the data-encrypting key.

IBM Safer Payments meets this requirement. For more information, see Chapter 5, “Key management configuration and procedures,” on page 37.

Generally, access to keys must be limited to the fewest number of custodians necessary. Also, keys must be stored securely in the fewest possible locations and forms. These are organizational duties to be met by the licensee.

For more information about the location where IBM Safer Payments encryption keys are stored, see “Configuring cardholder data storage locations” on page 24.

Remarks:

- This location is different for each IBM Safer Payments instance in a IBM Safer Payments cluster. Therefore, you must address the location individually for each cluster instance.
- Archived data and backups that are created by third-party applications are not in reach of the IBM Safer Payments software itself. This aspect of this requirement must be met by organizational procedures. If you do not intend to exclude the key path from backups, make sure that this does not contradict to PCI DSS Requirement 3.5.2.
- If the integrity of the key has been weakened, or there is a known or suspected compromise of a key you must activate a new usage key triplet and revoke the previous one. For more information, see “Revoking Keys” on page 51.

Requirement 2.5

Payment application must implement key management processes and procedures for cryptographic keys used for encryption of cardholder data, including at least the following:

For more information about how to securely generate, distribute, protect, change, store, retire, and replace cryptographic keys, see Chapter 5, “Key management configuration and procedures,” on page 37.

2.5.1 Generation of strong cryptographic keys

Chapter 5, “Key management configuration and procedures,” on page 37 discusses strong cryptographic key generation procedures that are implemented in IBM Safer Payments.

2.5.2 Secure cryptographic key distribution

Private keys must be copied manually into the key directory of each IBM Safer Payments instance. Therefore, it is the duty of the licensee to ensure secure distribution. IBM Safer Payments itself does not distribute these files. For more information, see “Configuring keygen key management ” on page 40.

Public keys are made available to IBM Safer Payments by entering them in the GUI. For more information, see “Activating a keygen master key ” on page 43 or “Activating a KMIP master key” on page 38. Therefore, communication between the workstations of the users and the IBM Safer Payments instances must be encrypted securely. For example, by using TLSv1.2. See refer to section 4.3.3.

2.5.3 Secure cryptographic key storage

IBM Safer Payments uses the AES-256 algorithm to ensure secure cryptographic key storage.

Any cryptographic keys must be stored securely, and access must be limited to people with a legitimate business need to access them.

2.5.4 Cryptographic key changes for keys that have reached the end of their cryptoperiod (for example, after a defined period of time has passed and/or after a certain amount of cipher-text has been produced by a given key), as defined by the associated application vendor or key owner, and based on industry best practices and guidelines (for example, NIST Special Publication 800-57).

IBM Safer Payments implements key-management procedures that allow for cryptographic key changes during operation, without service interruption. If no key change occurs during a defined period, IBM Safer Payments automatically shuts down. For more information about key change procedures that are implemented in IBM Safer Payments, see “Enforcing regular key changes ” on page 49.

2.5.5 Retirement or replacement of keys (for example: by archiving, destruction, and/or revocation as applicable) as deemed necessary when the integrity of the key has been weakened (for example, departure of an employee with knowledge of a clear-text key, etc.) or keys are suspected of being compromised.

IBM Safer Payments implements key-management procedures that allow for retirement or replacement of keys.

IBM Safer Payments does not archive revoked keys, and there is no need to do so. When a cryptographic key is retired/revoked in IBM Safer Payments, it soon becomes redundant because the process must include activation of a replacement key. There is no need to keep a retired/revoked key for decryption/verification purpose, because the same data can be decrypted/verified with any other valid key, including this and subsequent replacement keys.

IBM Safer Payments does not use any inactive cryptographic keys for encryption operations.

Retirement or replacement of keys is required, if the integrity of the key has been weakened, or keys are suspected of being compromised. See “Revoking Keys” on page 51 for details.

If the integrity of the master key has been weakened, a new master key should be generated and deployed to the IBM Safer Payments cluster. For more information, see “Changing the master key” on page 51.

IBM Safer Payments securely deletes all revoked keys within its reach. However, you must delete revoked keys manually from all other storage locations by using a secure wipe tool. For more information, see “Running a secure wipe tool” on page 58.

2.5.6 If the payment application supports manual clear-text cryptographic key management operations, these operations must enforce split knowledge and dual control.

Note: Examples of manual key-management operations include, but are not limited to: key generation, transmission, loading, storage, and destruction.

IBM Safer Payments enforces split knowledge and dual control, as it supports manual cryptographic key management operations. More precisely, two key holders are required for key generation and activation.

2.5.7 Prevention of unauthorized substitution of cryptographic keys

Substitution of cryptographic keys must be legitimized by two key holders. Organizational procedures must be put in place by the licensee that ensures no single user is granted two accounts. This warrants that no single user can pretend to be two distinct key holders.

In consequence, unauthorized substitution of cryptographic keys is prevented.

Requirement 2.6

Provide a mechanism to render irretrievable any cryptographic key material or cryptogram stored by the payment application, in accordance with industry-accepted standards. These are cryptographic keys used to encrypt or verify cardholder data.

Note: This requirement applies only if the payment application uses, or previous versions of the payment application used, cryptographic key materials, or cryptograms to encrypt cardholder data.

For PCI DSS compliance, cryptographic material must be rendered irretrievable. For more information about how to render cryptographic material irretrievable using a secure wipe tool, see “Running a secure wipe tool” on page 58.

IBM Safer Payments meets this requirement. Keys in IBM Safer Payments are application version independent and thus remain exactly what they are in an upgrade situation. Therefore, no action is required to render previous IBM Safer Payments version cryptographic material irretrievable. If you want to render cryptographic material irretrievable, you must revoke the respective keys. Keys that are revoked are securely deleted on disk (disk space overwritten with pattern) before the respective file contents are deleted.

