celonis

INSTALLATION GUIDE

Version 1.7

Corresponding Software Version

SAP Process Mining by Celonis 4.3.1

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REVISION HISTORY

VERSION NUMBER	VERSION DATE	SUMMARY OF REVISIONS MADE
1.4	MAR 22, 2017	Application Version 4.2
1.5	AUG 10, 2017	Updated version for application version 4.2-SP1
1.6	FEB 23, 2018	Updated version for application version 4.3
1.7	OCT 10, 2018	Updated version for application version 4.3-SP1

INTRODUCTION

ABOUT THIS GUIDE

SAP Process Mining by Celonis is a powerful software for retrieving, visualizing and analyzing real as-is business processes from transactional data stored by the SAP ERP systems. It provides users with the possibility to create and share comprehensive process analyses giving them full transparency about the business processes at hand.

TARGET AUDIENCE

This guide covers all relevant technical information about correctly installing SAP Process Mining by Celonis and is meant to be consulted by the following target audiences:

- System Administrators
- Support Personnel
- Technical Staff

GENERAL SOFTWARE UPDATE INFORMATION

For the latest version of the update guide and installation files, please always check my.celonis.com

LIST OF ABBREVIATIONS

ABBREVIATION	EXPLANATION
AFL	Application Function Library
CA	Certification Authority
CIC	SAP Customer Interaction Center
CIFS	Common Internet File System
CPML	Celonis Process Mining Library
ERP	Enterprise Resource Planning
HSQLDB	Hyper SQL Database
HTTP	Hypertext Transfer Protocol
ID	Identifier
JDBC	Java Database Connectivity
LTS	Long Term Support
NFS	Network File System
OS	Operating System
PDF	Portable Document Format
PNG	Portable Network Graphics
RHEL	Red Hat Enterprise Linux
SID	System Identifier
SLES	SUSE Linux Enterprise Server
SP	Service Pack
SPS	SAP HANA Support Package Stack
SSHFS	SSH File System

SSL	Secure Sockets Layer
SQL	Structured Query Language
URL	Uniform Resource Locator
ZIP	Zipper (Archive File Format)

SAP PROCESS MINING BY CELONIS

OVERVIEW

SAP Process Mining by Celonis consists of two components: The core SAP Process Mining by Celonis web application and the SAP HANA AFL plugin for SAP Process Mining by Celonis (called CPML). Please refer to below diagram Figure 1 for further information.
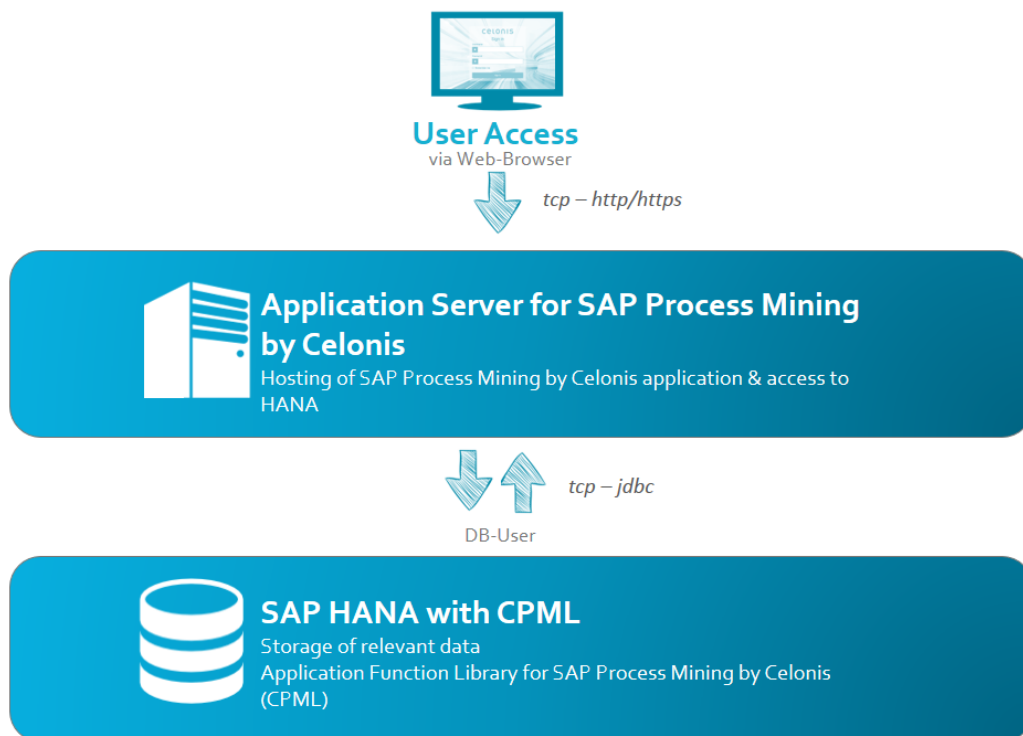

