

Libelle **SystemCopy**

Automated System Refreshes for SAP Systems AWS Deployment and Operation Guide



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Table of Contents

1.	Introduction	5
1.1.	Summary.....	5
1.2.	LSC Use Cases	5
2.	Typical Customer Deployment on AWS	6
3.	LSC Deployment Timeline	7
3.1.	Deployment Tasks.....	7
3.2.	Typical Deployment Timeline.....	7
4.	Installation Requirements	8
4.1.	Technical Prerequisites and Requirements for Deployment	8
4.2.	Recommended Know-How for the LSC Administrator.....	8
4.3.	AWS Environment Configuration	9
5.	AWS Architecture.....	9
6.	Security Considerations	11
6.1.	Identity and Access Management.....	11
6.2.	No-Root and Least-Privilege-Policy.....	11
6.3.	Public Resources	11
6.4.	User Roles and Policies	11
6.5.	Customer Sensitive Data.....	12
6.6.	Data Encryption Configuration	12
7.	License and Cost Considerations.....	12
7.1.	Traditional License Model.....	12
7.2.	Pay-Per-Use and AWS Market Place	12
8.	Sizing Considerations	13
8.1.	EC2 Instance Sizing	13
8.2.	EBS and S3 Volume Sizing	13
8.3.	Other Requirements	13
9.	Deployment on AWS.....	13
9.1.	Standard AWS Deployment Workflow.....	13
9.2.	Maximize Uptime and Availability of LSC on AWS	14
9.3.	Deployment Configurations.....	14
10.	Testing, Troubleshooting, and Health Checks.....	14

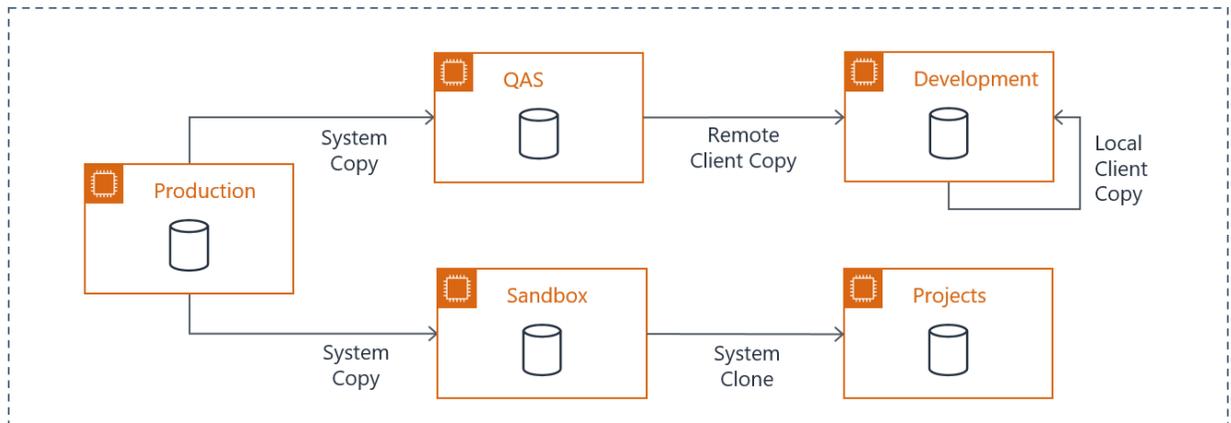
11. Backup and Recovery	17
12. Routine Maintenance	17
12.1. Rotating Keys	17
12.2. Patching and Upgrades	17
13. License Management	19
14. AWS Service Limits	19
15. System Copy Operation on AWS	19
15.1. Overview	19
15.2. LSC Server Agent	19
15.3. Validate Operation	21
15.4. LSC Directory Structure	22
15.5. LSC Graphical User Interface (GUI)	22
15.6. Operate LSC on AWS	31
15.7. Important things to check before starting system refresh	33
16. Support	35
16.1. Provisioning of Software Updates, Upgrades (Standard Support)	35
16.2. Access to free License Transfers	35
16.3. Hotline with Online and Email Support	35
16.4. Guaranteed Reaction Times	36
16.5. Incident Management	36
16.6. Escalation Management (Custom Enterprise plan only)	36
16.7. Personalized System Support (Custom Enterprise plan only)	36
16.8. Itemized Support Coverage	36
17. Disclaimer	37

1. Introduction

1.1. Summary

This document outlines how to plan the implementation, install, and operate Libelle's **SystemCopy** (LSC) on AWS.

1.2. LSC Use Cases

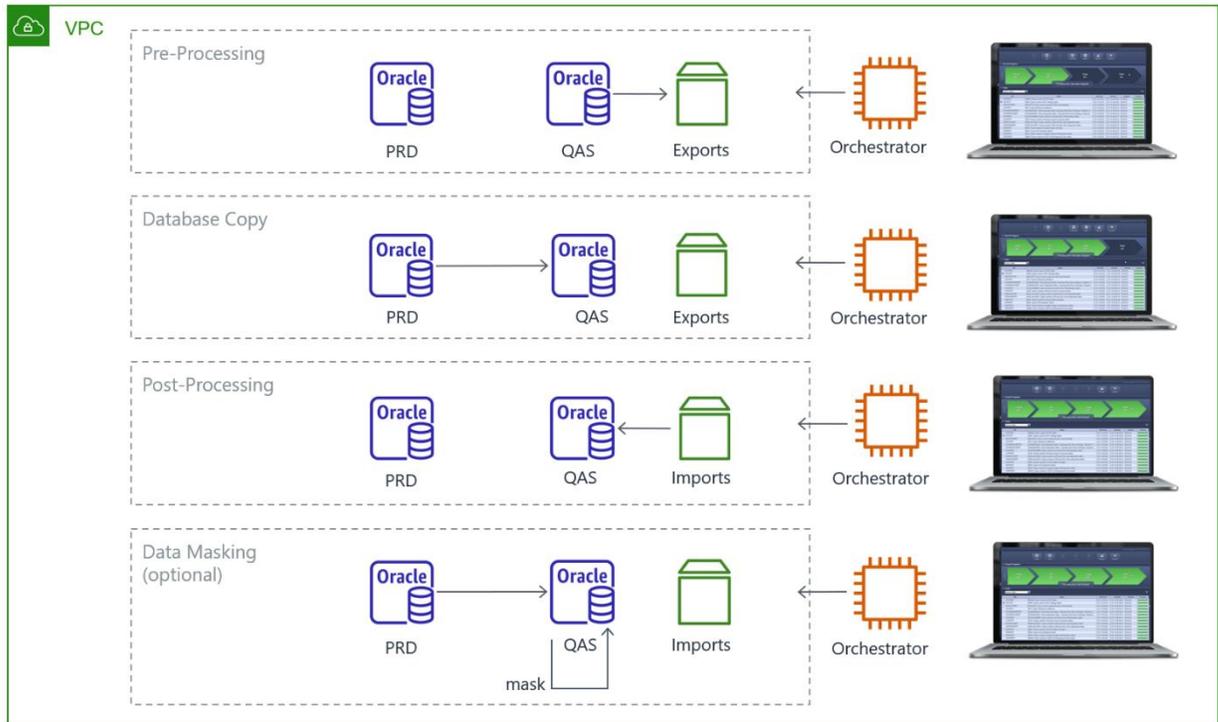


System refreshes are part of the SAP application lifecycle management process of developing, testing, and maintaining functionality in SAP landscapes. A system refresh is the process of refreshing production support systems with current production data. Traditional production support systems typically include a minimum of two of the following:

- Development Systems (DEV)
- Sandbox Systems (SBX)
- Quality Assurance Systems (QAS)
- Any additional, non-production systems e.g. for projects or an N+1 landscape.

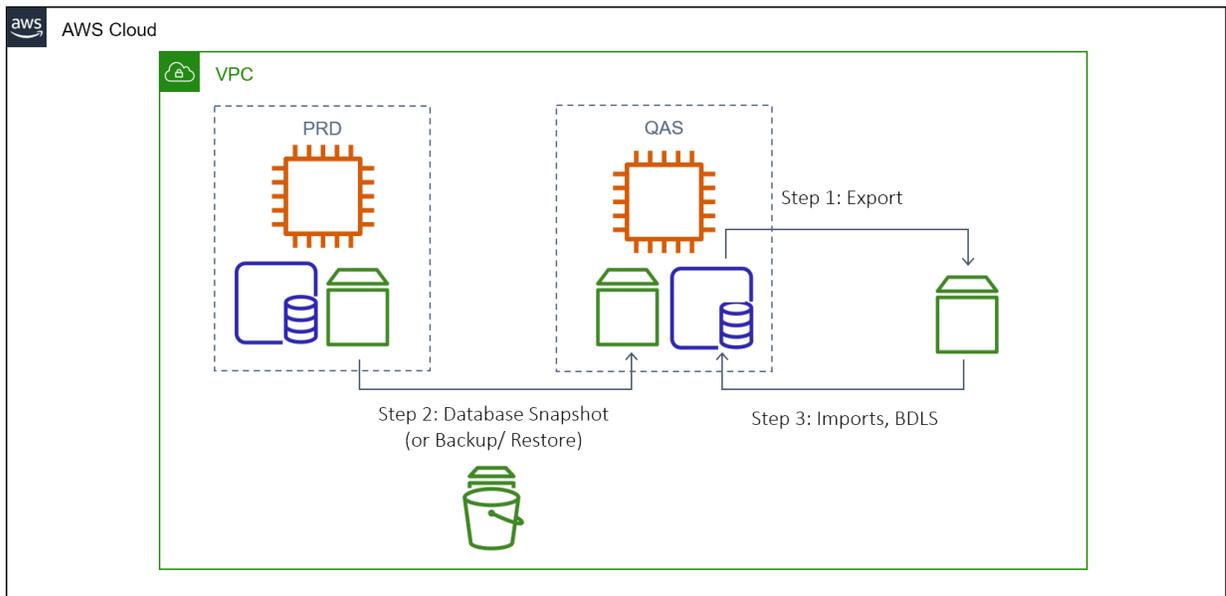
Libelle **SystemCopy** (LSC) automates and accelerates homogeneous system copies for SAP systems. System Refreshes are required to provide production support systems (e.g. QAS or DEV) with current production data. Such refreshes often take days or weeks to complete with multiple administrators working non-stop to deliver. LSC comes with nearly 500 pre-configured tasks covering all steps required for a typical refresh. A powerful, yet simple and easy-to-use orchestration and automation engine drives the process of building, configuring, and cascading templates across your SAP landscape. The execution of refreshes and exception handling is managed through a highly functional and easy-to-use GUI. LSC supports SAP System Refreshes for NetWeaver-based systems including S/4 HANA, ECC, CRM, SCM, BI, GRC, and most all SAP implementations. LSC supports all major databases including SAP HANA, SAP ASE, SAP MaxDB, MS SQL Server, DB2, and Oracle on AWS Windows and AWS Linux platforms. Additional scenarios covered are Local and Remote Client Copies

The refresh is completed in three phases as outlined in Figure 2 below. Additionally, there can be an additional Data Masking (Data Anonymization) Phase.



2. Typical Customer Deployment on AWS

LSC is a software solution that installs on an EC2 instance inside a customer VPC with access to SAP production support systems (QAS/ SAP Quality Assurance System, DEV/ SAP Development System, SBX/ SAP Sandbox System, or similar non-production systems).



3. LSC Deployment Timeline

3.1. Deployment Tasks

On a high level, the following tasks need to be executed as part of deployment

- Installation of LSC Master Server.
- Installation of LSC Worker Agents for all targets
- Configure workflow in based on LSC Standard Repository
- Complete the first refresh and validate expected results
- Participate in Training sessions for team(s)
- Setup hyper-care with Libelle Support for up to 3 months after go-live

3.2. Typical Deployment Timeline

The following shows a typical deployment timeline. This is assuming as typical SAP installation with 4 Production Source systems such as ECC, BI, CRM, SRM with 3 refresh targets each.

