



SAP System Copy Automation Orchestrate And Accelerate The SAP Refresh Execution



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1. Introduction

Stonebranch builds IT orchestration and automation solutions that transform business IT environments from simple IT task automation into sophisticated, real-time business service automation. No matter the degree of automation, the Stonebranch platform is simple, modern, and secure. Using the Stonebranch Universal Automation Platform, enterprises can seamlessly orchestrate workloads and data across technology ecosystems and silos. Headquartered in Atlanta, Georgia, with points of contact and support throughout the Americas, Europe, and Asia, Stonebranch serves some of the world's largest financial, manufacturing, healthcare, travel, transportation, energy, and technology institutions.

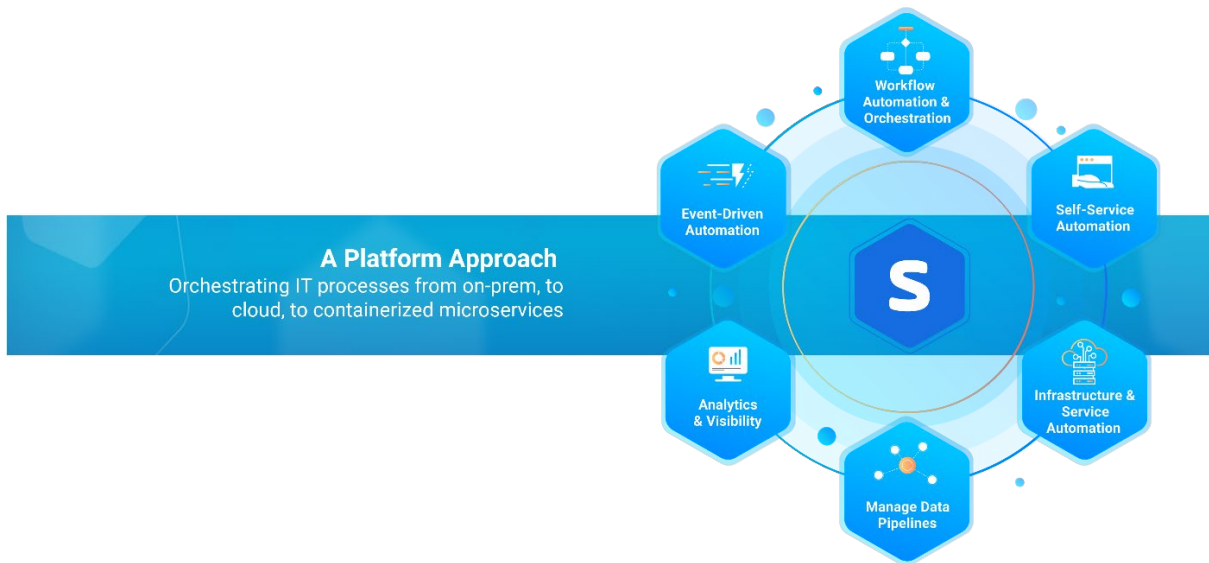


Figure 1: Real-Time Hybrid IT Automation Platform - Overview

Stonebranch offers the most modern real-time IT automation and orchestration platform designed to centrally manage and orchestrate automated jobs, tasks and workflows across hybrid IT environments from on-prem to the cloud. Within the UAC platform, we have five key solution areas. The focus is to provide an expandable and future proof solution where you can automate and orchestrate anything you need from a single platform.



Figure 2: Key Solution Portfolio

2. Scope

This whitepaper outlines how Universal Automation Center (UAC) integrated with Libelle's System Copy (LSC) automation solution can fully orchestrate and accelerate the SAP refresh execution.

Stonebranch is partnering with Libelle to support scheduling of automated SAP System Copy Workflows using Universal Automation Center in cloud (or on-premise).

The integration allows to import an SAP System Copy Workflow pre-configured in Libelle LSC into Universal Automation Center. The REST Webservice based import process is done via a single mouse click in the Universal Controller Web-GUI. Once imported the SAP System Copy Workflow can be operated by your existing Scheduling Team like any other SAP or Non-SAP Scheduling Workflow. The operation of the automated System Copy Workflow is done using the Universal Automation Center Web-GUI. Universal Automation Center is available as fully cloud enabled SaaS solution or can be deployed on-premise.

Key Benefits of the Integrated Solution

- One single solution for System Refreshes, System Clones, Client Copies, and Data Masking for any SAP System including HANA and S/4 HANA deployments
- Automated Database Copy – automate the Database Backup/ Restore/ Rename incl. automation for HANA DB Snapshots for fast provisioning of a database copy in minutes instead of hours
- Highly reduced costs by scheduling and operating your SAP System copy process from the Cloud (or on-premise) by your existing Scheduling Team – No SAP Expert required
- Reduced complexity by having a single solution for SAP System Copies and SAP (ABAP, BW PC, SAP BO, SAP DS, SAP HCI etc.) and Non-SAP scheduling activities
- Highly reduced operations efforts by scheduling and monitoring the End-to-End System Copy Process via a single Web-GUI
- Reduced manual efforts, execution time and errors by using predefined automation workflows and tasks and not a collection of scripts. The solution comes with an extensive set of nearly 500 pre-configured refresh tasks, always updated to support the latest SAP Systems.
- Proven Solution – More than 250 customers run the underlying Libelle LSC solution today. Universal Automation Center is used for SAP scheduling since 1999 at some of world's largest companies.