Figure 1: Architecture overview of SAP Process Mining by Celonis

For both components, an installation package is available. The installation package for SAP Process Mining by Celonis is available as

- Windows installer ("sappm-setup.exe") or
- a Linux executable run file ("sappm-<distribution>.run").

The installation package for CPML is delivered as a "zip-package" ("cpml_plugin_<platform>.tar.gz") which contains an executable "hdbinst" file for Linux. It is available for

- HANA on Intel architecture
- HANA on PowerPC architecture

Setup of the HANA database itself is out of scope of this document or the application itself. Please refer to the SAP HANA documentation.

PREREQUISITES

- **SAP HANA** on Intel or PowerPC architecture
  - o Minimum supported revision: HANA 1.0 SP 112
  - o Recommended revision: HANA 2.0
  - o Recommended architecture: Intel
  - o Recommended deployment: HANA scale-up (single-host system)
- **Application Server** on Intel architecture with one of the following operating systems:
  - o Windows Server 2008 R2 and higher
    - ▪ Recommended version: 2012 R2
  - o SUSE Linux Enterprise Server 12 and higher
    - ▪ Recommended version: 12 SP1
  - o RedHat Enterprise Linux 7 and higher
    - ▪ Recommended version: 7.2
  - o Ubuntu Server 14.04 LTS or 16.04 LTS
    - ▪ Recommended version: 16.04 LTS
- Possibility to transfer the installation files to both servers (HANA, Celonis Application Server)
- Access to installation files on SAP Marketplace (S-User and authorization required)
- Text editor (syntax highlighting support recommended (e.g. Notepad++ on Windows))
- Root/admin access on both servers

CPML

INSTALLATION ON SAP HANA SYSTEM

The installation of CPML is based on the installation routines for AFL libraries. Please note that during this process, the SAP HANA database will be **automatically restarted**. It is also possible to commence the installation while HANA is already shut down; the installer will then automatically start the HANA database after the installation.

- Transfer the installation CPML bundle to the SAP HANA server
- Extract the installation bundle
- Execute "hdbinst" with root privileges
- Follow the instructions of the installer
- Please note, that after entering the SAP HANA System ID, the installation routine will automatically stop the HANA database, install the plugin files and start the HANA database again.
- If the installer complains, that files are locked by the "indexserver" or the "scriptserver", you can manually restart the SAP HANA database before the plugin installation to release the locks.

CONFIGURE THE DATABASE

First verify if the plugin was successfully installed by checking if "CELONIS_AFL_SDK_CPML" is listed as installed plugin in the system overview of the "HANA Administration Overview" in HANA Studio as shown in Figure 2.
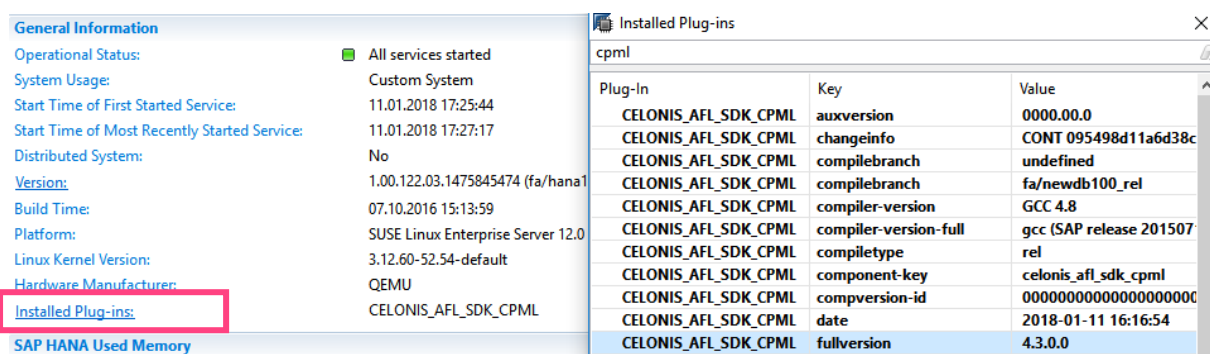