Reencrypting historic data with new keys is an internal process of IBM Safer Payments, which is automatically triggered by entering and activating a new key, and revoking the old keys. For more information about these reencryption processes, see “Enforcing regular key changes ” on page 49, “Revoking Keys” on page 51, and “Changing the master key” on page 51.

Requirement 3: Provide secure authentication features

Details about how requirement 3 and subrequirements 3.1, 3.2, 3.3, and 3.4 are fulfilled.

Requirement 3.1

The payment application must support and enforce the use of unique user IDs and secure authentication for all administrative access and for all access to cardholder data. Secure authentication must be enforced to all accounts generated or managed by the application by the completion of installation and for subsequent changes after installation. The application must enforce 3.1.1 through 3.1.11.

Note: The term *subsequent changes* used throughout Requirement 3 refers to any application changes that result in user accounts reverting to default settings, changes to existing account configurations, and changes that generate new accounts or re-create existing accounts.

Note: These password controls are not intended to apply to personnel who only have access to one card number at a time to facilitate a single transaction. These controls are applicable for access by personnel with administrative capabilities, for access to systems with cardholder data, and for access controlled by the payment application. This requirement applies to the payment application and all associated tools used to view or access cardholder data.

IBM Safer Payments meets this requirement. IBM Safer Payments enforces secure authentication for all authentication credentials that the application generates by:

- Enforcing secure changes to authentication credentials by the completion of installation.
- Enforcing secure changes for any subsequent changes (after installation) to authentication credentials.

Remarks:

- You must not use any administrative/root user accounts for daily operational use.
- You must assign secure authentication to any default accounts (even if they are not used), and then disable them. Use the PCI DSS compliance report to verify that all default user accounts are addressed correctly.
- If you use an LDAP server to manage user passwords, you must make sure that the LDAP server is configured according to the requirements.
- If you use the SMTP-based emailing capabilities of IBM Safer Payments, you must make sure that the SMTP server is configured according to the requirements.
- If you use OpenID connect (OIDC) token for user authentication, you must make sure that the authorization infrastructure is configured according to all applicable PA-DSS requirements.

3.1.1. The payment application does not use (or require the use of) default administrative accounts for other necessary software (for example, the payment application must not use the database default administrative account).

IBM Safer Payments does not require any administrative privileges to run and it does not use any third-party software except the operating system.

Note: If you use OIDC tokens with an external authentication infrastructure, you must address this requirement for the communication between the user client and the authorization server.

3.1.2. The application must enforce the changing of all default application passwords for all accounts that are generated or managed by the application, by the completion of installation and for subsequent changes after installation. This applies to all accounts, including user accounts, application and service accounts, and accounts used by the vendor for support purposes.

IBM Safer Payments meets this requirement because it is delivered with one default user account and you must change the password at your first login to access the user interface.

3.1.3. The payment application assigns unique IDs for user accounts.

IBM Safer Payments meets this requirement. Unique IDs are assigned for user accounts.

3.1.4. The payment application employs at least one of the following methods to authenticate all users:

- Something that you know, such as a password or passphrase.
- Something that you have, such as a token device or smart card.
- Something that you are, such as a biometric.

IBM Safer Payments meets this requirement by using password-based authentication.

3.1.5. The payment application does not require or use any group, shared, or generic accounts and passwords.

IBM Safer Payments meets this requirement. It does not require or use any group, shared, or generic accounts and passwords.

3.1.6 The payment application requires that passwords meet the following:

- Require a minimum length of at least seven characters.
- Contain both numeric and alphabetic characters.

IBM Safer Payments meets this requirement by providing options in the system configuration that force user passwords to have a minimum length, contain at least one uppercase character, contain at least one lowercase character, contain at least one digit, or contain at least one special character.

3.1.7. The payment application requires changes to user passwords at least every 90 days.

IBM Safer Payments meets this requirement by providing an option in the system configuration where the number of days for which passwords are valid is defined.

3.1.8 The payment application keeps password history and requires that a new password is different than any of the last four passwords used.

IBM Safer Payments meets this requirement by providing an option in the system configuration where the number of past passwords that a new password is checked against is defined.

3.1.9 The payment application limits repeated access attempts by locking out the user account after not more than six logon attempts.

IBM Safer Payments meets this requirement by providing an option in the system configuration where the number of failed login attempts after which a user account is disabled is defined.

3.1.10 The payment application sets the lockout duration to a minimum of 30 minutes or until administrator enables the user ID.

IBM Safer Payments meets this requirement by disabling a user account until an administrator manually reactivates it.

3.1.11 If a payment application session has been idle for more than 15 minutes, the application requires the user to reauthenticate to reactivate the session.

IBM Safer Payments meets this requirement by providing an option in the system configuration defining the number of seconds of idle time after which a session expires causing an automatic log out.

You can use the PCI DSS compliance report to verify the compliance of your IBM Safer Payments installation. For more information, see “Running the PCI DSS compliance report” on page 62.

Requirement 3.2

Software vendor must provide guidance to customers that all access to PCs, servers, and databases with payment applications must require a unique user ID and secure authentication.

For the organization of the licensee to be PCI DSS compliant, all access to PCs, servers, and databases with payment applications and cardholder data must require a unique user ID and PCI DSS compliant secure authentication. You must ensure that this requirement is met by organizational guidelines.

The IBM Safer Payments application itself complies with this requirement. In particular, each user can use a unique user ID, and authentication in accordance with Requirement 3.1 is implemented. However, the licensee must ensure by using organizational guidelines that users do not share accounts, and secure authentication is ensured through PCI DSS compliant configuration of the software.