#	Phase	Description	Days
1	Planning & Design	<ul style="list-style-type: none"> ▫ Review SAP environment, validate requirements ▫ Review and match current refresh procedure ▫ Identify handling of critical tasks ▫ Define Implementation architecture/ dependencies ▫ Establish project timeline ▫ Double-check installation requirements 	1
2	Software Installation	<ul style="list-style-type: none"> ▫ Download software binaries ▫ Re-validate findings from planning phase ▫ Fine-tune implementation architecture ▫ Install server agents and UI 	1
3	Software Setup	<ul style="list-style-type: none"> ▫ Setup base configuration for systems ▫ Configure LSC Standard Tasks 	3
4	DB Copy Integration	<ul style="list-style-type: none"> ▫ Integrate database copy into workflow 	1
6	Run System Refreshes	<ul style="list-style-type: none"> ▫ Execute refreshes 	2
7	Cascade Installs	<ul style="list-style-type: none"> ▫ Replicate Implementation to other systems in scope 	2
8	Training	<ul style="list-style-type: none"> ▫ Training 	1
9	Project Management	<ul style="list-style-type: none"> ▫ Project Manager during all phases 	1
		Total	12

4. Installation Requirements

4.1. Technical Prerequisites and Requirements for Deployment

- Master Server - One master is required; can be one of the agents or a standalone master server
- Agent Installation - Libelle SystemCopy tool is required to be installed on each server where SystemCopy related tasks need to be executed.
- OS User - SystemCopy tool runs as user <SID>adm at OS level. In case of windows it runs as a service under the appropriate user. This is because we run most of the tasks using R3trans.
- Installation Location - Typically the software is installed in c:\libelle\lsc but this is not mandatory [/opt/libelle/lsc in case of LINUX]. Customer can choose the installation path.
- Diskspace - Make sure that there is at least 5GB of disk space free for installing the software and storing exports and logs. A common shared disk is recommended.
- Clients in SAP - For every client that is planned to be copied from the production system there should be a corresponding client in the target system.
- SAP User - For each client that is intended to be copied there should be an SAP user defined (either dialog or system) preferably both in production and target system. This is required for executing ABAP reports. Also, the user created should have some specific authorizations. Please refer to the document lsc_user_auhorization.pdf [see attachments] for information about the authorizations. Also, to make it easier, SAP role files are provided. If you want to use sap generic user such as DIDC then make sure this user has SAP_ALL, SAP_NEW profiles assigned.
- System Copy GUI - System copy GUI will be installed locally on individual laptops; please make sure java 1.8 or higher is installed for the GUI to work properly.
- Ports - LSC agents need open ports to communicate. Default Port is 9000. Plan for multiple ports if multiple agents are installed (e.g. one agent for DB communication with DB user and one agent for SAP communication with sidadm user)

4.2. Recommended Know-How for the LSC Administrator

The following know-how is recommended for implementing and operating LSC on AWS:

Area	Involved in...	Extend of Involvement
OS Administration	Supports Server Process Installation, and DB Backup/Restore	Low
DB Administration	Supports Libelle Consultant with automation of the DB Backup/ DB Restore/ DB Rename	Medium
Network Administration	Supports Libelle Consultant for any areas mainly around network performance when backing up/ restoring the databases	Low
SAP Basis Administration	Key person to support the customer Refresh Workflows with the Libelle task repository and executing the first set of refreshes jointly with the Libelle Consultant.	High

SAP Functional Team and Security Teams	Data Masking Definitions if data masking integration is used	Medium
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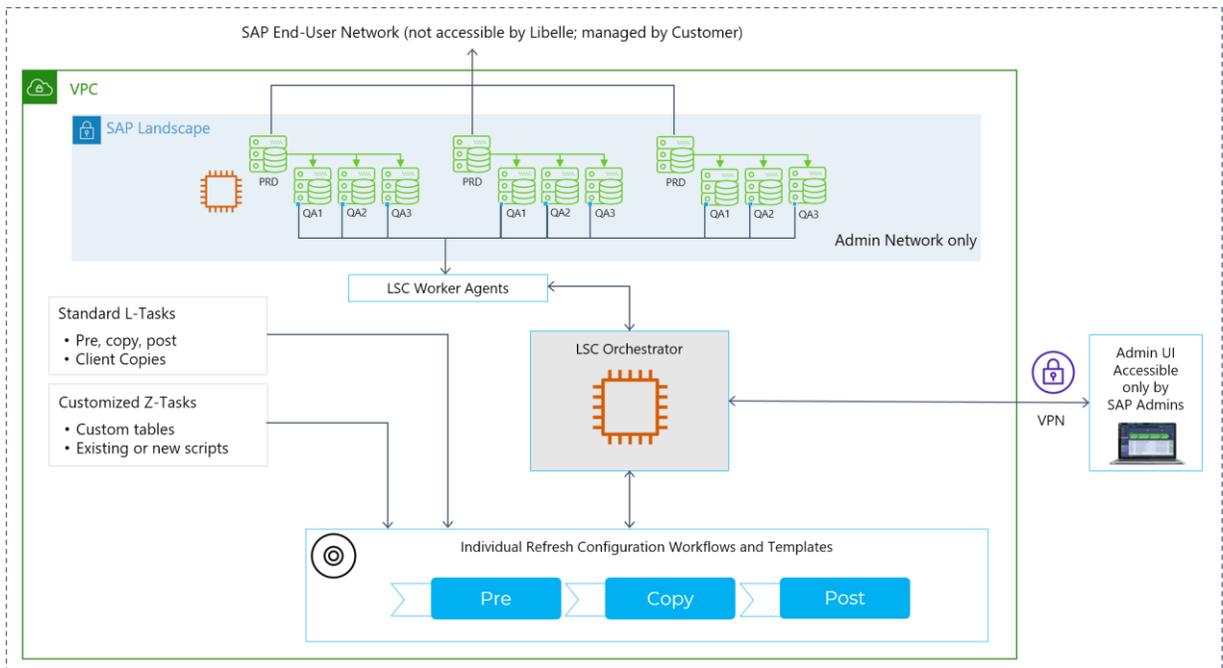
4.3. AWS Environment Configuration

- All LSC run completely isolated inside the customer AWS VPC where the customer operates his SAP environment.
- With that, the AWS environment configuration is already defined by existing customers AWS SAP environment architecture.
- LSC does not impact the environment architecture strategy
- Only additional components added to the VPC are (1) server agent on the respective target machine that needs to be refreshed, (2) Libelle Master Server running there or on a separate EC2 instance, and (3) an optional shared EBS file system to share data between LSC Master and Worker Agents

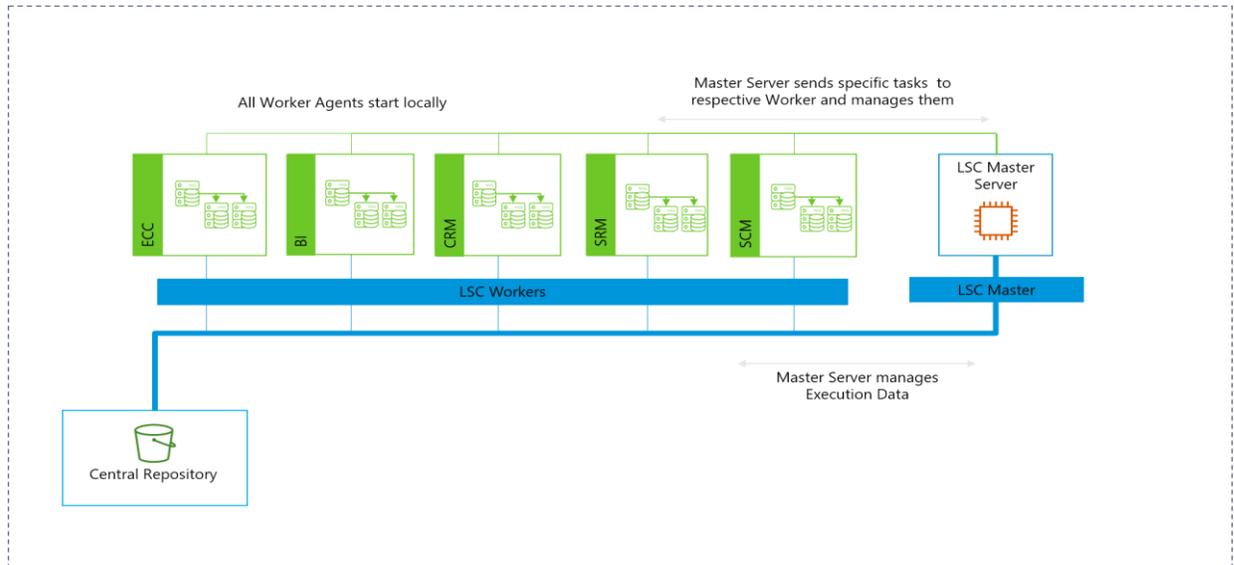
5. AWS Architecture

LSC is based on a powerful automation framework. It runs on an LSC central Orchestration Servers to centrally manage configurations, distributed LSC Worker Agents and refresh Executions. Both LSC Orchestrator and Workers are easy to install as a Server Agent Installation. Installations can be cascaded by simply copying the installation directory to a new server and adjusting. Once installed, Workers can be updated to the newest version from the Orchestrator. Installing LSC Orchestrator, setting up Workers, and configuring the workflow is a matter of a few hours. LSC typically does not require SAP Transports to be applied to the SAP systems.

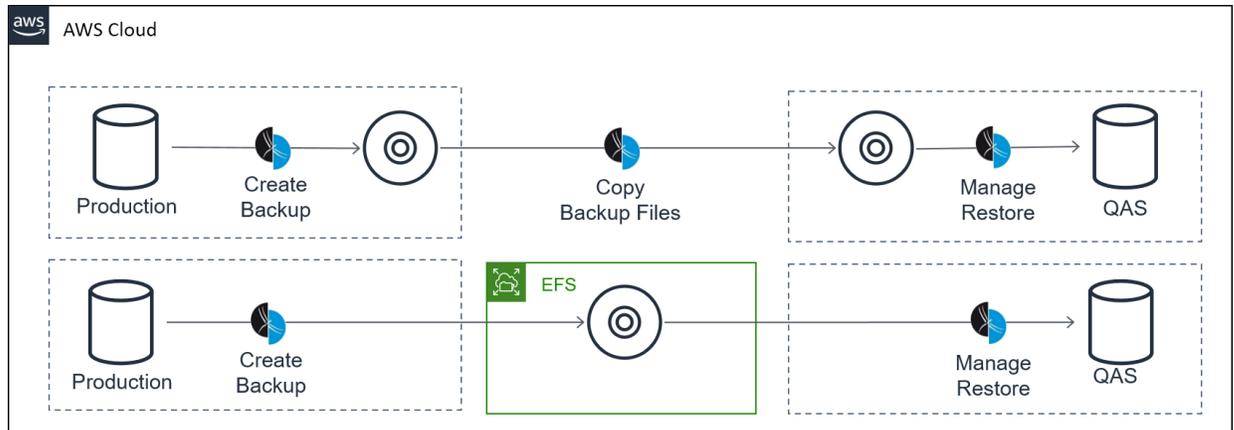
The following diagram shows the standard LSC architecture on AWS



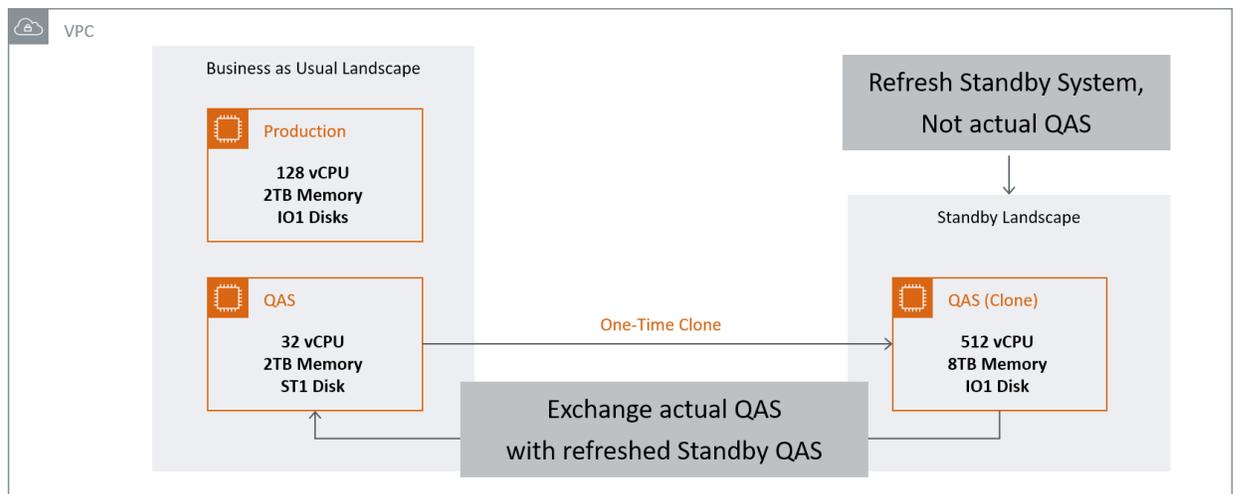
A shared file system can be deployed to maintain all libelle files on a central repository as outlined in diagram below