Figure 2: CPML Plugin Version

Then the scriptserver needs to be activated, in case it is not running yet. The procedure usually differs for HANA 1.0 and HANA 2.0; more specifically depending on whether the SAP HANA installation is a single-tenant or a multi-tenant installation. More information can also be found in SAP Note 1650957.

Activating the scriptserver on a SAP HANA single-tenant installation

In the "HANA Administration Overview" in HANA Studio, go to the tab "Configuration", expand "daemon.ini" and then expand "scriptserver". In case there is a "0" in the field "instances", add a "1" as shown in Figure 3.

Figure 3: Verification of scriptserver instance

Activating the scriptserver on a SAP HANA multi-tenant installation

In a SAP HANA multi-tenant installation, each tenant has its own scriptserver. Connect to the SYSTEMDB and open a SQL-console. Execute the following statement:

ALTER DATABASE <TENANT_NAME> ADD 'scriptserver'

For <TENANT_NAME> use the name of the tenant database that SAP Process Mining by Celonis should connect to. In case there is only a single tenant (global.ini -> multidb -> singletenant = yes), use the SID of the HANA installation for <TENANT_NAME>

SETUP THE USERS

We need to grant every user which is used by SAP Process Mining by Celonis to log on to the SAP HANA database the following privileges:

- "AFL__SYS_AFL_CPML_AREA_EXECUTE"
- "AFLPM_CREATOR_ERASER_EXECUTE"

To grant the rights to a user you can execute:

- "GRANT AFL__SYS_AFL_CPML_AREA_EXECUTE TO **<USER>;**"
- "GRANT AFLPM_CREATOR_ERASER_EXECUTE TO **<USER>;**"

To check if privileges for CPML are correctly set up, you can execute the following statement as **<USER>**:

- "CALL _SYS_AFL.CPML_AREA_ECHO_STRING_PROC ('Test was successful',?);"

If everything is set up correctly, the call returns 'Test was successful'. Additionally, the users minimally need the following privileges on the SAP HANA schema, where the tables and views reside which are read by the SAP Process Mining by Celonis application:

- CREATE ANY
- DROP
- EXECUTE
- SELECT
- INSERT

For further information on the schema and user layout, please refer to the Celonis Best Practices for HANA schema and user setup.

UNINSTALLATION

- On the SAP HANA server, go to the SAP HANA installation directory: "/hana/shared/<SID>"
- From there go to:
    - "/exe/linuxx86_64/plugins"
- Delete all "CELONIS_AFL_SDK_CPML_*" directories
    - If files are locked by an "indexserver" or "scriptserver" process, you can manually restart the SAP HANA database to release the locks
- Delete the symlink "CELONIS_AFL_SDK_CPML" from the folder:
    - "/usr/sap/<SID>/HDB00/exe/plugins"
- Restart the database

SAP PROCESS MINING BY CELONIS – DEPLOYMENT

DEPLOYMENT OPTIONS

- Single-server deployment supporting scale-up architecture
    - Consists of one Celonis Application Server hosting the central application, managing the system, hosting the Celonis Configuration Store and running the process mining engine.
- Multi-server deployment supporting scale-out architecture
    - Consists of one Celonis Application Server (master) hosting the central application, managing the system and hosting the Celonis Configuration Store.
    - Consists of one to several Compute Nodes running the process mining engine. The Master Application Server can also host the process mining engine for selected data models.
    - Consists of one shared file system (e.g. NFS, SSHFS, CIFS)

A typical scale-out architecture consists of one to several Compute Node per cluster, where in theory there is no limit for the number of Computer Nodes. For more information regarding configuration of the installation, especially with regards to deployment, please consult the Celonis Operation Guide.