Requirement 3.3

Secure all payment application passwords (including passwords for user and application accounts) during transmission and storage.

3.3.1 Use strong cryptography to render all payment application passwords unreadable during transmission.

To render passwords unreadable during transmission, communication between the workstations of the users and the IBM Safer Payments instances, and between IBM Safer Payments instances, must be encrypted. For example, by using the internal SSL encryption function of IBM Safer Payments.

If LDAP integration is used with IBM Safer Payments, passwords are transmitted to the LDAP server. For secure transmission, turn on LDAP encryption over SSL on the **Administration** > **System** > **Configuration** > **User** page, as shown in Figure 34 on page 74 .

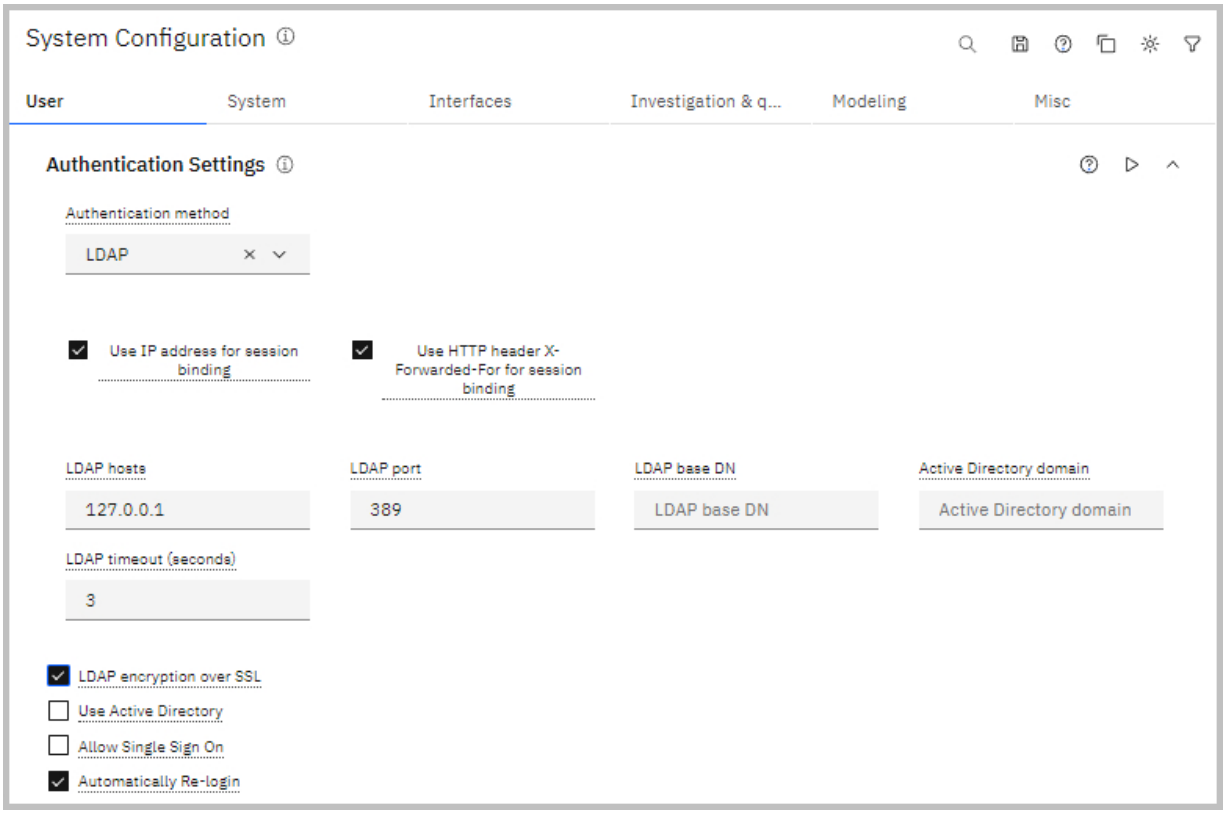


Figure 34. Authentication Settings (LDAP)

You can use the PCI DSS compliance report to verify the compliance of this option in your Safer Payments installation. For more information, see “Running the PCI DSS compliance report” on page 62.

3.3.2 Use a strong, one-way cryptographic algorithm, based on approved standards to render all payment application passwords unreadable during storage. Each password must have a unique input variable that is concatenated with the password before the cryptographic algorithm is applied.

Note: The input variable does not need to be unpredictable or secret.

Passwords are stored securely with IBM Safer Payments as salted PBKDF2 hashes. Every user has a unique 32 characters long random salt, which is set during user creation. To generate randomness, two boost functions are used, which take entropy from "/dev/urandom". As random input characters the 62 case-sensitive alphanumeric characters are used. The strength of the salt is thus 1984 bit (32*62). The generated salt is combined with the user’s password and login and is hashed by a PBKDF2 hashing function that uses SHA512 as the message digest algorithm and performs 50027 iterations.

You can use the PCI DSS compliance report to verify the compliance of your IBM Safer Payments installation. For more information, see “Running the PCI DSS compliance report” on page 62.

Requirement 3.4

Payment application must limit access to required functions/resources and enforce least privilege for built-in accounts.

- By default, all application/service accounts have access to only those functions/resources needed for purpose of the application/service account.
- By default, all application/service accounts have minimum level of privilege assigned for each function/resource as needed for the application/service account.

Use the IBM Safer Payments default user only to create new personalized user accounts and disable the default user immediately afterward.

IBM Safer Payments meets this requirement. IBM Safer Payments has a built-in role system that allows to define permissions for different user groups.

For more information, see “Starting the first cluster instance ” on page 15 and “Setting user privileges” on page 56.