The following picture outlines the SAP System Refresh phases automated by the solution:

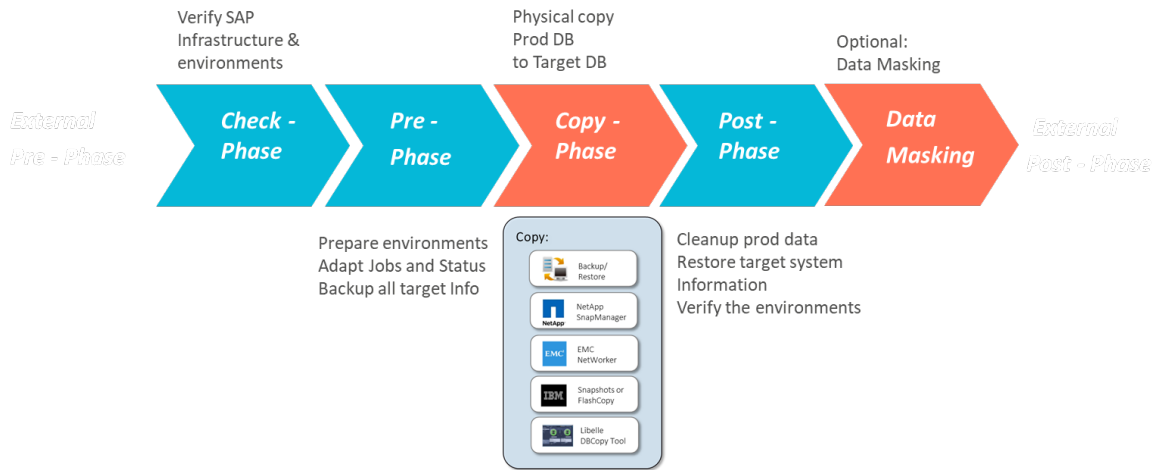


Figure 3: SAP System Copy Workflow Steps

2.1. What are System Refreshes?

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.

System Refreshes are understood as complete homogeneous system copies.

'System Refreshes' in the context of Universal Automation Center (UAC) integrated with Libelle (LSC) means both Homogeneous System Copies and Client Refreshes.

Client Copies are also covered by the solution – there are many instances where client copies make perfect sense. They are used either as local or remote client copies for example with Development systems or if there are multiple clients in QAS systems. Finally, System Clones where new SAP systems are duplicated from existing systems, are covered with UAC integrated with LSC using a custom repository.

The diagram below shows a sequence of System Refreshes, System Clones, local Client Copies, and remote Client Copies. UAC integrated with LSC provides end-to-end automated workflows for most common scenarios. The processes outlined in this whitepaper are centered around the actual System Refresh process using Universal Automation Center integrated with LSC. The vast majority of points presented apply equally to Client Copies and System Clones.

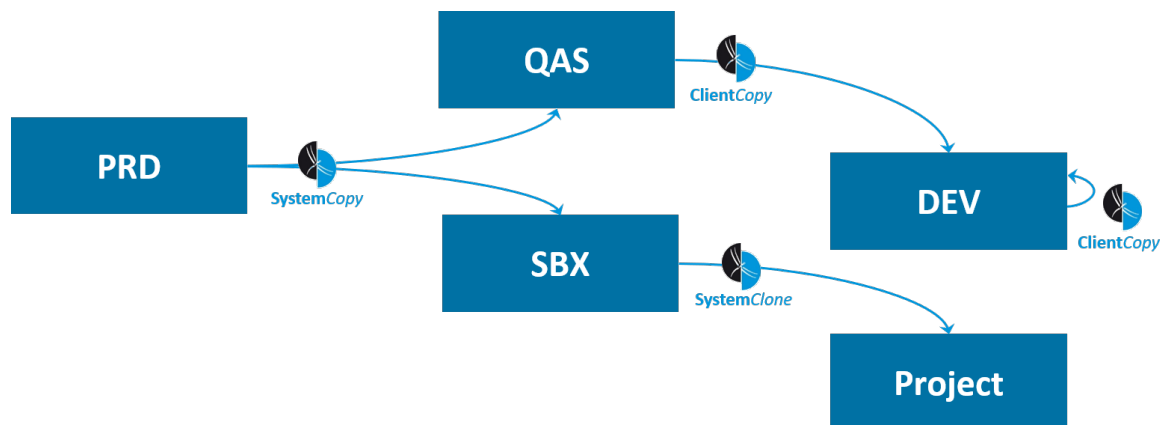


Figure 4: System and Client Refreshes Sources and Destinations

2.2. Refresh Challenges and Opportunities

Production support systems within SAP landscapes are designed to fulfil a specific role and deliver dedicated functionality in the application lifecycle. With that, creating a single QAS system involves considerations for more than 50-80 different areas within the SAP application after the database was copied from production. This including settings such as users, security, logical system name conversions (BDLS), RFC connections, transports, STRUST settings, to name only a few.

Main challenges of a workflow that is not fully automated includes the fact that the process is prone to errors and mishaps when executed manually. Wait periods in the process prevent Administrators to focus on the workflow. Human labor cannot easily be cascaded across multiple refreshes. Finally, the manual process is intrusive: Production Support systems are unavailable during refresh.

Manual executions of System Refreshes are expensive in multiple dimensions: They are time-, labor-, and know-how intensive. It is a repetitive process and multiple systems require several refreshes regularly. Systems are down for hours or days during execution.