Celonis recommends the single-server deployment for all use cases.

CELONIS CONFIGURATION STORE

The Celonis Configuration Store is the central storage of the application metadata, e.g. system settings, users, groups, definitions of analyses, and data models and contains all configuration done via the web frontend. The actual data to be analyzed resides in HANA.

For medium to large installations as well as any productive installations, Celonis recommends to setup the Celonis Configuration Store using a separate database system. For more information, please consult the Celonis Configuration Store Setup Guide.

SAP PROCESS MINING BY CELONIS – WINDOWS INSTALLATION

INSTALLATION PROCEDURE

Execute the "sappm–setup.exe" installer and enter

- The path where the software is to be installed
- The port under which the web application will be reachable (default: "9000")
  Set a password for the initial system administration user "sysadmin" (to use the default password "$admin!" just press enter).
  Please note that you must change the password on your first log in

After successful installation, start the "SAP Process Mining by Celonis" service from your Windows service manager.

SAP PROCESS MINING BY CELONIS – LINUX INSTALLATION

PREREQUISITES

Before you start the installation, please ensure you meet the following requirements:
- The installation file "sappm_<distribution>.run" is located on your target system (e.g. "/tmp/celonis/"). There are separate installers for the different supported Linux distributions, make sure to pick the one matching your distribution and major version.
- You have root privileges on the target system.
- You have created a dedicated "system user" to run the application on the target system (optional).
- You have installed the OS package "graphviz" (including its automatic dependencies) provided by your distribution or verified its existence. The installer will fail if this package is not installed. It is strongly recommended to install it from your distribution using a package manager:
  - On SLES: Execute "sudo zypper install graphviz"
- Additionally, to use the PDF and PNG exporting functionalities, you need to install the following OS packages (including their automatic dependencies) listed in Table 1. Please note, that the PDF and PNG exporting functionalities are only available on **newer** Linux distributions (SLES 12, RHEL 7, Ubuntu 16) and are optional to use the software.

SLES	RHEL	Ubuntu
• xauth • xorg-x11-server • libXss1 • gconf2 • mozilla-nss	• xorg-x11-auth.x86_64 • xorg-x11-server-Xvfb • libXtst • GConf2 • libXScrnSaver • libasound.so.2	• xauth • xvfb • libgtk2.0-0 • libxtst6 • libxss1 • libgconf-2-4 • libnss3-1d • libasound2

Table 1: OS packages for PDF and PNG exporting functionalities

INSTALLATION PROCEDURE

1. Log in on the target system.
2. Navigate to the folder where your installation files are located (e.g. "/tmp/celonis/")
3. Start the installation script with the following command:
   o As root: "bash sappm.run"
   o As non-root: "sudo bash sappm.run"

Please note, on SLES 11/RHEL 6 you might get the following information as shown in Figure 4.

Figure 4: Information about old version of "glibc" on SLES 11

4. Please enter the target directory where you wish to install SAP Process Mining by Celonis and press enter (to use the default path "/opt/celonis/celonis4/" just press enter) as shown in Figure 5.

Figure 5: Specify target installation directory of SAP Process Mining by Celonis.

5. Please enter the system user which runs the Celonis Server (to use root just press enter) as shown in Figure 6.

Figure 6: Specify system user that starts the SAP Process Mining by Celonis application.

6. Specify the port on which you will access the Celonis web frontend (to use the default port "9000" just press enter) as shown in Figure 7.

Figure 7: Specify port for Celonis web frontend.

7. Specify the initial password for the user "sysadmin". This user will be used to log in on the web frontend as shown in Figure 8. Please note, you will have to change the password on your first log in (to use the default password "$admin!", just press enter).

```
Please specify the initial password for the user sysadmin [$admin!]
```

Figure 8: Specify initial Celonis web frontend password.