Requirement 4: Log payment application activity

Details about how requirement 4 and subrequirements 4.1, 4.2, 4.3, and 4.4 are fulfilled.

Requirement 4.1

At the completion of the installation process, the “out of the box” default installation of the payment application must log all user access and be able to link all activities to individual users.

The default IBM Safer Payments configuration logs all user access, and links all activities to individual users.

You can use the PCI DSS compliance report to verify the correct configuration of your IBM Safer Payments logging function. For more information, see “Running the PCI DSS compliance report” on page 62.

Note: All PCI DSS relevant log messages are classified accordingly in the IBM Safer Payments software. Disabling them results in non-compliance with PCI DSS. For more information, see “Changing log message settings” on page 55.

You must also configure your system log according to PCI standards. You can find links to the security guides of all supported operating systems in “Changing operating system settings” on page 31.

Requirement 4.2

Payment application must provide an audit trail to reconstruct the following events:

- All individual user accesses to cardholder data from the application
- All actions taken by any individual with administrative privileges as assigned in the application
- Access to application audit
- Invalid logical access attempts
- Use of, and changes to the application’s identification and authentication mechanisms (including but not limited to creation of new accounts, elevation of privileges, etc.), and all changes, additions, deletions to application accounts with root or administrative privileges
- Initialization, stopping, or pausing of the application audit logs
- Creation and deletion of system-level objects within or by the application

IBM Safer Payments can be configured accordingly to meet all subrequirements of requirement 4.2.

You can use the PCI DSS compliance report to verify the correct configuration of your IBM Safer Payments logging function. For more information, see “Running the PCI DSS compliance report” on page 62.

For more information about adapting log message settings, see “Changing log message settings” on page 55.

After adaptation, the report can be rerun and immediately reflects any changes made.

Note: All PCI DSS relevant log messages are classified accordingly in the IBM Safer Payments software. Disabling them results in non-compliance with PCI DSS.

Note: IBM Safer Payments itself cannot prevent log files to be deleted from outside the application on file level. Organizational procedures must be implemented to prevent such deletions and modifications. Therefore, centralized logging is recommended.

Requirement 4.3

Payment application must record at least the following audit trail entries for each event: [...]

IBM Safer Payments can be configured accordingly to meet all subrequirements of requirement 4.3.

You can use the PCI DSS compliance report to verify the correct configuration of your IBM Safer Payments logging function. For more information, see “Running the PCI DSS compliance report” on page 62.

Note: All PCI DSS relevant log messages are classified accordingly in the IBM Safer Payments software. Disabling them results in non-compliance with PCI DSS.

Requirement 4.4

Payment application must provide centralized logging.

IBM Safer Payments provides centralized logging and fully meets this requirement.

All IBM Safer Payments system and audit logs can be accessed from the GUI, and third-party monitoring tools can import IBM Safer Payments log files. Third party monitoring tools can retrieve the log files that are written by IBM Safer Payments from the "log" directory as specified in IBM Safer Payments base configuration.

To facilitate centralized logging, IBM Safer Payments supports the syslog protocol in Unix/Linux.

For more information about how to activate centralized logging, see “Changing log message settings” on page 55.

Note: Your central log server must collect all relevant log messages from the system log. You must implement an operational process within your organization to collect the relevant logs from the operating systems logs.

Requirement 5: Develop secure payment applications

Details about how requirement 5 and subrequirements 5.1, 5.2, 5.3, 5.4, 5.5, and 5.6 are fulfilled.

Requirement 5.1

The software vendor has defined and implemented a formal process for secure development of payment applications, which includes:

- Payment applications are developed in accordance with PCI DSS and PA-DSS (for example, secure authentication and logging).
- Development processes are based on industry standards and/or best practices.
- Information security is incorporated throughout the software development life cycle.
- Security reviews are performed prior to release of an application or application update.

IBM Safer Payments meets this requirement. The internal software development guidelines of IBM Safer Payments reflect on PCI DSS and PA-DSS requirements. A regular IT security training program

is established. It is mandatory for the developers of IBM Safer Payments to follow the OWASP guidelines for secure software development and operations.

5.1.1 Live PANs are not used for testing or development.

IBM Safer Payments meets this requirement. IBM Safer Payments uses artificially generated data for testing, or data that is anonymized using a secure hashing method, such as SHA256 with salt.

5.1.2 Test data and accounts are removed before release to customer.

IBM Safer Payments meets this requirement. Test data and accounts are only added to the software in the test harnesses, never to the installation media. Thus test data and accounts can never find their way to the delivered installation archives.

5.1.3 Custom payment application accounts, user IDs, and passwords are removed before payment applications are released to customers

IBM Safer Payments meets this requirement. Test data and accounts are only added to the software in the test harnesses, never to the installation media. Thus test data and accounts can never find their way to the delivered installation archives.

5.1.4. Payment application code is reviewed prior to release to customers after any significant change, to identify any potential coding vulnerability.

- Code changes are reviewed by individuals other than the originating code author, and by individuals who are knowledgeable in code-review techniques and secure coding practices.
- Code reviews ensure code is developed according to secure coding guidelines. (See PA-DSS Requirement 5.2.)
- Appropriate corrections are implemented prior to release.
- Code-review results are reviewed and approved by management prior to release.
- Documented code-review results include management approval, code author, and code reviewer, and what corrections were implemented prior to release.

IBM Safer Payments uses a revision policy, in which feature development occurs only in the development branch, and never in the release branches. Code changes to release branches are committed individually by issue ticket of the issue tracking system to the source code revision control system. Development managers can review them individually before they are committed to a new branch release (patch release).

5.1.5 Secure source-control practices are implemented to verify integrity of source code during the development process.

IBM Safer Payments uses Git as a source code management system. In our intranet, we maintain a section that provides information on how to use it and how it is configured.