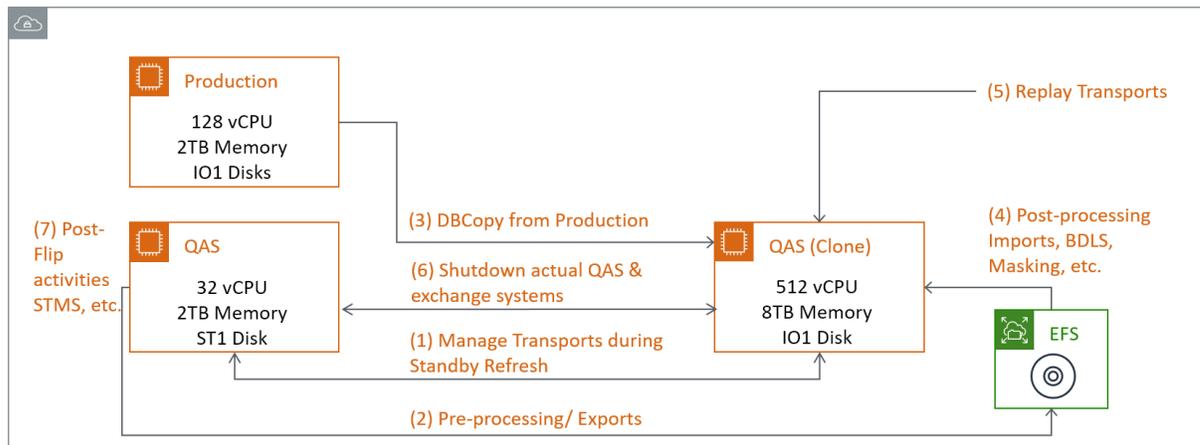
Database backups and restores during the system refresh can be maintained locally, or shared via EFS



LSC supports Compute and Disk bursting to accelerate system refreshes per diagram below:



LSC supports refreshing a standby system to accelerate bursting to improve end-user experience per diagram below:



6. Security Considerations

6.1. Identity and Access Management

The Libelle users are limited to SAP System Administrators. users must authenticate against the Server Agent before having access to the features. Libelle supports Local Libelle Users managed by the Libelle Software, LDAP authentication, and Active Directory, or a combination of Local and LDAP authentication. Users are then authenticated with different level of authorities. Libelle supports three key roles which are (1) Viewer Role – Restricted to viewing status of System Refresh Execution, but cannot perform operations, (2) Operator Role – All Viewer authorization and can start/ stop/ restart System Refresh Execution, and (3) Administrator Role – All Operator authorization and can create additional tasks to be executed.

6.2. No-Root and Least-Privilege-Policy

LSC access is highly limited as it is an internal administration software, only used on restricted systems (QAS/DEV system), used internal only used by limited number of administrators, without access to/ from the outside. Libelle service is running within Domain of the SAP Administration Group. LSC runs as SIDADM. Libelle SAP users have defined roles.

6.3. Public Resources

No public resources are used for operating Libelle SystemCopy on AWS.

6.4. User Roles and Policies

Libelle service is running within Domain of the SAP Administration Group. LSC runs as SIDADM. Libelle requires a user in the existing SAP target system that needs to be refreshed and there are specific defined SAP roles. Please refer to the SAP role document for more information.

6.5. Customer Sensitive Data

No customer data is stored at Libelle or stored within the Libelle application. Libelle does not store any information in its software. It may trigger a workflow local to the server it runs on which exports restricted data from/ to the same file system but does not store/ transmit any information.

6.6. Data Encryption Configuration

The critical aspects of encryption in context of setting up and operating of LSC are (1) storage of customer secrets in the application, and (2) ensure that the application and its authorization/ authentication via LDAP cannot be bypassed by manipulating configuration files.

All passwords stored in the config.xml file are encrypted asymmetrically with RSA encryption. On first start LSC generates a private key that is 2048 bit long and that can be secured with a passphrase, but customers can generate their own private keys with their own passphrases. The passphrase must be provided at start of LSC. The private key is encrypted with AES256.

Libelle is ensuring the integrity of the config.xml file by digitally signing it. Bypassing the tool and doing manual changes to the config.xml file leads to an invalid signature. An unsigned config.xml or a signed config.xml with an invalid signature cannot be executed by the Master Agent.

Local users' passwords are hashed, salted and stored in the lsc.xml file. This file is also digitally signed, using the same private RSA key, to protect it from modifications.

7. License and Cost Considerations

7.1. Traditional License Model

Software Licenses are required to operate LSC. Licenses are available as perpetual license or licenses subscription from Libelle or an authorized Libelle Partner (BYOL). Software maintenance services are recommended whereby software maintenance is included in the subscription fee. Consulting and training are highly recommended.

7.2. Pay-Per-Use and AWS Market Place

Today, the solution is also available to SAP Managed Services Companies as a Pay-Per-Use Model (BYOL). In the near future, LSC is available to for end-customers and partners via a Pay-per-use Service Model thru the AWS marketplace. Please check Libelle's offering on the AWS marketplace for more information.

8. Sizing Considerations

The following are recommendations on how to size the LSC central Orchestration Server.

8.1. EC2 Instance Sizing

- Server Type: Virtual Machine
- OS: Windows or Linux
- Memory: 16 GB (Better 32G). 200MB X number of configurations planned + a minimum of 8GB operating system memory
- CPU: 2 CPU

8.2. EBS and S3 Volume Sizing

- Local Disk: 10-20GB for LSC Master Server Binaries and Log Files
- Local disk or shared disk across all production support systems
- Disk Space: 2-5GB per refresh configuration. Recommend ~100GB for an average environment size of 20 refresh configurations. 300GB. Depends on number of installations, export sizes, and execution retention period.
- File Systems: /Libelle (NFS share and this file system should be mounted on all target systems.
- Permission: Master server process should be able to read & write to this mount point. Also, make sure that SIDADM users from all target hosts have read & write permission to this mount point.

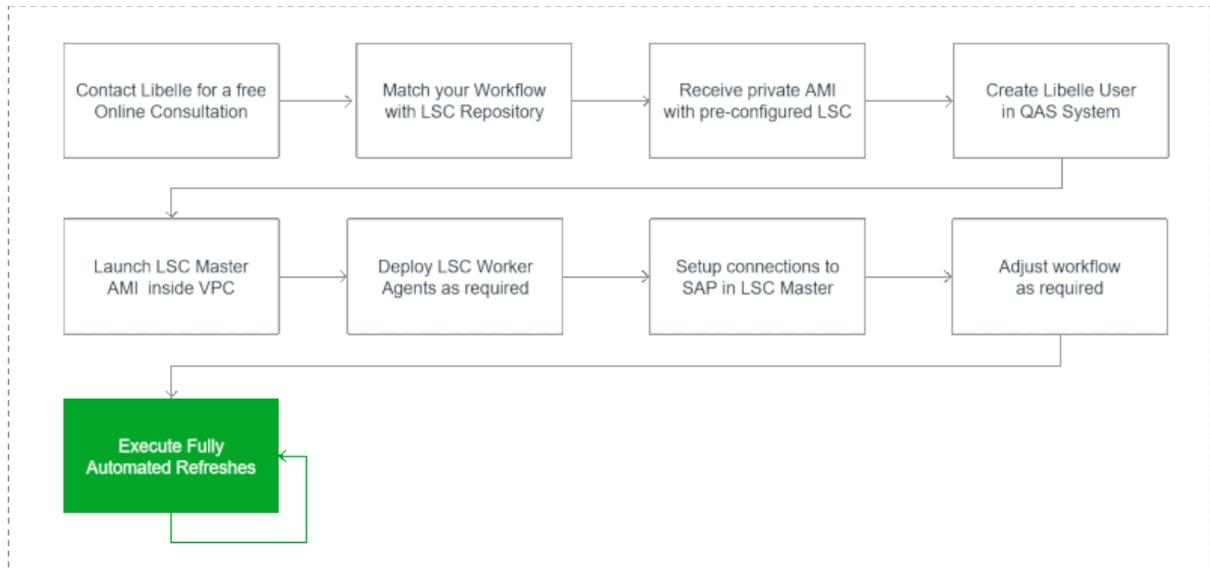
8.3. Other Requirements

- Port: Any unused port. This needs to be opened from Libelle master servers to end user desktops and to the target hosts. Communication is Bi-Directional.
- SAP User (Type: Service user) needs to be created on all target systems and all clients.
- Roles: Please find attached authorizations requirement PDF.
- Database user: Schema user and password from target database host
- Operating system user: SIDADM user
- Agent: Agent needs to be installed and started on all target hosts.
- Libelle GUI: - JRE 8 or higher to run Graphical User Interface (GUI)

9. Deployment on AWS

9.1. Standard AWS Deployment Workflow

The following flowchart describes the best ways to deploy LSC on AWS, you can either choose an AMI with LSC pre-installed or copy LSC yourself to one of your instances. The LSC AMI is configured to automatically launch the LSC service on boot. Now you can connect to the LSC master via the Java frontend.



9.2. Maximize Uptime and Availability of LSC on AWS

LSC supports refreshing production support systems. As such, the process carries a limited number of Administration Users for a limited time during the refresh. To maximizing uptime for this use case, Libelle recommends following standard backup and recovery procedures. The complete LSC Central Orchestrator can be restored in less than 10-15 minutes.

9.3. Deployment Configurations

Please refer to Section 5 – AWS Architecture for a deployment configuration overview

10. Testing, Troubleshooting, and Health Checks

Testing and troubleshooting (debugging) is required in case System copy or any specific task run out into errors situation. And to resolve errors we have to find specific log to identify the cause of an error. We can also debug LSC in case we require some information from a running task or a completed task. Most of the issues can be solved below questions can be answered or cross checked.

1. Are all server processes running properly?
2. Are all server processes run in correct user context?
3. Are file and directory privileges set correctly?
4. Are all needed TCP ports opened within the firewall?
5. Do all software components have the same release level?
6. Are LSC-users created and activated in every SAP-system involved?
7. Do LSC-users have the correct privileges?

For each and every running or completed task we have set of logs available which easily can be accessed from LSC GUI. Select failed task from monitoring tab and right click to see all execution files.

UID	Name	Start time	End time	Duration	Progress
LSICFIMP	SICF: Import WebService definiti...	5/11/20 1:34:22 PM	5/11/20 1:36:37 PM	00:02:15	<div style="width: 100%; height: 10px; background-color: green;"></div>
LSOAMANAGERIMP	SOAMANAGER: Importing Web...	5/11/20 1:34:23 PM	5/11/20 1:38:56 PM	00:04:31	<div style="width: 100%; height: 10px; background-color: green;"></div>
LSOAMANCLINIMP	SOAMANAGER: Importing Clie...	5/11/20 1:34:23 PM	5/12/20 9:49:16 AM	20:14:53	<div style="width: 100%; height: 10px; background-color: red;"></div>
LSLDAPICUSTIMP	Import SLDAPIC...	5/11/20 1:34:28 PM	5/11/20 1:34:28 PM	00:00:04	<div style="width: 100%; height: 10px; background-color: green;"></div>
LCSTTBLIMP	Import content of	5/11/20 1:34:29 PM	5/11/20 1:34:29 PM	00:00:01	<div style="width: 100%; height: 10px; background-color: green;"></div>
LCSTCLNTBLIMP	Import content of	5/11/20 1:35:37 PM	5/11/20 1:35:37 PM	00:00:12	<div style="width: 100%; height: 10px; background-color: green;"></div>
LSICSTIMP	SECSTOPE: Im...	5/12/20 9:58:35 AM	5/12/20 9:58:35 AM	00:00:06	<div style="width: 100%; height: 10px; background-color: green;"></div>

Select the respective client on which it has failed.

Display Task ✕

Task: LRZ11SET Version: 12

Configuration Data

Main Attributes
 Category
 Execution Attributes
 Parameters
 Return Codes
 Code

Execution Data

2020-05-08_21-19-11
2020-05-08_21-24-02

Task Instances ↻ 🔄

No.	Client	System	Duration	Status
01	800	Q01	00:00:01	error

? Previous Next Close

We have set of files to debug the complete task execution.