8. The installation is now complete. Navigate to your install directory (default "/opt/celonis/celonis4/") and start the service with the following command:
   o As root: "sh start.sh"
   o As non-root: "sudo sh start.sh"

CELONIS WEB FRONTEND

You can access the web frontend with the following URL: "http://<hostname of your server>:<port>" (e.g. http://celonispm:9000)
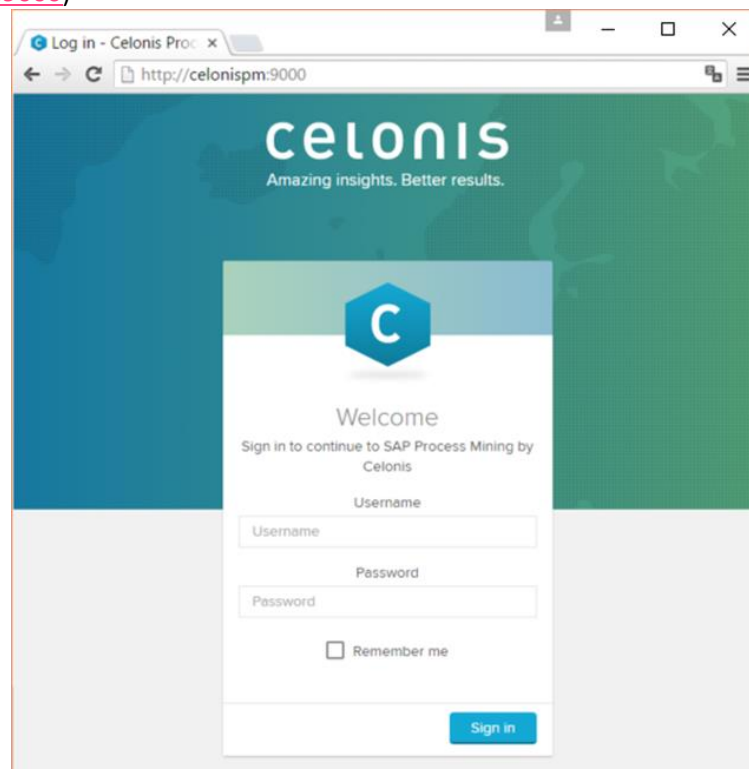

Figure 9: Celonis web frontend

To log in as seen in Figure 9, you can use the user "sysadmin" and the password you provided. After the log in, you must activate the license. How to do that is described in the next chapter.

For more information regarding configuration of the installation, especially with regards to security, please consult the Celonis Operation Guide.

CONFIGURE SAP PROCESS MINING BY CELONIS

LICENSE ACTIVATION

Sign up for a license for SAP Process Mining by Celonis on

- https://my.celonis.de/sappm_signup

After successful sign up and license approval, you need to activate your license with the "Server ID" displayed in the SAP Process Mining by Celonis frontend.

CPML WRAPPER FUNCTIONS

CPML needs wrapper functions to be able to read data from HANA into the CPML plugin. The wrapper functions are written in SQL-script and are data model specific. SAP Process Mining by Celonis generates the functions dynamically for you. You must trigger the generation after the creation of a data model and each time you change the data model. For each table of the data model a set of wrapper functions is generated and stored in the schema of the table. The wrapper functions can be viewed in the HANA Studio (Schema – Procedures).

PARALLEL LOADING AND MEMORY MANAGEMENT

You can configure the number of parallel tables to be loaded on HANA as well as the number of columns, that are staged in parallel via the properties "cpml.table.max.parallel" and "cpml.column.max.parallel" in the "config-custom.properties" file.

- **Decrease** these values in case you run into memory issues on HANA.
- **Increase** the values to try to decrease the load time on HANA while being aware of the memory implications.

IMPLEMENTATION ON MULTI-TENANT INSTALLATIONS OF SAP HANA

When implementing process mining projects on a multi-tenant installation of SAP HANA, you should pay special attention to the design of your event log scripts. Currently, monitoring views (e.g. "M_TABLES"), that might be used under the hood by e.g. the "currency conversion", **cannot** be queried cross-tenant.