5.1.6 Payment applications are developed according to industry best practices for secure coding techniques, including:

- Developing with least privilege for the application environment.
- Developing with fail-safe defaults (all execution is by default denied unless specified within initial design).
- Developing for all access point considerations, including input variances such as multi-channel input to the application.

The developers of IBM Safer Payments are provided with training materials about secure coding technologies and how to use them. Each IBM Safer Payments developer must undergo secure coding training at least annually.

5.1.7 Provide up-to-date training in secure development practices for application developers at least annually, as applicable for the developer's job function and technology used, for example:

- Secure application design
- Secure coding techniques to avoid common coding vulnerabilities (for example, vendor guidelines, OWASP Top 10, SANS CWE Top 25, CERT Secure Coding, etc.)
- Managing sensitive data in memory

- Code reviews
- Security testing (for example, penetration-testing techniques)

The developers of IBM Safer Payments are provided with training materials about secure coding technologies and how to use them. Each IBM Safer Payments developer must undergo secure coding training at least annually.

Requirement 5.2

Develop all payment applications to prevent common coding vulnerabilities in software-development processes.

The Agile approach that is used by IBM Safer Payments development meets this requirement. In addition, mandatory code reviews by trained reviewers prevent common coding vulnerabilities.

5.2.1 Injection flaws, particularly SQL injection. Also consider OS Command Injection, LDAP and XPath injection flaws as well as other injection flaws.

SQL injection in IBM Safer Payments is impossible as there is no SQL engine in IBM Safer Payments. In general, every entry to IBM Safer Payments is read by an anticipatory parser that does not open any door for code injection.

5.2.2 Buffer Overflow

All buffers that are used for external input are protected against overflowing. All internal buffers do not provide external access and thus cannot be used to attack the software.

5.2.3 Insecure cryptographic storage

IBM Safer Payments meets this requirement. IBM Safer Payments uses industry standard AES-256 and SHA256 crypto-libraries that it keeps in source code form.

5.2.4 Insecure communications

To comply with this requirement, all sensitive and authenticated IP communication must be encrypted. This can be achieved with the internal SSL encryption functions of IBM Safer Payments. For more information, see “Configuring SSL encryption” on page 17.

Note: For performance reasons, the internal SSL encryption of IBM Safer Payments does not apply for all internal communication between IBM Safer Payments instances. Instead, only keys and passwords are encrypted during transmission, as well as any encrypted attribute values, including the PAN.

5.2.5 Improper error handling

Error messages do not deliver passwords or transaction data values.

5.2.6 All “High” vulnerabilities as identified in the vulnerability identification process at PA-DSS Requirement 7.1

For more information, see “Requirement 7: Test payment applications to address vulnerabilities and maintain payment application updates” on page 80.

5.2.7 Cross-site scripting (XSS)

For injecting JS code or any other browser executable code, IBM Safer Payments provides save escaping routines, as described in the online help system of IBM Safer Payments.

Requirement 5.3

Software vendor must follow change-control procedures for all application changes. Change-control procedures must follow the same software development processes as new releases (as defined in PA-DSS Requirement 5.1), and include the following:

IBM Safer Payments uses a standard revision control system and an issue tracking system. The combination of these tools satisfies this requirement.

5.3.1 Documentation of impact

This requirement is met by SIBM Safer Payments development operational procedures in combination with the software development that are used by IBM Safer Payments.

5.3.2 Documented approval of change by appropriate authorized parties

This requirement is met by IBM Safer Payments development operational procedures in combination with the software development tools that are used by IBM Safer Payments.

More precisely, each issue that potentially causes code changes in a released branch must be described (by customer or employees) in a ticket that is entered into the issue tracking system. From there, only development managers review the tickets, and if they authorize them for a code change, they forward the ticket to the respective developer or developer team. This ensures that any code change in a released branch occurs only after it has been approved by authorized parties. The entire process is fully documented by the IBM Safer Payments issue tracking system.

5.3.3 Functionality testing to verify that the change does not adversely impact the security of the system.

This is done by using the automated factory test suite of IBM Safer Payments. The IBM Safer Payments software development handbook mandates that at least full factory tests are run on each branch release.

5.3.4 Back-out or product de-installation procedures

IBM Safer Payments enables back-out after the application of a patch in full flight. Similar to the IBM Safer Payments update process, you update one instance at a time. In a redundant (clustered) setup, the other instances assume the computation load and automatically provide the missed data to the updated instance. Back-out is the same process, only in reverse.

The key prerequisite is that you can back-out only one patch level at a time. If you want to back-out from IBM Safer Payments 5.3.1.8 to IBM Safer Payments 5.3.1.4, for instance, you first back-out one instance after another to IBM Safer Payments 5.3.1.7, then toIBM Safer Payments 5.3.1.6.

For more information, see “Installing a fix pack update” on page 12.

Requirement 5.4

The payment application vendor must document and follow a software-versioning methodology as part of their system development lifecycle. The methodology must follow the procedures in the PA-DSS Program Guide for changes to payment applications.

The IBM Safer Payments revision policy is documented in “Versioning method” on page xii.

Requirement 5.5

Risk assessment techniques (for example, application threat-modeling) are used to identify potential application security design flaws and vulnerabilities during the software-development process.

On our intranet, a section describes the risk assessment techniques of IBM Safer Payments.

Requirement 5.6

Software vendor must implement a process to document and authorize the final release of the application and any application updates.

This requirement is met by IBM Safer Payments development operational procedures. A factory staging process mandates that every patch or upgrade release is authorized by the respective person.

Requirement 6: Protect wireless transmissions

Details about how requirement 6 and subrequirements 6.1, 6.2, and 6.3 are fulfilled.