Display Task ✕

Task: LRZ11SET Version: 12

Configuration Data

Main Attributes
 Category
 Execution Attributes
 Parameters
 Return Codes
 Code

Execution Data

2020-05-08_21-19-11
2020-05-08_21-24-02

Task Instances ▶ Instance 1 ↻ 🔄

Client: 800
 System: Q01
 Attempt: 08 error
 Start: May 12, 2020 10:37:28 AM
 End: May 12, 2020 10:37:29 AM
 Duration: 00:00:01
 Reaction: skip ⓘ

Files:
 Show important files only

Type	Size	Name
logfile	577	i01r08_Q01_800.log
datafile	577	i01r08_Q01_800.data
debugfile	3686	i01r08_Q01_800.debug

? Previous Next Close

* .data -> actual data exported or imported in system.

- * .debug -> complete debug to task, Important for Libelle development team in case bug fixes.
- * .exec -> what exactly executed in system for this task.
- * .log -> log file to executed task with error codes and details to identify the cause of error.
- * .result -> result file to the execution of task.

Select the log file to see all information regarding executed task with step by step details required to identify the issue.



Note: - In case you are not able to identify the cause of issue, you can zip these files and sent it to Libelle Support team for further analysis.

Above set of files can be accessed at file system level as well. Location for these files are <LSC Home directory>/execution/<config name>/date/<phase name>/<task name>

```
workshop-1b:/opt/libelle/lsc_8.0_new/executions/LCC_P01_Q01/2020-05-15_18-42-55/check/LCHECKFMVERSION # pwd
/opt/libelle/lsc_8.0_new/executions/LCC_P01_Q01/2020-05-15_18-42-55/check/LCHECKFMVERSION
workshop-1b:/opt/libelle/lsc_8.0_new/executions/LCC_P01_Q01/2020-05-15_18-42-55/check/LCHECKFMVERSION # ls -l
total 144
-rw-r--r-- 1 q0ladm sapsys 512 May 15 20:43 i01r01_Q01_800.data
-rw-rw-rw- 1 q0ladm sapsys 3837 May 15 20:43 i01r01_Q01_800.debug
-rw-r--r-- 1 q0ladm sapsys 13748 May 15 20:43 i01r01_Q01_800.exec
-rw-rw-rw- 1 q0ladm sapsys 512 May 15 20:43 i01r01_Q01_800.log
-rw-rw-rw- 1 q0ladm sapsys 512 May 15 20:43 i01r01_Q01_800.log.bak
-rw-r--r-- 1 q0ladm sapsys 6644 May 15 20:43 i01r01_Q01_800.trace
-rw-r--r-- 1 q0ladm sapsys 642 May 18 21:54 i01r03_Q01_800.data
-rw-rw-rw- 1 q0ladm sapsys 4810 May 18 21:54 i01r03_Q01_800.debug
-rw-r--r-- 1 q0ladm sapsys 13748 May 18 21:54 i01r03_Q01_800.exec
-rw-rw-rw- 1 q0ladm sapsys 642 May 18 21:54 i01r03_Q01_800.log
-rw-rw-rw- 1 q0ladm sapsys 642 May 18 21:54 i01r03_Q01_800.log.bak
-rw-r--r-- 1 q0ladm sapsys 6440 May 18 21:54 i01r03_Q01_800.trace
-rw-r--r-- 1 q0ladm sapsys 642 May 18 21:54 i02r03_Q01_809_809.data
-rw-rw-rw- 1 q0ladm sapsys 4677 May 18 21:54 i02r03_Q01_809_809.debug
-rw-r--r-- 1 q0ladm sapsys 13748 May 18 21:54 i02r03_Q01_809_809.exec
-rw-rw-rw- 1 q0ladm sapsys 642 May 18 21:54 i02r03_Q01_809_809.log
-rw-rw-rw- 1 q0ladm sapsys 642 May 18 21:54 i02r03_Q01_809_809.log.bak
-rw-r--r-- 1 q0ladm sapsys 6460 May 18 21:54 i02r03_Q01_809_809.trace
-rw-rw-rw- 1 q0ladm sapsys 6079 May 18 21:54 instances.xml
-rw-rw-rw- 1 q0ladm sapsys 4647 May 18 21:54 instances.xml.old
```

To find out, if your server process is running, you can display the current processes of your operating system. On Windows, start the task manager and look for the lsc process in the Processes tab. If the

server is running, the entry `lsc.exe` will appear. On Unix systems, please enter the following command at your console:

```
>ps -ef | grep lsc
```

If no processes are displayed, your server does not run. A running Libelle SystemCopy server implies the display of a process with `/lsc`.

11. Backup and Recovery

LSC supports refreshing production support systems. As such, the process carries a limited number of Administration Users for a limited time during the refresh. To maximizing uptime for this use case, Libelle recommends following standard backup and recovery procedures. The complete LSC Central Orchestrator can be restored in less than 10-15 minutes.

Libelle recommends a regular backup of the complete Libelle Directory regularly. Backups should follow standard backup/ recovery scenarios. All LSC configurations are stored in static flat files, and as such they can be stored in a shared location like S3 and have a symbolic link point to that location. This S3 location could also be made highly available.

12. Routine Maintenance

12.1. Rotating Keys

Rotating keys is not supported directly by LSC, but you can create a second master server and duplicate from the old one to the new one.

12.2. Patching and Upgrades

12.2.1. Updating Central Orchestrator

The systems master, worker, and the graphical user interface should all have the same version. They must be stopped before updating the Libelle SystemCopy. After that, we recommend making a backup of the complete Libelle SystemCopy installation of each system.

You can accomplish the software update for each system with the installation wizard, i.e. the program `setup` or `setup64` for 64-bit-systems on the distributed data carrier. Choose the option `Update` and follow the instructions of the installation wizard.

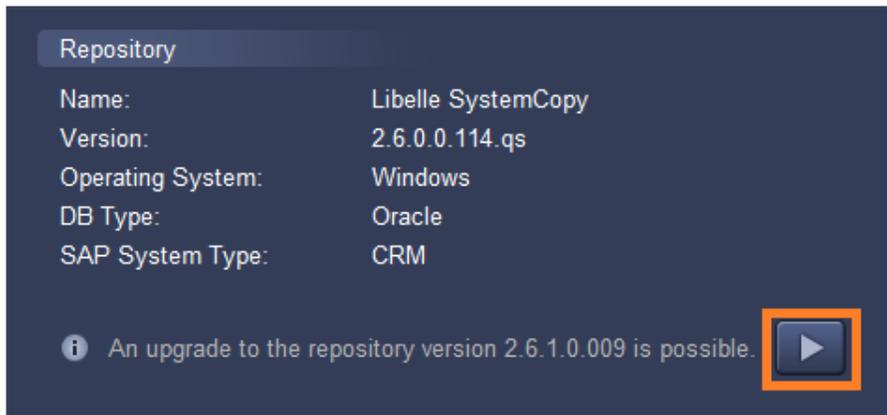
After the software of the systems has been updated, first you start the workers and then the master, as described in chapter `Controlling the Server Process`. Once the master is started, you start the graphical user interface.

12.2.2. Updating Refresh Configurations

This chapter describes the steps to update a Libelle SystemCopy installation that must be performed in order to maintain existing configurations and personal tasks. You'll keep the existing configurations

during the update. Distributed tasks are possibly expanded, supplemented, or removed. Your particular tasks naturally remain unchanged, although they may have to be adjusted afterwards. Global and local parameters as well as their values might be modified during the update when they originate from the repository. Nevertheless, your self-defined parameters and values – these remain unchanged.

If there is a newer repository version than the one a configuration is supplied with, the graphical user interface shows that and offers the respective update at the push of a button.



To update tasks, follow the workflow below:

1. Activate the Setup tab in the graphical user interface.
2. Select a configuration from the configuration list.
3. Click the update button if an update of the configuration is possible.
4. Confirm the security check with OK.
5. Repeat these steps for all configurations.

Alternatively, use the Shell interface as follows:

```
>lsccli -config:upgrade lsc_P01_Q01
```

Final step to complete the update is to locate and review the automatically generated update report. The standard directory for update reports is **LSC_HOME/reports/config_update/<config>**.

Review the update report in order to be informed about changes that have happened. The report also contains your custom tasks.

Tasks that you programmed yourself have not been touched by the update so far. But it is possible that the new version of Libelle SystemCopy contains structural or substantive changes that also require adjustments of your personal tasks. Please verify the following issues and adjust – if necessary – your personal tasks, so they continue to provide the usual behavior and the desired results.

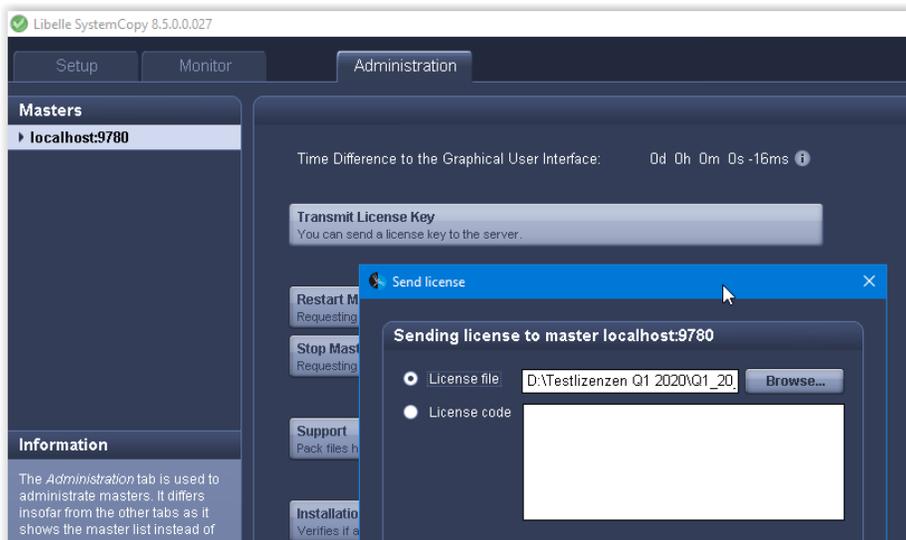
- Does the application programming interface documented in the Programmer's Guide still coincide with the functions and parameters used in my personal tasks?
- Does the directory structure of the home-directory introduced in chapter Directory Structure still coincide with the paths used in my personal tasks?

An LSC update may require new or changed permissions for the Libelle SAP user in the SAP system. See details in the document User Authorization and the user roles provided in the corresponding repository folder.

13. License Management

Each configuration needs a master for control. In order to run a master, the corresponding server must be equipped with a valid license key in the home-directory. All other program components of a configuration do not require license keys.

The license key is located in a file called `lsc.lic`. You receive a valid license key for your configuration from your software vendor. The license key can be sent to the server program via the Graphical User Interface.



14. AWS Service Limits

There are no special considerations for AWS service limits in the context of Libelle SystemCopy. LSC installs within the VPC that hosts the SAP production support systems.

15. System Copy Operation on AWS

15.1. Overview

This chapter is intended for Basis team/System Copy team to quickly check frequently performed actions on LSC. This document is prepared keeping in mind the most performed actions in SystemCopy. This document is not a replacement of training and support provided by Libelle. For any additional questions please contact LSC support.

15.2. LSC Server Agent

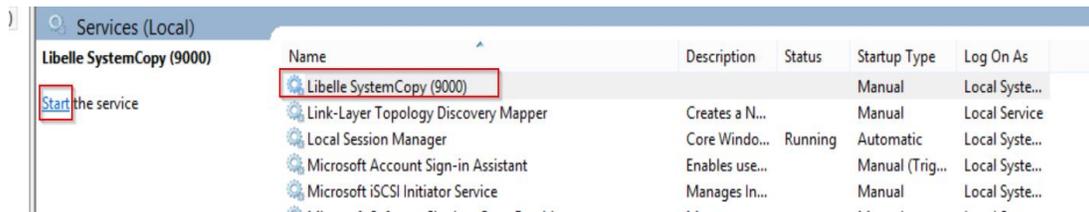
Starting and stopping LSC is day to day task for Basis team who are performing system copy regularly on their SAP systems using Libelle SystemCopy tool. LSC service is started and stopped differently based on operating system.