Automating refreshes end-to-end and centering the workflow around an orchestration solution such as Universal Automation Center Workflows, brings many opportunities for the business:

- **Highly predictable:** Refreshes are part of the lifecycle and have to be delivered. Predictability leads to IT and business being more confident in the results and requesting more refreshes.
- **Higher refresh frequencies:** Delivering refreshes in hours instead of days allows for more refreshes. Customers can increase refresh intervals to quarterly or monthly from annually.
- **High Span of Control:** For years, outsourcing to low-cost SAP service provider was the only option to manage complexity and improve the bottom line for the business. Today, with software such as Universal Automation Center integrated with LSC, your

inhouse or outsourced Scheduling Team could operating your SAP System copy process using the Universal Controller in cloud (or on premise) WEB-GUI – No SAP Basis team member is required.

- **Lower Operating Costs:** Refresh automation allows the IT department to be more flexible with lower operating costs, aggressively increase operational efficiency of own operation, and reduce endless attention to repetitive tasks.

3. Solution Description

3.1. Overview

The SAP System Copy solution from Libelle LSC (Libelle System Copy) has been integrated with Stonebranch Universal Automation Center. In Libelle LSC the SAP System refresh workflows are configured using the Libelle LSC GUI. To quickly set-up a System refresh workflow, LSC provides already many predefined automation workflows and an extensive set of nearly 500 pre-configured refresh tasks, always updated to support the latest SAP Systems.

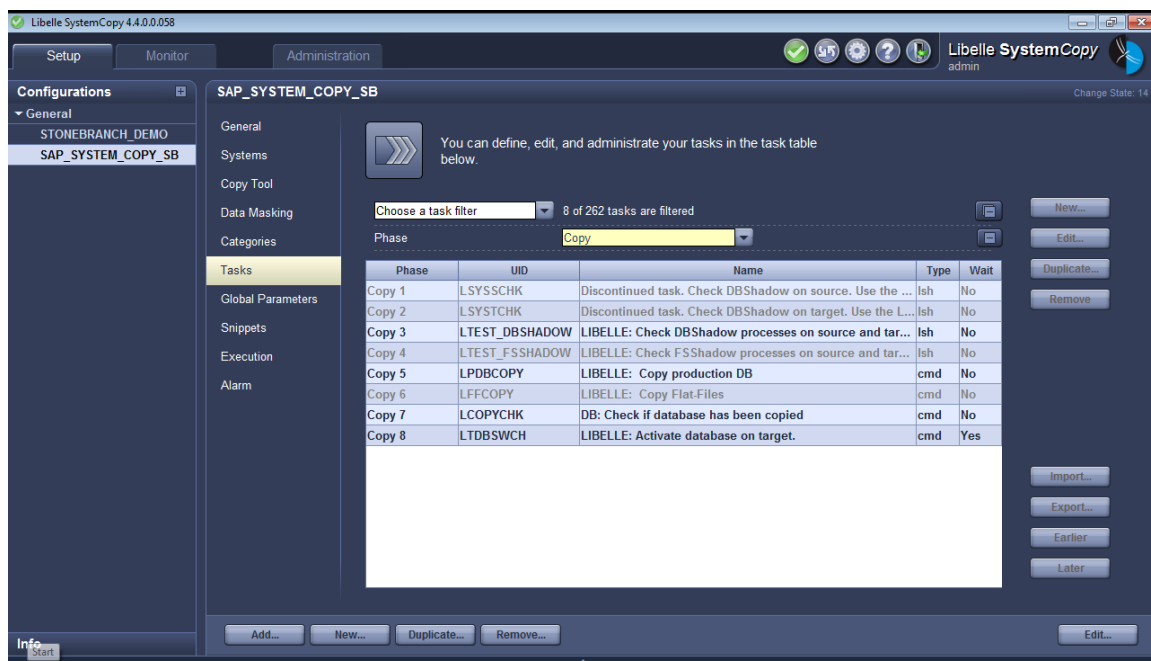


Figure 5: LSC GUI to configure a System Copy process

IMPORT OF WORKFLOWS TO UNIVERSAL AUTOMATION CENTER

The configured Workflows are then import from Libelle LSC into Universal Automation Center by launching the Import LSC-WF Task in the Universal Controller Web-GUI.