This requirement does not apply to IBM Safer Payments itself, as the software does not require wireless transmissions. If the licensee uses wireless transmission, it must be ensured that subrequirements 6.1, 6.2 and 6.3 are met.

Requirement 6.1

For payment applications using wireless technology, change wireless vendor defaults, including but not limited to default wireless encryption keys, passwords, and SNMP community strings. The wireless technology must be implemented securely.

To ensure compliance, you must verify that

- Default encryption keys are changed at installation, and are changed anytime anyone with knowledge of the keys leaves the company or changes positions.
- Default SNMP community strings on wireless devices are changed.
- Default passwords/passphrases on access points are changed.
- Firmware on wireless devices is updated to support strong encryption for authentication and transmission over wireless networks.
- Other security-related wireless vendor defaults are changed, if applicable.
- Firewalls are installed between IBM Safer Payments (and other systems that store Cardholder Data) and wireless networks.
- Firewalls are configured to deny or control, if such traffic is necessary for business purposes, any traffic from the wireless environment into the Cardholder Data environment.

Requirement 6.2

For payment applications using wireless technology, payment application must facilitate use of industry best practices (for example, IEEE 802.11i) to implement strong encryption for authentication and transmission.

When you use wireless technology with IBM Safer Payments, you must ensure that

- Industry best practices (for example, IEEE 802.11i) are used to include or make available strong encryption for authentication and transmission.
- PA-DSS requirement 6.1 is fully met.

Requirement 6.3

Provide instructions for customers about secure use of wireless technology.

When you use wireless technology with IBM Safer Payments, you must ensure that

- PA-DSS requirement 6.1 is fully met.
- PA-DSS requirement 6.2 is fully met.

Requirement 7: Test payment applications to address vulnerabilities and maintain payment application updates

Details about how requirement 7 and subrequirements 7.1, 7.2, and 7.3 are fulfilled.

Requirement 7.1

Software vendors must establish a process to identify and manage vulnerabilities, as follows:

7.1.1 Identify new security vulnerabilities using reputable sources for obtaining security vulnerability information.

Organizational procedures are implemented to keep this information current.

7.1.2 Assign a risk ranking to all identified vulnerabilities, including vulnerabilities involving any underlying software or systems provided with or required by the payment application

On our intranet, we maintain a section that collects common security vulnerabilities as well a risk assessment regarding the IBM Safer Payments software product.

7.1.3 Test payment applications and updates for the presence of vulnerabilities prior to release

A collection of automated tests verifies that there are no known vulnerabilities in the new IBM Safer Payments release. Those tests are run before a release is delivered to customers and are documented within the factory staging.

Requirement 7.2

Software vendors must establish a process for timely development and deployment of security patches and upgrades.

7.2.1 Patches and updates are delivered to customers in a secure manner with a known chain of trust.

A process for the development and deployment of patches and upgrades is established. The same process is used whether the root cause is a security-related issue or just a technical/functional related issue.

7.2.2 Patches and updates are delivered to customers in a manner that maintains the integrity of the patch and update code.

Patches are delivered through Fixcentral. Software is delivered using a secure web server (https protocol). Installation media is protected by SHA256 hash that is provided via the Release Notes in the IBM Support Portal. Any patches and updates are integrity tested before delivery. Before the installation, the customer must manually test the integrity via the checksum as described in “Downloading the installation image ” on page 7.

7.2.3 Provide instructions for customers about secure installation of patches and updates.

“Where to find more information” on page xi provides a link to the IBM Support Portal and Fixcentral where Technotes, patches, and updates can be securely downloaded.

Requirement 7.3

Include Release Notes for all application updates, including details and impact of the update, and how the version number was changed to reflect the application update.

A process to include Release Notes for all patches or upgrades is established. The Release Notes and the version number are publicly available on the IBM Support Portal. If a patch for a PA-DSS certified release is delivered, a vendor change document is created. The document describes the impact of all changes according to PCI DSS compliance and why it was necessary. The vendor change analysis document can be requested from your account manager.

Requirement 8: Facilitate secure network implementation

Details about how requirement 8 and subrequirements 8.1, 8.2, and 8.3 are fulfilled.

Requirement 8.1

The payment application must be able to be implemented into a secure network environment. Application must not interfere with use of devices, applications, or configurations required for PCI DSS compliance (for example, payment application cannot interfere with anti-virus protection, firewall configurations, or any other device, application, or configuration required for PCI DSS compliance).

This requirement is met by IBM Safer Payments.

Note: For performance reasons regular “on demand” anti-virus protection scans are preferred over “on access” scans for IBM Safer Payments “ddc” directories.

Requirement 8.2

The payment application must only use or require use of necessary and secure services, protocols, daemons, components, and dependent software and hardware, including those provided by third parties, for any functionality of the payment application. For example, if NetBIOS, file-sharing,

Telnet, FTP, etc., are required by the application, they are secured via SSH, S-FTP, TLSv1.2, IPSec, or other technology.