For Linux, LSC can be started in the following way: Go to [LSC_HOME]/bin and use the following command (in the screenshot) to start service. As a best practice, always start LSC with full path and with sidadm user as shown in the screenshot below and grep for lsc process

```
scosapdbt1:HDB:htladm /hana/shared/libelle/lsc/bin 80> /hana/shared/libelle/lsc/bin/lsc -port 9000
scosapdbt1:HDB:htladm /hana/shared/libelle/lsc/bin 81> ps -aef | grep lsc
htladm 24931 1 5 11:30 ? 00:00:00 /hana/shared/libelle/lsc/bin/lsc -port 9000
htladm 24945 32207 0 11:30 pts/0 00:00:00 grep --color=auto lsc
scosapdbt1:HDB:htladm /hana/shared/libelle/lsc/bin 82>
```

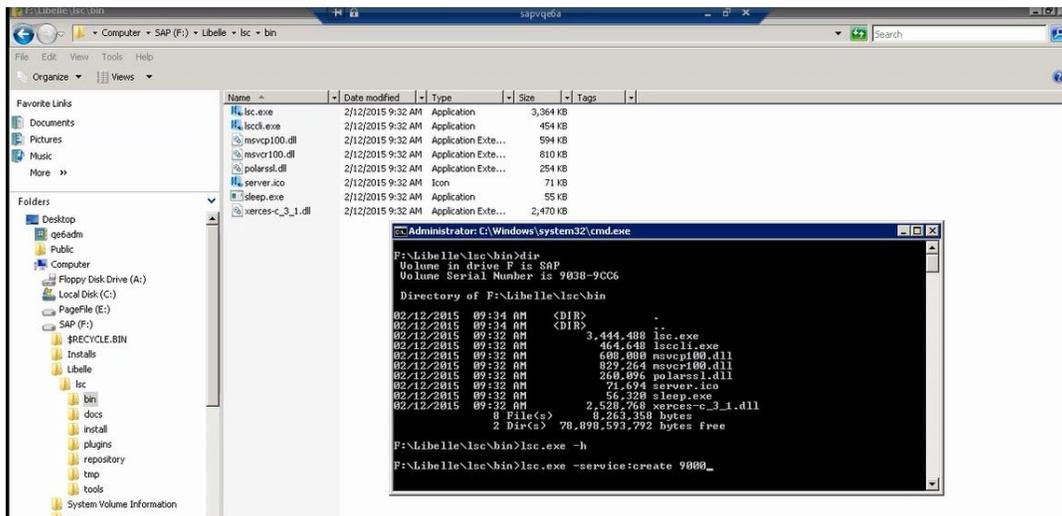
To stop LSC process kill the running process using `kill -9 <PID>`

In Windows we can start/stop LSC by registered service in `services.msc` as shown in below screen shot.

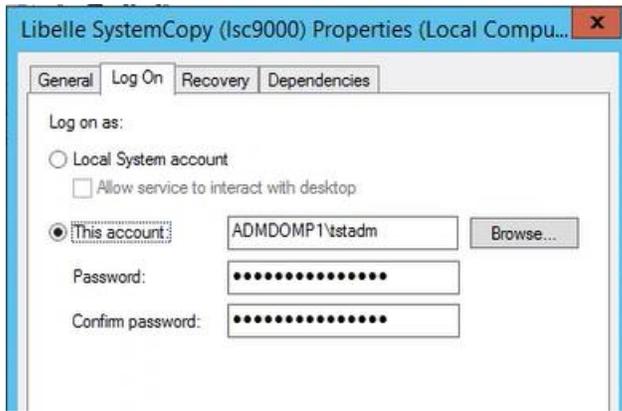


Service creation in windows after LSC install is very important step. Go to `<LSC Home directory>/bin`. Open command prompt (as administrator) and run below command for the same.

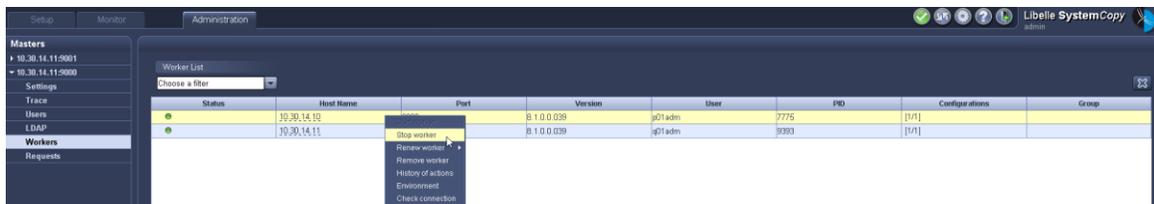
`>lsc.exe -service: create -port 9000 (Screenshot below)`



For more options on service creation please check help by running `lsc.exe -h`. Also, Service should be started always with `<SIDADM>` user.

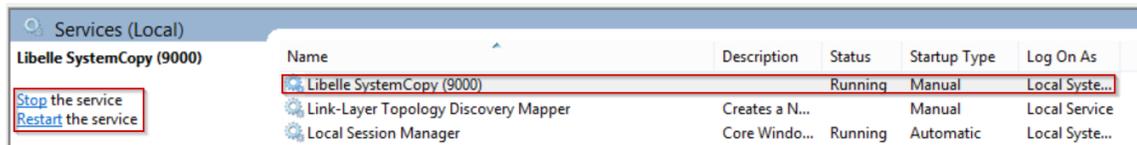


Also, LSC worker agents can be stopped and started from GUI itself as shown below in the screenshot. Go to Administration-> Select master server->Workers -> Select worker -> Right click -> Start /Stop worker



15.3. Validate Operation

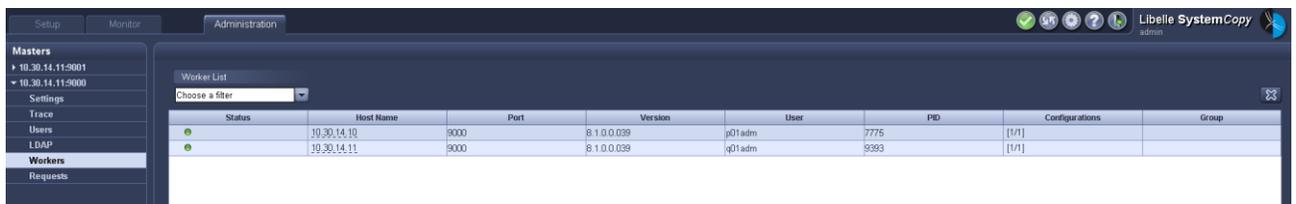
For Windows, please verify running services in services list **services.msc**



For Linux, please grep for "lsc" in all running processes: **ps -aef | grep lsc**



Also, you can check list of all worker agents currently active and running from GUI itself. Go to Administration -> Select Master server -> Workers

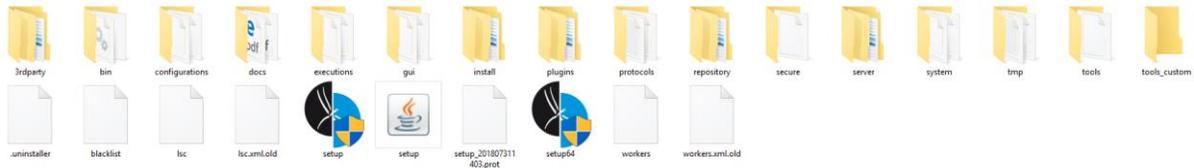


LSC triggers multiple binaries in the background depending upon the tasks that is getting executed. To check the processes that are being controlled by LSC to the following:

- **Windows:** Please check the task manager. Recommended way of doing this is by checking with sys admin tools like process explorer.
- **Linux:** Grep for lsc in the process list. This will list all active processes with the parent pid of LSC:
`ps -aef | grep lsc`

15.4. LSC Directory Structure

After Installation of LSC. Contents of the LSC directory looks like this:



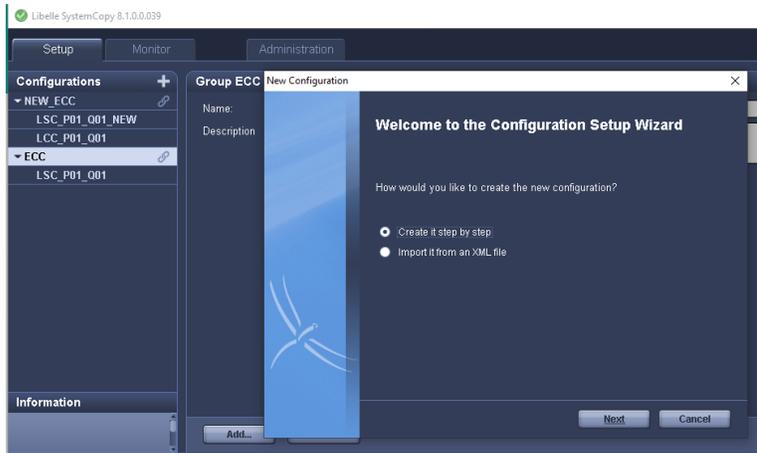
- **Bin:** Includes binaries for LSC
- **Configurations:** Holds LSC configuration files. Configuration files are stored in XML format and include all parameters and tasks needed to run an SAP system copy in an unattended fashion
- **Executions:** Contains execution data of running or finished system copies. Data stored here is most relevant for resolving errors.
- **Plugins:** This directory contains three sub directories (1) Messages: This folder contains email message template triggered from tool, (2) Reports: All binaries, stylesheets required to generate report are located here, and (3) Task_execute: Contains all plugins used by tool to perform tasks.
- **Repository:** This folder contains task repository for system copy, client copy and data scrambling activities.
- **Tools:** This folder contains different tool to connect with different type of database and perform SQL tasks (Ex: BDLS, generic SQL functions).
- **Tools_custom:** This folder contains nwrfsdk directory which is used to connect to SAP and perform ABAP related tasks, nwrfsdk is provided by SAP only.
- **Lib:** Contained all library files required for LSC binary to work.
- **lsc.xml:** XML file which contains details regarding configuration for LSC system copy.

15.5. LSC Graphical User Interface (GUI)

LSC comes with a JAVA GUI and through ought 2021, Libelle is rolling out an additional HTML UI. The following describes how to use the JAVA GUI.

15.5.1. How to setup a configuration

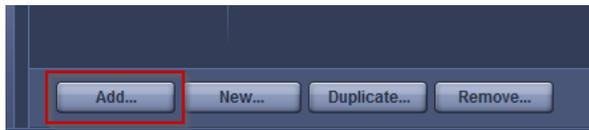
You can create configuration from LSC GUI using configuration setup wizard. There are two options within the wizard. Either we can create a configuration from scratch or upload xml file exported from an already created configuration (explained in the installation and configuration document).



15.5.2. Add existing Configurations

If the configuration is already existing on the master server, we can easily add the configuration into GUI.

1. Click on Add button



2. Click identify configuration and add configuration in list for your lscgui
 Hostname: - target server/master server host name.
 Port: - Target LSC server/Master server LSC port number



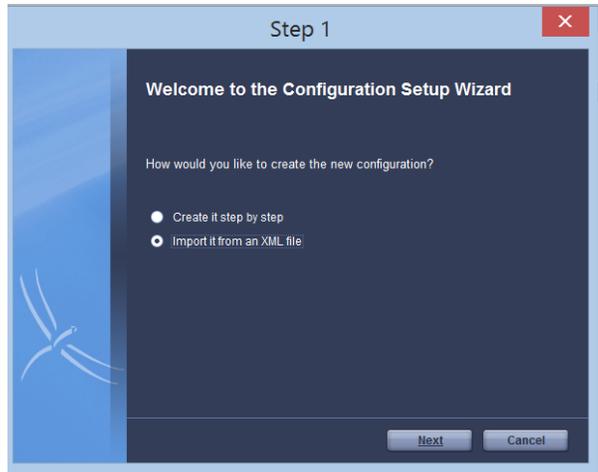
15.5.3. Create configurations from XML file

Uploading configuration from xml file

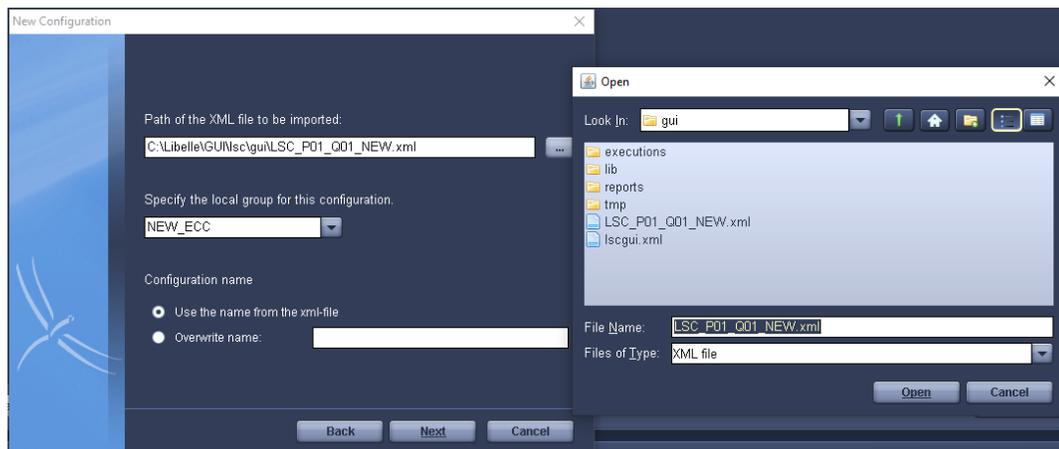
1. Click on Button "New"



2. Select option “import from xml file “



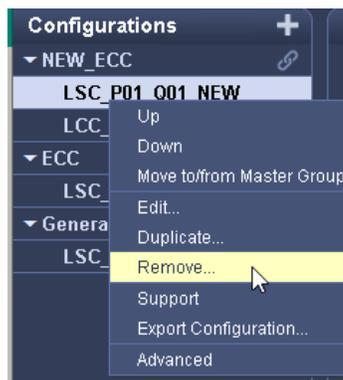
3. Select xml file from location and upload the same to LSC GUI on appropriate group as per your requirement.