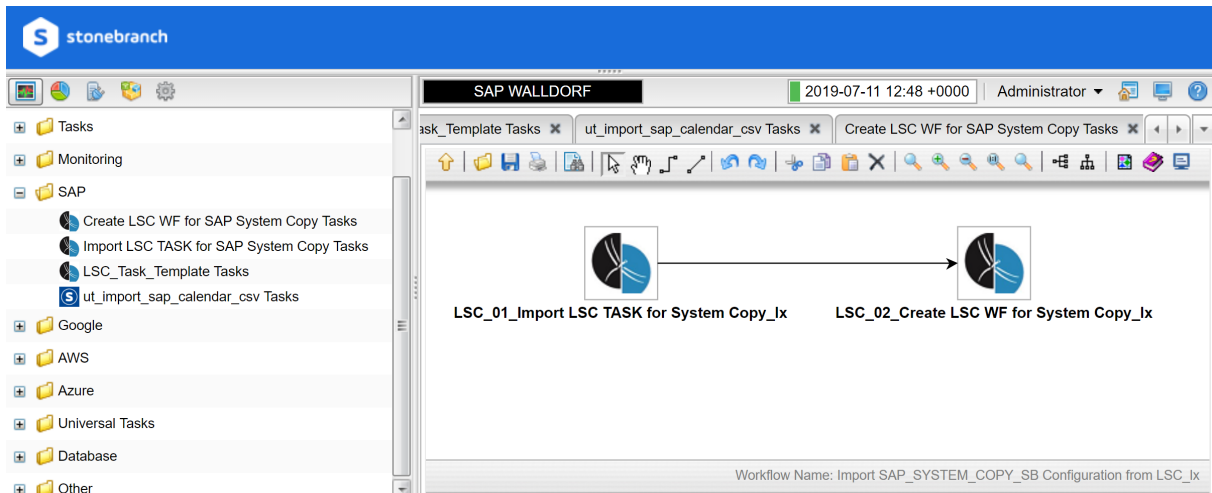


Figure 6: Workflow Imports in UAC

Once imported the SAP System Copy Workflow can be operated from Universal Automation Center. The screenshot below shows an example of an imported SAP System Copy Workflow consisting of four sub-workflows covering all phases of the SAP System Copy process.

System Copy Phases – sub-workflows:

- Check-Phase: Verification, whether all prerequisites are met.
- Pre-Phase: Preparatory work for the system copy is done.
- Copy-Phase: Here the SAP system with the database is copied to the target system.
- Post-Phase: Subsequent work is done at the end.

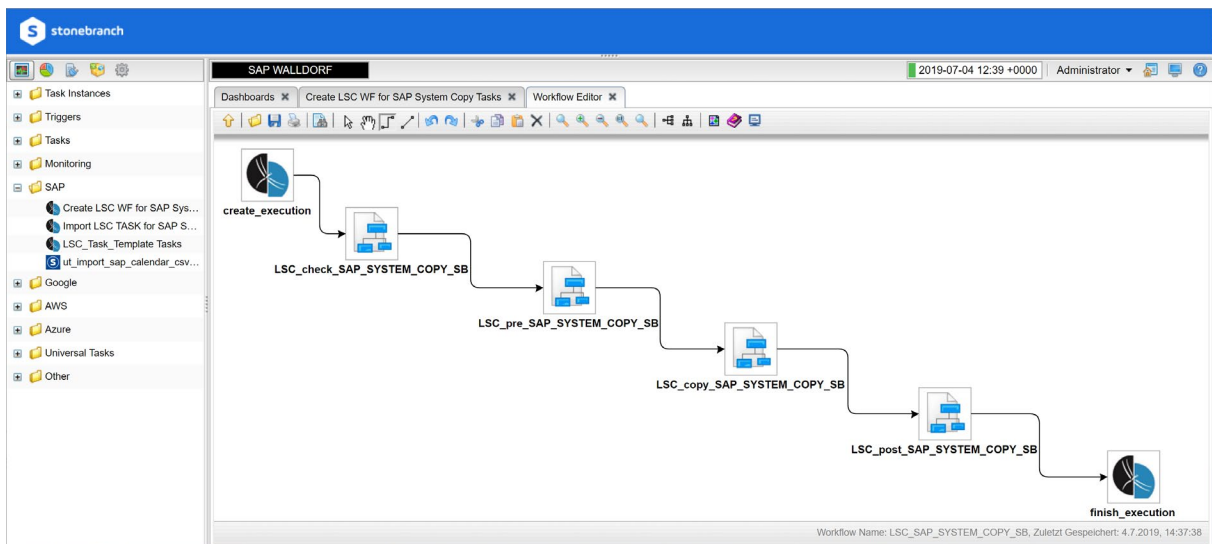


Figure 7: SAP System Copy Workflow

3.2. What is Libelle System Copy?

Libelle System Copy (LSC) automates and accelerates homogeneous system copies for SAP systems. As outlined above, 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.

LSC has three main components: a powerful, yet simple-to-use Automation Framework, an extensive Task Repository with almost 500 pre-configured refresh tasks, and a Management Console for Administrators to configure and execute refreshes.

4. System Refresh Phases

System Refreshes are comprised of four phases with each phase entailing dedicated steps which refers to as Refresh 'Tasks'. The steps have to be done either manually absent of a tool or are fully automated using a Libelle System Copy (LSC) workflow operated by the Universal Controller Web GUI. The phases are as follows:

4.1. Check Phase

During the LSC Check Phase source and target kernel versions and ABAP component versions are checked. Also, connectivity, client settings, and logical system names are validated. The Check Phase can be executed any time prior to a refresh. For development refreshes, there are additional steps that are taken like committing and closing open development work. The screenshot below shows an example of the Check-Phase sub-workflow steps in Universal Automation Center:

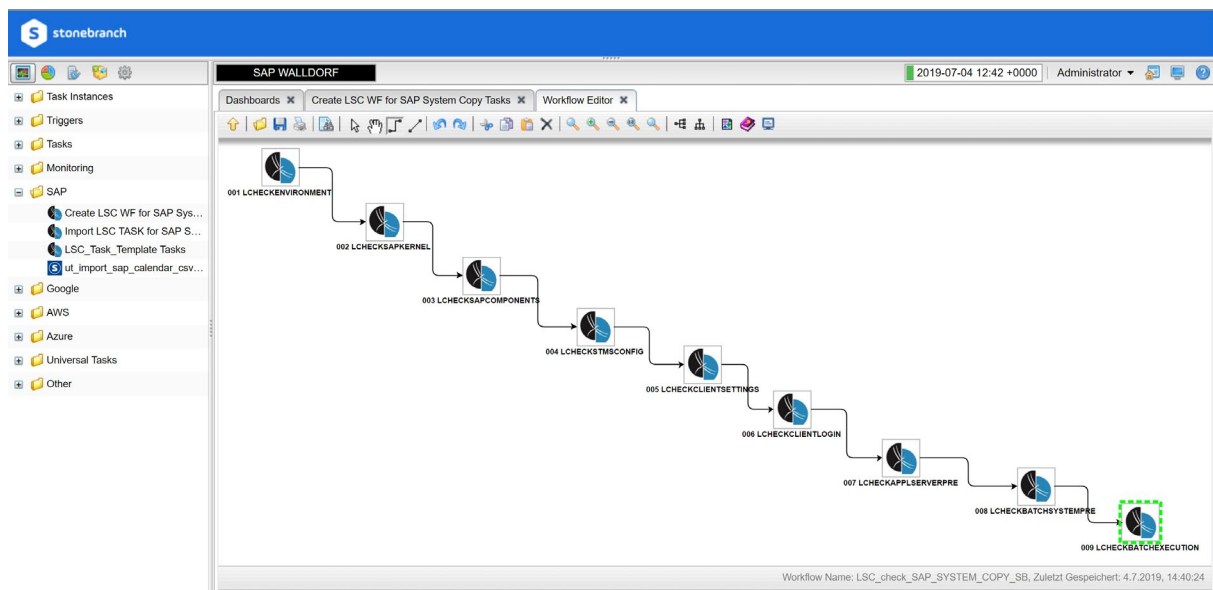


Figure 8: SAP System Copy - Check-Phase: Verification, whether all prerequisites are met

4.2. Pre-Processing Phase

Pre-Processing happens right before the actual QAS system is shut-down prior to the actual refresh starts. This can happen while users can still be using the system. Main goal is to the export and management of approximately 70 T-Codes such as BD54, DB13, DB59, RZ04, RZ10, RZ20, RZ70, SCC4, SCC7, SCC8, SE03, SE06, SE38, SE61, SE80, SECSTORE, SM02, SM14, SM28, SM 37, SM 38, SM51, SM58, SM59, SM61, SM65, SM69, SMLLG, SMQR, SMQS, SMT1, SMWO, SNC, SP12, SR13, SS02, ST03, STMS, STRUST, WE20, and more. Other Pre-Processing tasks include export of JAVA configuration and an inventory of pending transports so that they can be re-applied in post-processing.

4.3. Copy Phase

During the Copy Phase, a complete physical or snapshot copy of the production database is executed. This can be a live copy directly from production, or an automated restore from a previously created backup. The Copy Phase works slightly differently for the different database (HANA DB, SAP ASE, SAP MaxDB, Oracle, MS SQL, or DB2). Additional pre-, and post-database copy steps are managing settings such as HANA DB users, or recovering specific redo-log files to achieve a landscape-wide consistent recovery point across multiple SAP Systems (for example if ECC, BI, and CRM are refreshed together).

4.4. Post-Processing Phase

Post-Processing typically presents the highest amount of work and time during the refresh. It requires the import and management of appropriate T-Codes exported in Pre-Processing. JAVA configuration settings are imported, and Logical System Name Conversions are executed. Background screens are restored, and transports are re-imported either with or without an optional manual validation. Finally, the SAP systems need to be started in the

correct sequence of starting Central Instance first, Application Server second, and grant users' access at the end.

4.5. Data Masking Phase (optional)

System Refreshes are often followed by an automated data masking phase or 'data sanitation' phase. This process removes sensitive data from non-production system and replaces it with random data. Libelle provides a specific implementation for Data Masking with its very own Libelle Data Masking solution.

Core Refresh Phases are: Pre-Processing covering mostly configuration table exports, a full database copy, followed by post-processing including imports, BDLS, and other post-steps.

4.6. Web-based Monitoring & Reporting of Execution Phases

The execution of the different System Refresh Phases can be monitored in real-time via the Universal Controller Web-GUI. Different real-time views are available e.g. List view, Tree View, Dashboard view and workflow view. Each view can be configured by the user to display the information he requires. The following screenshots are showing an example of the Tree view, dashboard and Workflow view – displaying also predictive analysis data for each Processing step like: Lowest Estimated End Time, Highest Estimated End Time, Average Estimated End Time etc.