PDF/PNG EXPORT

In case the PDF/PNG exporting does not work, please check the following steps:

- PDF and PNG exporting functionalities are only available on newer Linux distributions (SLES 12, RHEL 7, Ubuntu 16) and on Windows. Please note, that when upgrading the OS (e.g. from SLES 11 to SLES 12), the software must be reinstalled with the appropriate installer for the new OS.
- Make sure you have installed all previously listed OS packages on Linux. Check the log files of the application (both stderr and stdout) for possible errors or further missing libraries.
- In case you have SSL activated, the user running the SAP Process Mining service/process needs to trust the certificate. For certificates signed by an official CA or your company's CA, this should already be the case. In case you are using a self-signed certificate, make sure to add this certificate to the trusted certificates of the service user.
- You have correctly set the parameter "server.url" to the URL, at which the application is accessible from within the network (e.g. https://celonis.mycompany.com) in the "config-custom.properties" file. In case the local access for the process generating the PDF on the server needs to be different (e.g. because you unload SSL on a frontend server that also handles a third-party authentication), you can set the parameter "server.external" to the address, where the instance is reachable locally.
- The HTTP header "X-Frame-Options" is by default set to "DENY" for security reasons. If you see error messages in the browser console regarding this header while downloading a PDF, you can set the property "http.framepolicy.xframeoptions" in the "config-custom.properties" file to "SAMEORIGIN" while considering the security implications.
- In case the PDF only contains the structure of the analysis and charts, but no data (i.e. only lines), your system might be lacking the necessary fonts or font libraries. In this case, you can set the property "externaltool.legacy=true" in the "config-custom.properties" file.
- The user running Celonis needs to have a valid and writable "home" directory for storing temporary files.
- As a last resort, you can manually adjust the script and executable used for exporting. Check the log files generated during startup of the application for the current configuration.
- One example of an adjustment would be a manual override of the user's "home" directory (the "home" directory of the user running the Celonis process needs to be writable by this user. If the "home" directory points to a non-writable directory (e.g. "/root"), the exporting will fail).

SAP HANA 2.0

Please consider the following in case you want to connect your SAP Process Mining by Celonis installation with SAP HANA 2.0: Since each SAP HANA Support Stack brings its own version of the SAP HANA JDBC driver, you need to replace the default SAP HANA JDBC driver shipped with SAP Process Mining by Celonis (currently 1.0 SPS 12) with the suitable driver for HANA 2.0. To do so,

- Get the suitable JDBC driver from your HANA Client or HANA studio installation (you can download those from the SAP Marketplace).
- You will need to search for a file called "ngdbc.jar" and copy this file.
    - To verify its version, you can run "java -jar ngdbc.jar –version".
    - It should display "package package com.sap.db.jdbc, Java Platform API Specification, version 1.6, SAP HANA JDBC Driver, SAP SE, 2.0.13-dc4d9b4446a4c5cef1666c4a8a8b8383300a274e", wherein 2.0 shows you, that this is a driver for HANA 2.0.
- Shut down your SAP Process Mining by Celonis installation
- Go to "<installDir>\appdata\appfiles\WEB-INF\lib" (on Windows) or "<installDir>\root\appfiles\WEB-INF\lib" (on Linux)
- Rename the existing file "ngdbc-1.120.16.jar" to "ngdbc.jar.orig".
- Paste the newly renamed "ngdbc.jar" file into the same folder.
- Start the SAP Process Mining by Celonis application.

SUPPORT DESK MANAGEMENT

Support for SAP Process Mining by Celonis is delivered jointly by SAP and Celonis. 1st and 2nd level support services for end users are provided by SAP. 3rd level support services are provided by Celonis. In case 3rd level support is necessary, incidents are automatically forwarded to Celonis. Support is available 24x7. To contact support, you can create an incident in component "XX-PART-CEL". Please include at least the following items in your incident description:

- The browser and version you are using (e.g. Internet Explorer 11)
- Installation which you are trying to access (in case of multi system landscape)
- URL used to access the system (sometimes, there can be more than one URL to reach a single installation. This will also help to identify the installation you are trying to access)
- User name used to log in
- Screenshot of the error message/situation
- Stack trace of the error message (if any) – only accessible on the server log files.

Before contacting support, make sure you have had a look in the Celonis manual (accessible via "Help" in the Celonis application) and related SAP notes for component "XX-PART-CEL". In case you need to escalate your incident, you can send an email to and/or contact SAP CIC.

REFERENCES

- Celonis Operation Guide
- Celonis Configuration Store Migration Guide
- Celonis Best Practices for HANA schema and user setup
- SAP Customer Interaction Center