15.5.4. Remove Configurations

Configuration can be removed from only the GUI (local) or completely deleted from the master server (Global). If a configuration is deleted locally it can be added back. If a configuration is deleted globally, we have to create a new configuration.

1. Select configuration which you want to remove and click on remove option.



- Remove locally or remove globally based on above description



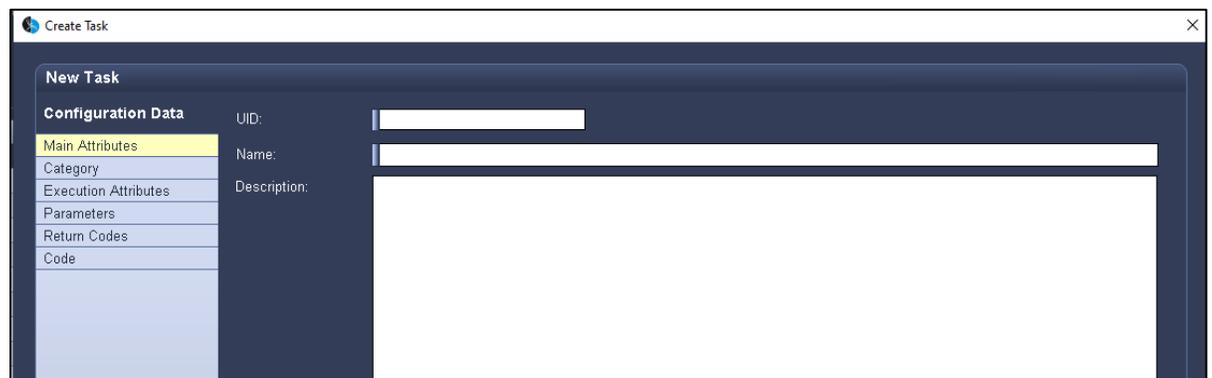
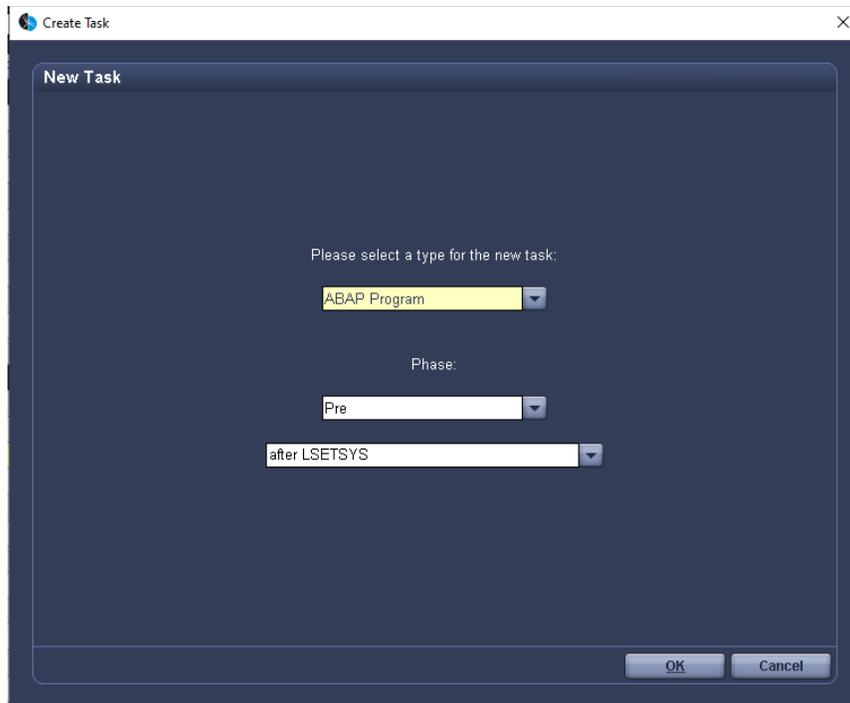
15.5.5. Create Tasks

Task can be created as “new task” or “duplicate existing task”

- Select the configuration where you want to create new task. Click on edit
- Click the “+” button and select Task



- Click on “new” then pop-up window will appear which require information regarding new task
 - Select type of task and continue
 - Select the phase in which task needs to be executed
 - Select the index position of the task in the selected phase



4. The Task-UID is a unique identifier used to differentiate tasks(Main Attributes)
5. For custom tasks (Z-Tasks) use the task category "CUSTOMER". All custom tasks can then be activated or deactivated at once. It is also possible to use any other category if that makes sense.



6. Select execution attributes where the task should be executed. Tasks can be created as client-dependent (under Execution Attributes) or otherwise
 - a. If yes, task is created for each client separately
 - b. Execution can be restricted to single clients using the list given
 - c. If no, task is only being executed on the client marked as default client

d. If a task is stored encoded it only is visible having developer role

The screenshot shows the 'New Task' configuration window. On the left is a sidebar with tabs: Main Attributes, Category, Execution Attributes (highlighted), Parameters, Return Codes, and Code. The main area is titled 'Configuration Data' and includes:

- Activated:
- Phase: Post (dropdown)
- Type: Command Script (dropdown)
- Wait after execution:
- Number: 8 (input)

Below this are sections for 'Systems' and 'Clients'. The 'Systems' section has two radio buttons:

- Execute task for all systems with any of the roles:
 - Source SAP (checkbox)
 - Target SAP (checkbox)
 - Satellite System (checkbox)
 - Source Database (checkbox)
 - Target Database (checkbox)
- Execute task for the following systems (selected by their IDs): [text input]

The 'Clients' section has four radio buttons:

- Execute task with the system's default client.
- Execute task with every client having the copy flag set.
- Execute task with each client defined in the system.
- Execute task with the following clients: [text input]

7. Define input parameters, if needed. These parameters are also referred to as „local parameters“.

The screenshot shows the 'New Task' configuration window with the 'Parameters' tab selected. A table lists parameters:

Name	Value	>>>
foo	bar	<input type="checkbox"/>

Below the table are buttons for 'New', 'Duplicate', and 'Remove'. An 'Edit Parameter' dialog is open, showing:

- Name: foo
- Value: bar
- Description: some description

Buttons for 'Type', 'OK', and 'Cancel' are also visible.

8. Depending on task type, define return codes here; if no return code is defined a task will always fail



- Place code – depending on the task type used – here; no headers are needed – will be added by LSC

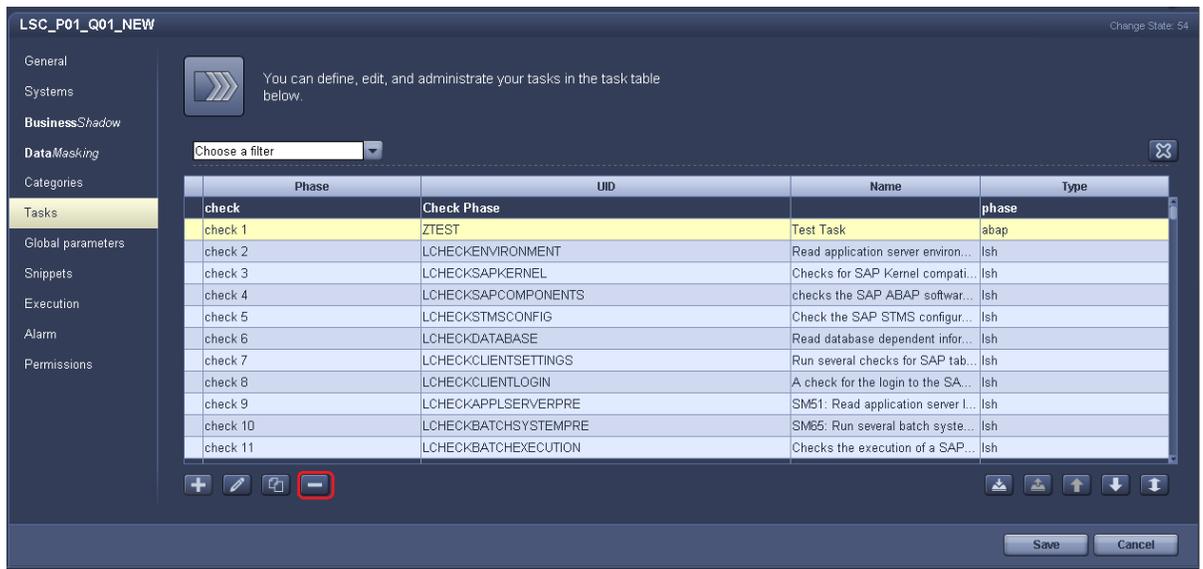


15.5.6. Delete Tasks

- Select the configuration where you want to delete the task
- Click on edit



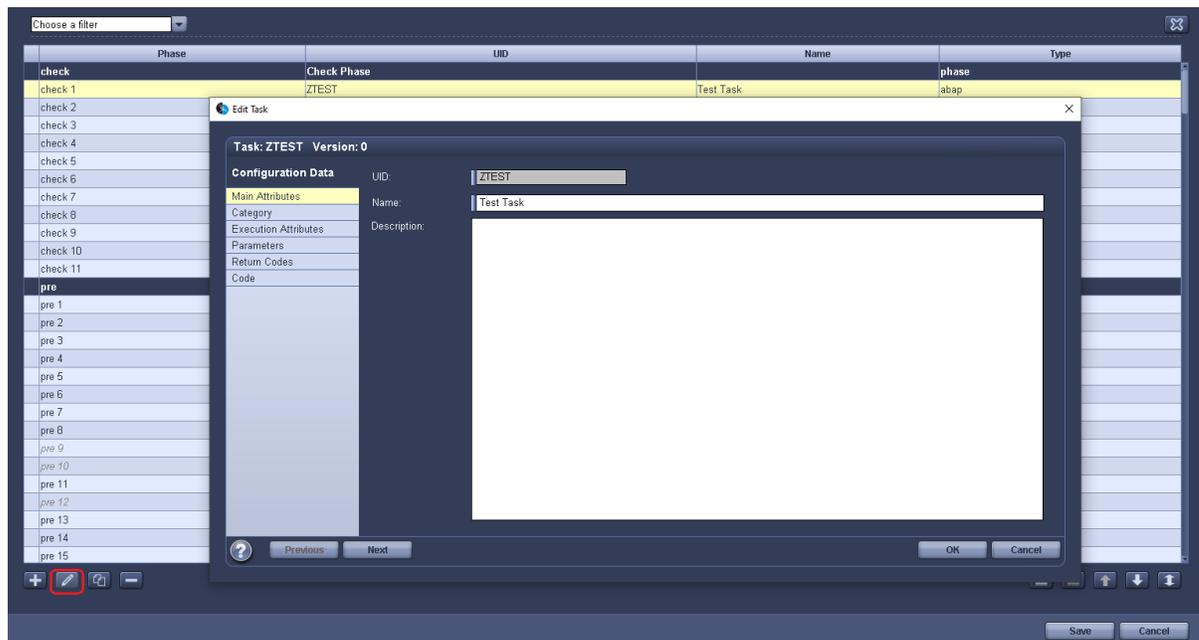
3. Select task and click on Delete button (highlighted in screenshot)