The following services, protocols, daemons, components, and dependent software and hardware are required and used by IBM Safer Payments:

- Computer hardware that supports the operating system.
- Operating system. Refer to “System requirements ” on page 5 for the list of operating systems that are supported with this IBM Safer Payments release in a PCI DSS compliant environment.
- IP/http networking secured by TLSv1.2
- syslog
- SMTP (optional) secured by TLSv1.2
- LDAP (optional) secured by TLSv1.2
- The following libraries are linked statically:
  - openssl-1.1.1n
  - zlib-1.2.11
    - minizip
  - boost_1_70_0
  - bzip2-1.0.8
  - snmp++ 2.6
  - minizip 1.1
  - opencv-4.1.1
  - Itx
  - rapidjson
  - librdkafka-1.3.0
- The list of dynamically linked libraries can be obtained by running the following command from a shell:

```
ldd /usr/bin/iris
```

- In case you want to use the ODBC interface in case actions or notifications IBM Safer Payments links the following plug-in dynamically:

```
Iris_sql_util.so
```

- The plug-in itself might also link other libraries. The list of dynamically linked libraries for the plug-in can be obtained by running the following command from shell:

```
ldd iris_sql_util.so
```

- In addition, IBM Safer Payments can link IBM MQ client libraries (libmqic.so) and a custom parser implementation (sp_custom_parser.so) at run time, if the shared libraries are deployed on the shared library search path of IBM Safer Payments. Both are not required to run IBM Safer Payments. They are developed and released by independent development teams. Therefore, they are not covered by the PA-DSS certification of IBM Safer Payments.

To comply with this requirement, certain IP communication must be encrypted, and several operating system configuration settings must be made. This is addressed in detail in sections “Installation overview ” on page 5 and Chapter 4, “Operational configuration ,” on page 29.

To comply with this requirement, you must not use SSD type hard disks, as secure deletion cannot be assured with this technology.

Requirement 8.3

The payment application must not require use of services or protocols that preclude the use of or interfere with normal operation of multi-factor authentication technologies for securing remote access to the payment application that originates from outside the customer environment.

IBM Safer Payments does not interfere with such technologies.

Requirement 9: Cardholder data must never be stored on a server connected to the internet

Details about how requirement 9 and subrequirements 9.1 are fulfilled.

Requirement 9.1

The payment application must be developed such that any web server and any cardholder data storage component (for example, a database server) are not required to be on the same server, nor is the data storage component required to be on the same network zone (such as a DMZ) with the web server.

To meet this requirement, you must not store cardholder data on a server that is connected to the internet. For more information, see "Configuring cardholder data storage locations" on page 24.

Systems that are used by external Python programs are out of scope of IBM Safer Payments. External Python programs could be used to store data on external systems. You must ensure that no Cardholder Data is stored on servers that are accessible from the internet.

Requirement 10: Facilitate secure remote access to payment application

Details about how requirement 10 and subrequirements 10.1 and 10.2 are fulfilled.

Requirement 10.1

Multi-factor authentication must be used for all remote access to the payment application that originates from outside the customer environment.

If the organization of the licensee enables remote access, this must be secured in accordance with requirement 10 by using multi-factor authentication.

IBM Safer Payments itself implements multi-factor authentication through the distribution of personalized client certificates, which must be imported with the browser that is being used. See "Creating certificates with OpenSSL" on page 21 for details.

If your installation requires a multi-factor authentication, you can either use multi-factor authentication as provided by IBM Safer Payments or use a third party multi-factor solution. For example, a remote VPN access.

Requirement 10.2

Any remote access into the payment application must be performed securely.

10.2.1 If payment application updates are delivered via remote access into customers' systems, software vendors must tell customers to turn on remote-access technologies only when needed for downloads from vendor, and to turn off immediately after download completes. Alternatively, if delivered via virtual private network (VPN) or other high-speed connection, software vendors must advise customers to properly configure a firewall or a personal firewall product to secure "always-on" connections.

This requirement applies only if the licensee accepts updates to be delivered using remote access. To be PCI DSS compliant, such remote access must be turned on only temporarily, and when needed. It

must be turned off immediately after use. Notwithstanding, PCI DSS Requirement 1 must always be met.

Use a securely configured firewall or a personal firewall product, if the computer is connected over VPN or other high-speed connection, to secure these “always-on” connections, per PCI DSS Requirement 1.

10.2.2 If vendors or integrators/resellers can access customers’ payment applications remotely, a unique authentication credential (such as a password/phrase) must be used for each customer.
Currently, remote access to a customer's environment is not allowed for vendors or integrators/resellers.

10.2.3 Remote access to customers’ payment applications by vendors, integrators/resellers, or customers must be implemented securely.
For any remote access, remote access security features must be used. These include but are not limited to:

- Change default settings in the remote access software. For example, change default passwords and use unique passwords for each customer.
- Allow connections only from specific (known) IP/MAC addresses.
- Use strong authentication and complex passwords for login.
- Enable encrypted data transmission according to PA-DSS Requirement 12.1.
- Enable account lockout after a certain number of failed login attempts.
- Configure the system so a remote user must establish a Virtual Private Network (VPN) connection over a firewall before access is allowed.
- Enable the logging function.
- Restrict access to customer passwords to authorized reseller/integrator personnel.
- Establish customer passwords according to PA-DSS Requirements 3.1.1 through 3.1.11.

For more information, see “Requirement 3: Provide secure authentication features” on page 72.

Requirement 11: Encrypt sensitive traffic over public networks

Details about how requirement 11 and subrequirements 11.1 and 11.2 are fulfilled.

Requirement 11.1

If the payment application sends, or facilitates sending, cardholder data over public networks, the payment application must support use of strong cryptography and security protocols (for example, TLS, IPSEC, SSH) to safeguard sensitive cardholder data during transmission over open, public networks.

To comply with this requirement, all IP communication must be protected by strong cryptography and security protocols. For example, by only using TLSv1.2 or higher, SSH-2, IPSEC, all with at least 128-bit encryption. This can be achieved by using the internal SSL encryption function of IBM Safer Payments and using multi-factor authentication. For more information, see “Configuring SSL encryption” on page 17.

Requirement 11.2

If the payment application facilitates sending of PANs by end user messaging technologies (for example, email, instant messaging, chat), the payment application must provide a solution that renders the PAN unreadable or implements strong cryptography, or specify use of strong cryptography to encrypt the PANs.