Instance Name	Type	Status	Lowest Estimated End Time	Highest Estimated End Time	Average Estimated End Time
LSC_SAP_SYSTEM_COPY_SB	Workflow	Running	2019-07-04 16:09:31 +0000	2019-07-04 16:09:31 +0000	2019-07-04 16:09:31 +0000
create_execution	Universal	Success	2019-07-04 13:49:43 +0000	2019-07-04 13:49:44 +0000	2019-07-04 13:49:44 +0000
finish_execution	Universal	Waiting			
LSC_check_SAP_SYSTEM_COPY_SB	Workflow	Success	2019-07-04 13:50:31 +0000	2019-07-04 13:50:34 +0000	2019-07-04 13:50:33 +0000
LSC_copy_SAP_SYSTEM_COPY_SB	Workflow	Running	2019-07-12 07:27:56 +0000	2019-07-12 07:27:56 +0000	2019-07-12 07:27:56 +0000
001 LTEST_FSSHADOW	Universal	Success	2019-07-12 07:26:38 +0000	2019-07-12 07:26:38 +0000	2019-07-12 07:26:38 +0000
002 LTEST_LASA	Universal	Success	2019-07-12 07:26:44 +0000	2019-07-12 07:26:44 +0000	2019-07-12 07:26:44 +0000
003 LREAD_DEVICES_TRG	Universal	Success	2019-07-12 07:26:49 +0000	2019-07-12 07:26:49 +0000	2019-07-12 07:26:49 +0000
004 LREAD_DEVICES_SRC	Universal	Success	2019-07-12 07:26:56 +0000	2019-07-12 07:26:56 +0000	2019-07-12 07:26:56 +0000
005 LTDBDROP	Universal	Success	2019-07-12 07:27:00 +0000	2019-07-12 07:27:00 +0000	2019-07-12 07:27:00 +0000
006 LDROP_DEVICES	Universal	Success	2019-07-12 07:27:07 +0000	2019-07-12 07:27:07 +0000	2019-07-12 07:27:07 +0000
007 LDEL_DEVICES	Universal	Success	2019-07-12 07:27:11 +0000	2019-07-12 07:27:11 +0000	2019-07-12 07:27:11 +0000
008 LDBDUMP	Universal	Success	2019-07-12 07:27:18 +0000	2019-07-12 07:27:18 +0000	2019-07-12 07:27:18 +0000
009 LCREATE_DEVICES	Universal	Success	2019-07-12 07:27:22 +0000	2019-07-12 07:27:22 +0000	2019-07-12 07:27:22 +0000
010 LDBCREATE	Universal	Success	2019-07-12 07:27:29 +0000	2019-07-12 07:27:29 +0000	2019-07-12 07:27:29 +0000
011 LDBCHK	Universal	Running	2019-07-12 07:27:33 +0000	2019-07-12 07:27:33 +0000	2019-07-12 07:27:33 +0000
012 LDBLOAD	Universal	Waiting			
013 LSWITCHSET	Universal	Waiting			
014 LRECOVERSTART	Universal	Waiting			