4. Once task is removed from task list then don't forget to save the configuration to reflect the changes.

15.5.7. Modify Tasks

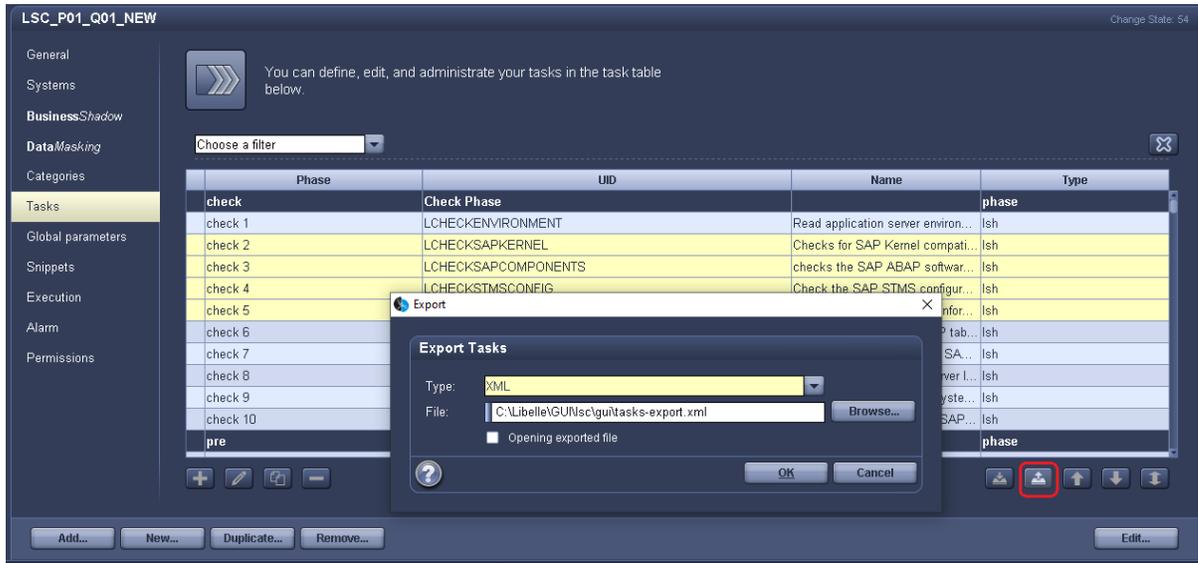
Select the task which you want to modify and click on edit (highlighted in screenshot)



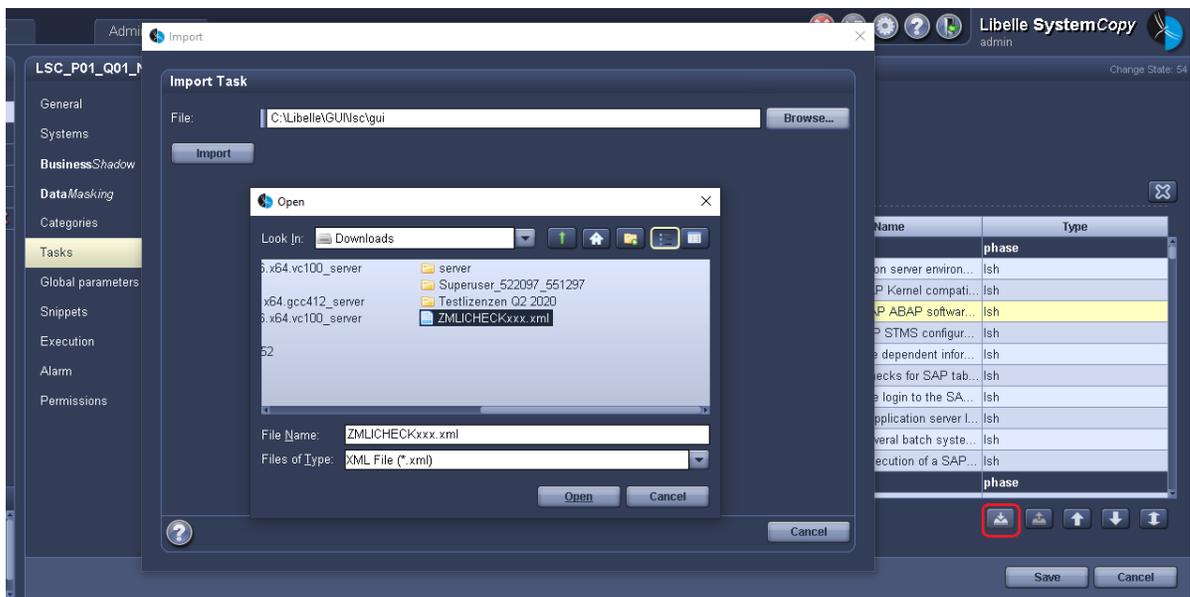
Note: - L (Libelle standard tasks) tasks code cannot be modified, but you can change sequence and execution role of any tasks.

15.5.8. Export Tasks and Import Tasks

Select the task or multiple tasks which you want to export and client on the export button.



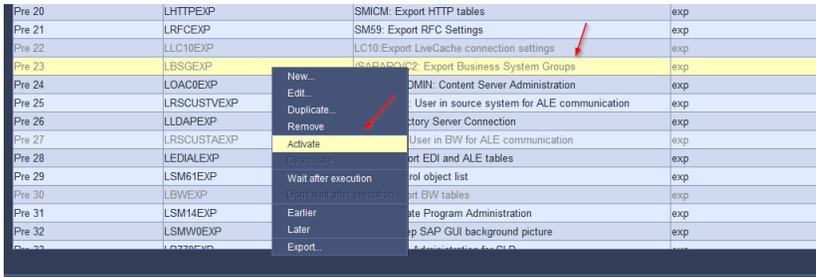
You can select the export path and file name as per your requirement. To import, click on the “Import” button and select the location where xml file is present.



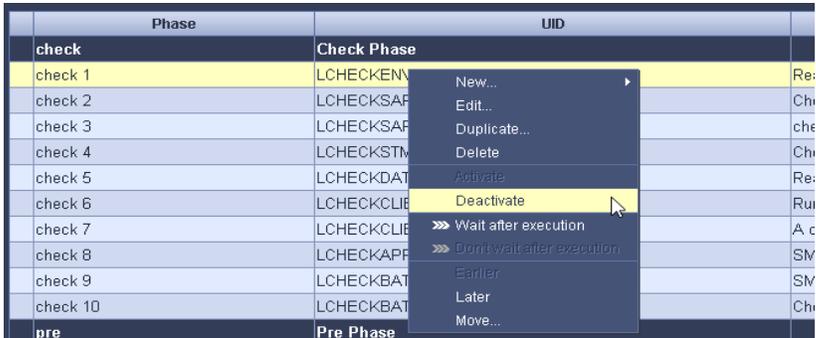
Select the appropriate xml file and click “import”. It will import all the tasks which are present in xml file. You can specify here which task you want to export and continue with saving the same in configuration

15.5.9. Activate and De-Activate Tasks

Select task in configuration which you want to activate, Right click on that task and press activate followed by saving the configuration to activate the same.



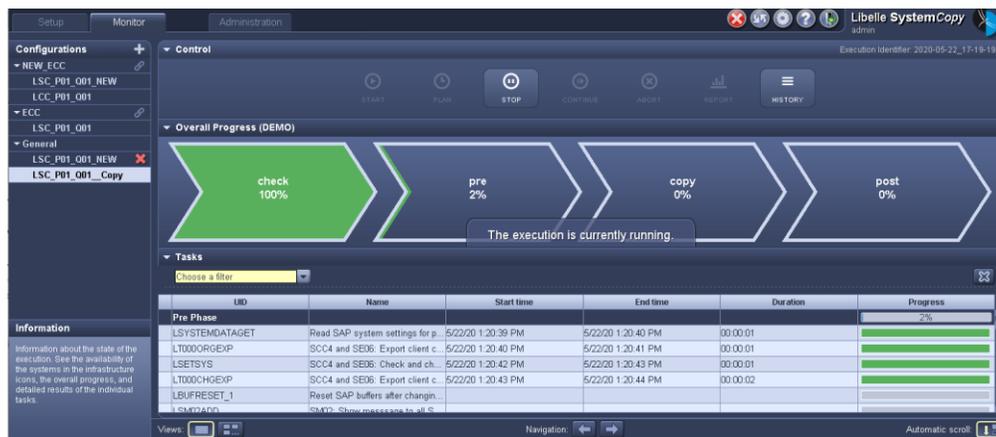
To de-activate, select task in configuration which you want to deactivate, Right click on that task and press deactivate followed by saving the configuration.



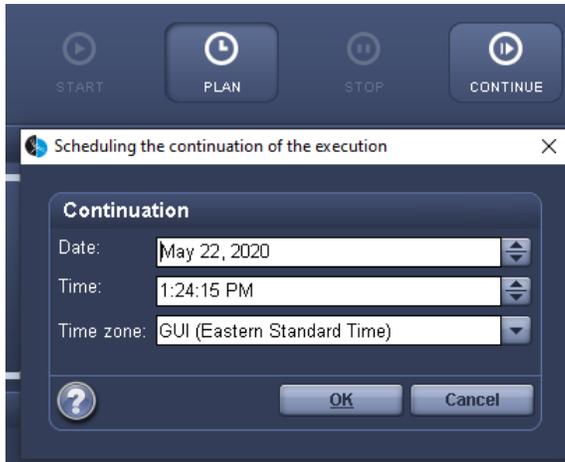
15.6. Operate LSC on AWS

15.6.1. How to plan / Start / Abort / Stop a SystemCopy

In LSC GUI go to Monitor tab to start stop or abort the system copy as shown below.



- Execute start check will start the tasks in check phase
- Start Execution will start the actual system copy starting from pre-phase
- Stop will stop the running execution as soon as the running task is finished
- Immediate stop will kill the running process immediately
- Continue will start the task where it was stopped before
- Abort will abort the running system copy, which need to be restarted from the beginning
- Plan execution will plan the execution where we can provide date and time and tool will automatically start the execution.



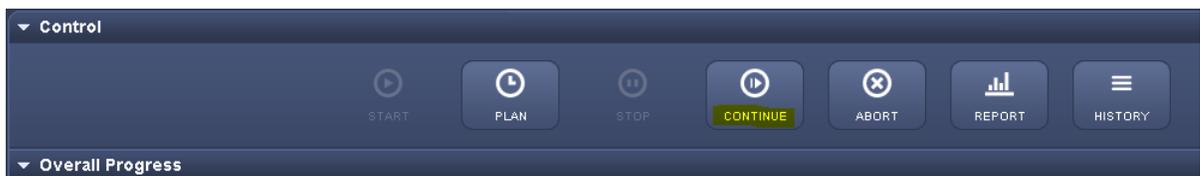
15.6.2. How to execute a single task

To execute a single task only you have to first go to monitoring tab and select the task which you want to run and right click on the same and select "execute this task only" option .As shown below it will re-execute that particular task only and then process will stop.

UID	Name	Start time	End time	Duration	Progress
LCHECKENVIRONMENT	Read application server environ...	5/22/20 1:23:36 PM	5/22/20 1:23:42 PM	00:00:05	10%
LCHECKSAPKERNEL	Checks for SAP Kernel compati...	5/22/20 1:23:42 PM	5/22/20 1:23:45 PM	00:00:02	
LCHECKSAPCOMPONENTS	checks the SAP ABAP software...				
LCHECKSTMSCONFIG	Check the SAP STMS...				
LCHECKDATABASE	Read database dependen...				
LCHECKCLIENTSETTINGS	Run several check...				

15.6.3. How to "continue from" a task

You can continue stopped copy phase and you can also continue remaining tasks on specific phase as per your requirement as shown below.



Above option will start the system copy from where it was stopped or stopped with error.

UID	Name	Start time	End time	Duration	Progress
LCHECKENVIRONMENT	Read application server environ...	5/22/20 1:23:36 PM	5/22/20 1:23:42 PM	00:00:05	10%
LCHECKSAPKERNEL	Checks for SAP Kernel compati...	5/22/20 1:23:42 PM	5/22/20 1:23:45 PM	00:00:02	
LCHECKSAPCOMPONENTS	checks the SAP ABAP software...				
LCHECKSTMSCONFIG	Check the SAP...				
LCHECKDATABASE	Read database dependen...				
LCHECKCLIENTSETTINGS	Run several check...				

Above option will continue the copy process starting from selected task only .it will re-execute all task after selected tasks even though those tasks are already completed.