IBM Safer Payments allows to send PANs by end user messaging technologies. For such “notifications” and “case actions”, a configuration option ensures that only masked PANs are sent out, according to PA-DSS Requirement 2.2. In consequence, requirement 11.2 is met.

If you use PAN in notifications or case actions, you must activate encryption and enable masked PAN. For more information about how to turn masking of PANs on, see Chapter 5, “Key management configuration and procedures,” on page 37.

Requirement 12: Secure all non-console administrative access

Details about how requirement 12 and subrequirements 12.1 and 12.2 are fulfilled.

Requirement 12.1

If the payment application facilitates non-console administrative access, encrypt all such access with strong cryptography using technologies such as SSH, VPN, or TLS, for web-based management and other non-console administrative access.

All administrative access to IBM Safer Payments is over the IBM Safer Payments API and natively uses the http or https protocol. To comply with this requirement, all API communication must use the https protocol only, providing strong encryption. This can be achieved with the internal SSL encryption function of IBM Safer Payments. For more information, see “Configuring SSL encryption” on page 17.

Requirement 12.1.1 Instruct customers to encrypt all non-console administrative access with strong cryptography, using technologies such as SSH, VPN, or TLSv1.2 for web-based management and other non-console administrative access.

This requirement aligns with PCI DSS requirement 2.3. To be compliant, you are required to use strong cryptography for non-console administrative access. Use technologies such as SSH2, VPN, or TLSv1.2 (use at least 128-bit encryption strength). Do not use telnet or rlogin for remote access to Safer Payments servers.

Requirement 12.2

Use multi-factor authentication for all personnel with non-console administrative access.

You must implement processes to make sure that for all non-console administrative access multi-factor authentication is used.

Multi-factor authentication consists of at least two of the following:

- Something you have, such as a token device or a smart card.
- Something you are, such as a biometric identification.
- Something you know, such as a password or a passphrase.

To achieve multi-factor authentication, you can either use a third-party solution or the built-in IBM Safer Payments solution, which is described in “Creating certificates with OpenSSL” on page 21.

Requirement 13: Maintain a PA-DSS Implementation Guide for customers, resellers, and integrators

Details about how requirement 13 and subrequirements 13.1 are fulfilled.

Requirement 13.1

Develop, maintain, and disseminate a PA-DSS Implementation Guide for customers, resellers, and integrators that accomplishes the following:

13.1.1 Provides relevant information specific to the application for customers, resellers, and integrators to use.

This document is the IBM Safer Payments PA-DSS Implementation Guide.

13.1.2 Addresses all requirements in this document wherever the PA-DSS Implementation Guide is referenced.

Appendix A, “PA-DSS requirements,” on page 67 addresses all requirements.

13.1.3 Includes a review at least annually and upon changes to the application or to the PA-DSS requirements, and is updated as needed to keep the documentation current with all changes affecting the application, as well as to the requirements in this document.

The IBM Safer Payments PA-DSS Implementation Guide is reviewed/updated at least annually, and whenever a relevant software feature is changed or introduced to the software. It is reviewed/updated at least on an annual basis with respect to PA-DSS requirements changes.

Requirement 14: Assign PA-DSS responsibilities for personnel, and maintain training programs for personnel, customers, resellers, and integrators

Details about how requirement 14 and subrequirements 14.1, 14.2, and 14.3 are fulfilled.

Requirement 14.1

Provide training in information security and PA-DSS for vendor personnel with PA-DSS responsibility at least annually.

Training is provided at least annually for personnel with PA-DSS responsibilities.

Requirement 14.2

Assign roles and responsibilities to vendor personnel including the following:

- Overall accountability for meeting all the requirements in PA-DSS.
- Keeping up-to-date within any changes in the PCI SSC PA-DSS Program Guide.
- Ensuring secure coding practices are followed.
- Ensuring integrators/resellers receive training and supporting materials.
- Ensuring all vendor personnel with PA-DSS responsibilities, including developers, receive training.

Roles for all responsibilities are assigned to IBM Safer Payments team members. To obtain the list of all responsible persons, request it from your account manager.

Requirement 14.3

Develop and implement training and communication programs to ensure payment application resellers and integrators know how to implement the payment application and related systems and networks according to the PA-DSS Implementation Guide and in a PCI DSS compliant manner.

All staff who is involved in IBM Safer Payments implementation and support is educated regarding PCI DSS requirements and is supplied with training materials. The same applies to staff of our resellers and integrators, if they support IBM Safer Payments installations in scope of PCI DSS.

14.3.1 Review training materials at least annually and upon changes to the application or to PA-DSS requirements. Update the training materials as needed to keep the documentation current with new payment application versions and changes to PA-DSS requirements.

Training materials are reviewed/updated at least annually, and whenever a new software version is released.

To obtain the most current set of the training materials, request them from your account manager.

Sample key custodian form

Name of key custodian: _____

Personnel Number: _____

Position: _____

I hereby confirm and agree that

- I have read and understood the policies and procedures that are associated with key management and I will comply with them.
- I understand that non-compliance with the key management procedures can lead to disciplinary action including termination of employment and prosecution.
- I am aware that cryptographic keys and related information are sensitive information. I will treat them with due care.
- I will never divulge any key management or related security systems, passwords, processes, keys, security hardware, or secrets to any unauthorized party.
- I understand and accept my responsibilities as a key custodian.

Date: _____

Key custodian signature: _____

Supervisor signature: _____

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Accessibility

Accessibility features help a user who has a physical disability such as restricted mobility or limited vision to use software products successfully. IBM Safer Payments supports the following accessibility features:

- Assistive technologies such as screen readers and screen magnifier software.
- Keyboard operation for specific or equivalent features.
- Customization of display attributes such as color, contrast, and font size.

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