Figure 9: SAP System Copy – Tree View of the System Refresh processing steps

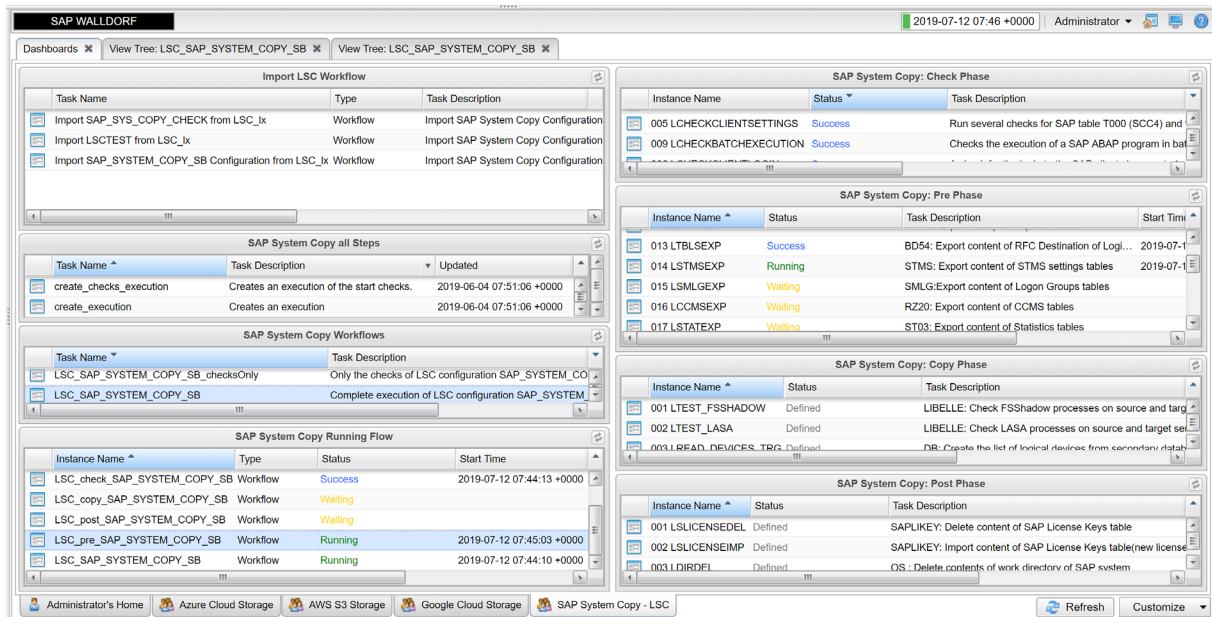


Figure 10: SAP System Copy – System Refresh Dashboard

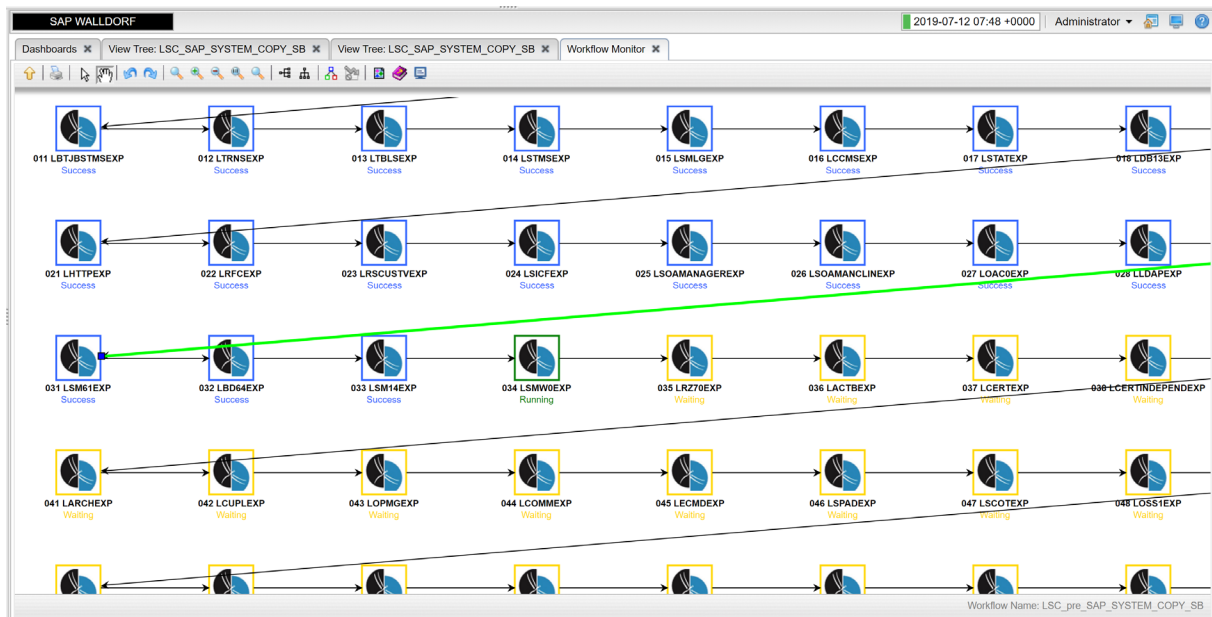


Figure 11: SAP System Copy – System Refresh Workflow view

AUDITING AND REPORTING

Each executed System refresh Process including all Workflow and Task instances is saved for auditing purpose in the Universal Automation Center database and can be analyzed using the inbuild fully configurable reporting engine.

5. Setup and Operation of the Solution

All operations and executions are contained inside the customers network with no outside connections required. Additional LSC worker agents are installed on systems that are participating in the refresh as required. After configuring SAP and database connections, a workflow editor provides a standard refresh template for the specific environment and refresh steps are adjusted or expanded as needed. After the template is activated the configured Workflow is imported by a single Mouse Click to Universal Controller. Once imported refresh execution is then conveniently monitored and managed through the Universal Controller Web GUI. The Universal Controller is also available as SaaS Cloud deployment allowing you to perform the System Copy operations from any of your locations.

LSC is based on a powerful automation framework. It runs on an LSC Master Servers to centrally manage configurations, distributed LSC Worker Agents and refresh Executions. Both LSC Master 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 making adjustments. Once installed, Workers can be updated to the newest version from the Master. Installing LSC Master, 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.

Key components of the LSC Automation Framework include:

- LSC Master Server installation(s) on a standalone Linux, Unix, or Windows Server; additional Worker installation(s) on the systems where refresh steps are executed; Libelle Connectors to communicate with/between SAP Systems, database, and servers.
- LSC Task Repository including nearly 500 pre-configured tasks, workflow orchestration and workflow management engine.
- LSC role-based GUI(s) for refresh configuration and refresh management

LSC Tasks fall into the following categories. They can be either LSC Standard Tasks from the Libelle Repository, tasks developed by customer, or custom tasks built by Libelle for a specific customer.

- **Tasks for SAP Tables and Database Operations:** R3Trans Exports/ Deletes/ Imports, SQL Connectors for SAP HANA, SAP ASE, SAP MaxDB, Oracle, DB2, and MS SQL Server.
- **Tasks for Unix, Linux, and Windows Script Executions:** Shell Script Executor, PowerShell Executor, Libelle Shell Executor, and others.
- **Tasks to execute SAP Functions:** Generic R3Trans Tasks, execution of ABAP programs via SAP's standard SDK, or execution of SAP executables or Reports.
- **Tasks to manage Refresh Workflow:** Manual breakpoints, multi-system synchronization tasks, and Email Status Tasks.

UNIVERSAL CONTROLLER:

The Universal Controller to execute and monitor the System Refresh workflow runs as Web Application in a Tomcat Application server. All configurations, reports, activity and audit logs are stored in an external Database, which can be Oracle, SQLSERVER or MySQL. Universal Controller can be provided with zero installation as a High Available Cloud Application or can be deployed on-premise on a Linux or Windows Operating system within a few hours.