15.7. Important things to check before starting system refresh

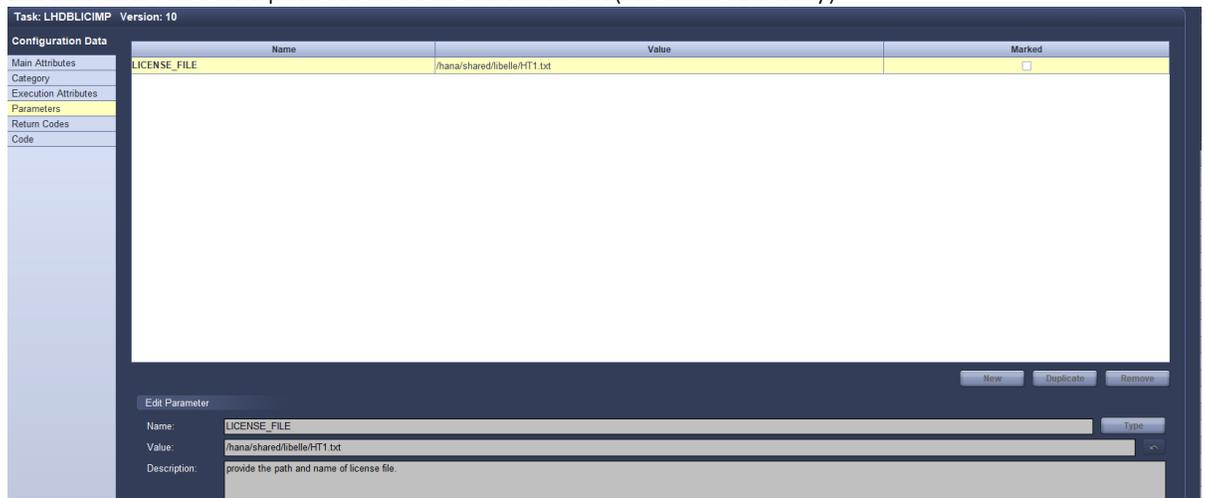
Global Parameters (LSC): Make sure to update/validate below parameter for system refresh

Name	Value
tp_profile_path	\\scosapd1\sapmnt\trans\TP_DOMAIN_DEV.PFL
last_copy_date	20180429
backup_path	/hana/backup/data/PRD/2018_05_19_30_00_databackup_0_1
InstanceOwnerName	system
InstanceOwnerPassword	*****
encrypted_option	

- **Tp_profile_path**: Profile path for transport profile file.
- **last_copy_date**: last system refresh date.
- **backup_path**: location for source system DB backup file(For HANA DB Only).
- **InstanceOwnerName**: System user for database.
- **InstanceOwnerPassword**: System user password HANA database.
- **Encrypted_option**: Leave it blank if database is not enabled

Local task parameters: make sure to validate some local task parameters for below tasks

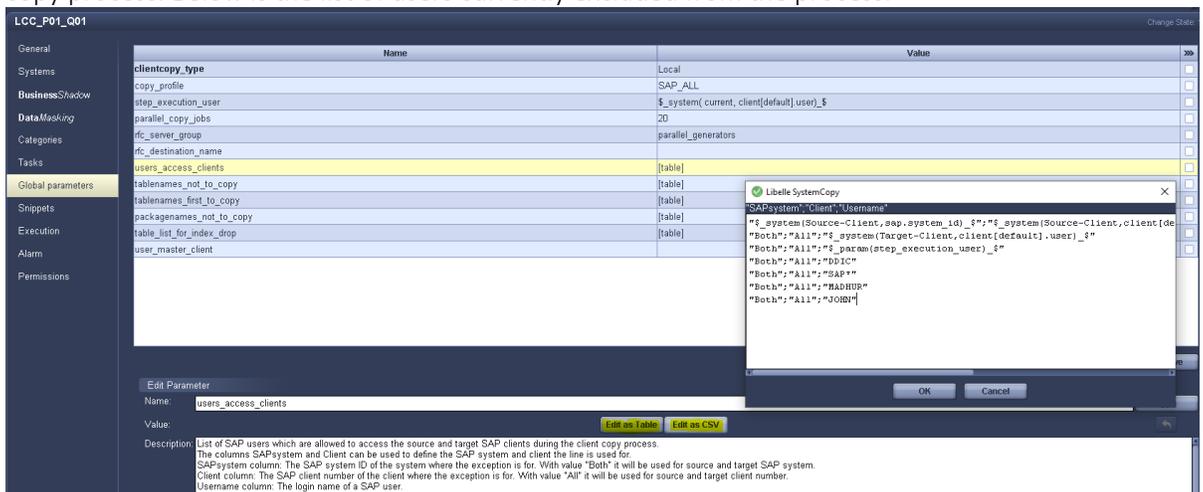
- **LHDBLICIMP**: Provide path for HANA DB License file(for HANA DB only)



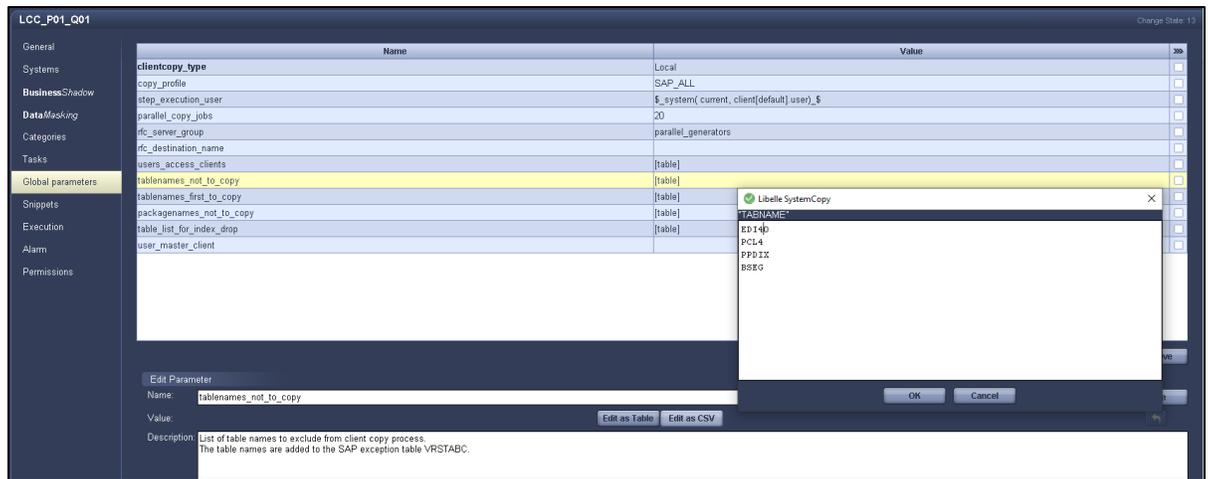
Global parameters (LCC): Below some global parameters which needs to be validated before starting local/remote client copy



- **clientcopy_type**: What kind of client copy will be executed. (remote or local)
- **copy_profile**: SAP profile for client copies. The profile defines the data to be copied
- **parallel_copy_jobs**: Number of parallel running table copy jobs. The parameter set the Maximum number of parallel jobs. The SAP itself checks for the available RFC resources and limits the number of parallel jobs according the RFC resources.
- **rfc_server_group**: A "RFC Server Group" for parallelism of client copy. The group name can be maintained in transaction RZ12. The default value "parallel_generators" is available on most SAP systems, because it is used by SAP programs.
- **rfc_destination_name**: rfc destination name for source system, this parameter is only required for "Remote client copy" for local client copy leave this parameter blank
- **user_access_clients**: List of user ID's from SAP system which is excluded for lock as part of client copy process. Below is the list of users currently excluded from the process.



- **tablenames_not_to_copy**: List of table names to exclude from client copy process. The table names are added to the SAP exception table VRSTABC.



- **packagenames_not_to_copy**: List of package names to exclude from client copy process. The package names are added to the SAP exception table VRSTABC.
- **table_list_for_index_drop**: List of SAP tables to drop secondary non-unique database indexes on target side before execution of client copy. The indexes are recreated after the client copy automatically. Dropping indexes can speed up the copy process for a table. All clients of the SAP system are affected. Testing in other clients can be not possible without the indexes.
- **user_master_client**: For a local client copy with the SAP copy profile SAP_ALL the user data can be copied from a different client. This client number can be entered here.

16. Support

16.1. Provisioning of Software Updates, Upgrades (Standard Support)

Libelle is continuously updating its software products to expand functionality and fix potential issues with its software. Libelle will provide, free of charge to customer, Software Updates and Software upgrades. Libelle will supply the Customer with unlimited copies of any of these updates and/or enhancements without additional charge.

16.2. Access to free License Transfers

Maintenance includes free license transfers to and from supported platforms to another without any additional license charges within the maintenance scope.

16.3. Hotline with Online and Email Support

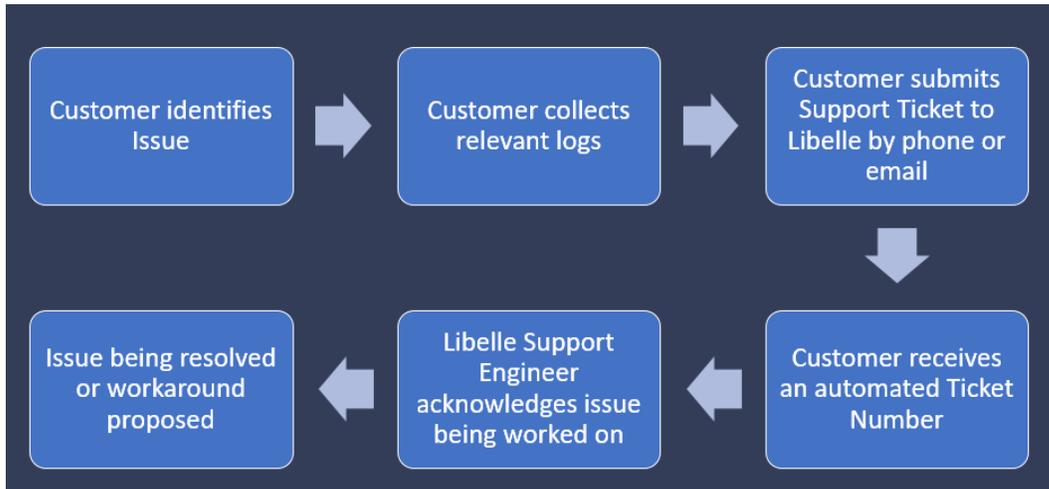
Libelle provides Hotline services to support troubleshooting via telephone, email, online screen sharing for use and operation of the Libelle Software via its central Ticketing System. Libelle will recommend and coordinate upgrades for Software. As part of this proposal, Libelle provides free access to the Libelle U.S.-based Hotline Monday – Friday 8:30am – 7:30pm U.S. Eastern Time for customers in North-, Middle- and South America and 8:30am – 5:30pm European Central Time for customers in Europe, Middle East and Africa (EMEA).

16.4. Guaranteed Reaction Times

Libelle works towards the fastest possible reaction times and will try to fix critical issues as fast as possible. Libelle US includes a guaranteed maximum reaction time for tickets of 4 hours for Libelle SystemCopy in the Americas and up to 1 business day in EMEA.

16.5. Incident Management

The following Flow Chart outlines the Support Process:



16.6. Escalation Management (Custom Enterprise plan only)

If issues remain unresolved, Customer will initiate an escalation process by which Libelle will nominate a Steering Group consisting of members from Libelle Sales, Support and Development. Libelle will assign a special problem manager who will write an action plan to manage the process of issue resolution. This plan will set out actions and responsibilities, milestones, planned review points and further escalation criteria. Such plan shall be immediately agreed with and communicated to Customer. Should the issue remain unresolved, the Error and its resolution by the Supplier will be escalated to the steering group for immediate action.

16.7. Personalized System Support (Custom Enterprise plan only)

Libelle Hotline is staffed with certified Libelle consultants who rotate between hotline and field installations. With that, the person who is/ was leading the installation at customer is the primary contact person for hotline and for providing continuous integration support to. With that, established communication and environment-specific know-how will be fully leveraged.

16.8. Itemized Support Coverage

Item	Implementation Phase	Standard Maintenance	Custom Enterprise Plan
Help with the LSC Server Agent if installation was setup by Libelle	✓	✓	✓

Help with the LSC Server Agent if installation was setup by certified Partner	✓	✓	✓
Help with any LSC Standard Tasks	✓	✓	✓
Help with DBCopy tool in place	✓	✓	✓
Help with LSC Workflow	✓	✓	✓
Support in identifying if any issues are related to Libelle Standard Tasks or not.	✓	✓	✓
Support with SAP environment unrelated to LSC	✓	✗	✗
Support during DB copy outside Libelle Copy tool	✓	✗	✓
Support for adding new tasks to the environment	✓	✗	✓
Pro-active support during SAP Upgrades as it affects Libelle LSC	✓	✗	✓
Weekend Support	✓	✗	✗
Install additional Server Agents	✓	✗	✓
Setup and configure additional standard tasks	✓	✗	✓
Support developing custom tasks	✓	✗	✓
Assisted System Refreshes with tool	✓	✗	✗
Standby support during critical refreshes during Hotline Hours	✓	✗	✓
Personalized System Support (Dedicated System Engineer)	✓	✗	✓

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