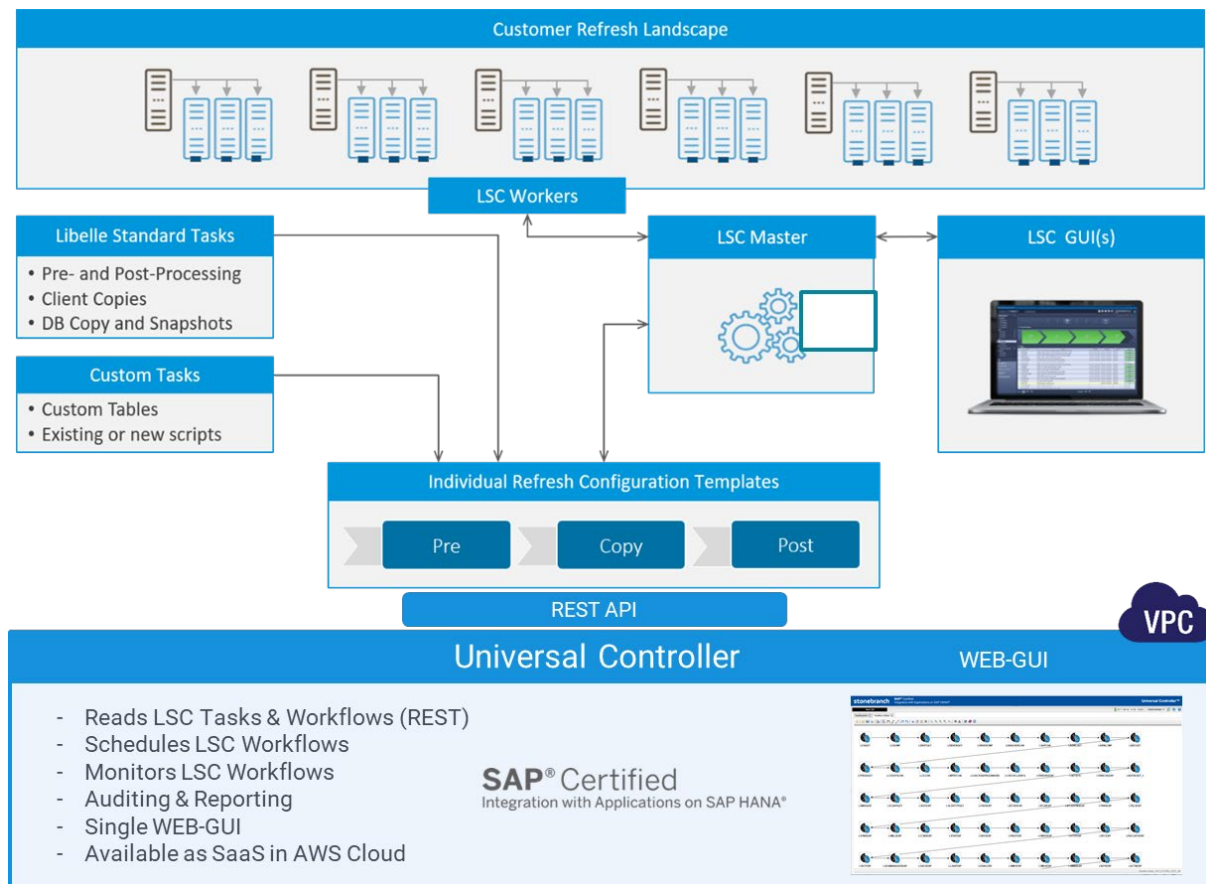


Figure 12: LSC Architecture Overview

5.1. Setup SAP Configuration in LSC

After installing the LSC Master Server, basic settings for each required system are configured. LSC supports multi-system configurations to support installation where for example a standalone Database Hosts runs separately from the Central Service Server. Configurations can be easily duplicated via the LSC GUI. All configuration data is stored on the Master Server. Connections to the SAP system are made via the Standard SAP SDK. Only requirement inside SAP, is to setup a Libelle SAP user on the system that needs to be refreshed with defined authorizations for refresh tasks. Below a screenshot from an LSC GUI defining the SAP configuration of a QAS Central Services System.

S4H_SQ1 Change State: 41

General

Systems System Identifier: SQ1

Copy Tool

Data Masking

Categories

Tasks

Global Parameters

Snippets

Execution

Alarm

Authorizations

Host Name: localhost

Description:

JRE Home Directory:

UTC Offset: -0500

System Roles

Source SAP	Source Database	Target SAP	Target Database	Satellite System
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

SAP Data

System Type: ECC

Basis Release: 750

System Name: SQ1

User Name <sid>adm: sq1adm

Password <sid>adm:

License Type: New

Java Instance Home:

Profile File: /usr/sap/SQ1/SYS/profile/SQ1_DVEBMGS00_scosapt1

Support Stack: 04

Instance Number: 00

Client	User Name	Password	Logical System Name	Copy	Default
000	libelle		<input checked="" type="checkbox"/>	<input type="radio"/>
200	libelle	SQ1CLNT200	<input checked="" type="checkbox"/>	<input type="radio"/>

New Remove

Database Data

Type: HANA

Database Name: SQ1

Instance: 00

Home Directory: /hana/shared/SQ1/HDB00

Port: 30041

User Name: system

Password:

ABAP Stack

Schema Owner: SAPABAP1

Schema Password:

Java Stack

Schema User:

Schema Password:

Save Cancel

Figure 13: Introduce SAP System Configuration to LSC

5.2. Refresh Template Management

In addition to providing a powerful workflow editor for setting up individual refresh configurations, LSC provides an easy-to-use Template Engine so that customers can define their own standard refresh templates.

All configured Refresh Configuration are available as Template Configuration. Changes in configurations can be easily updated in the respective template and are then available to derive refresh configuration for future refreshes.

Instead of editing each and every single configuration, customers can make workflow edits in the template for their refresh type such as ECC. Individual workflow configurations such as refresh for QA2 are then derived from the template to make them consistent with other QA refreshes for that system type. Also, workflows as well as templates have a detailed change log so each and every workflow change can be traced down to date, time, and LSC user.

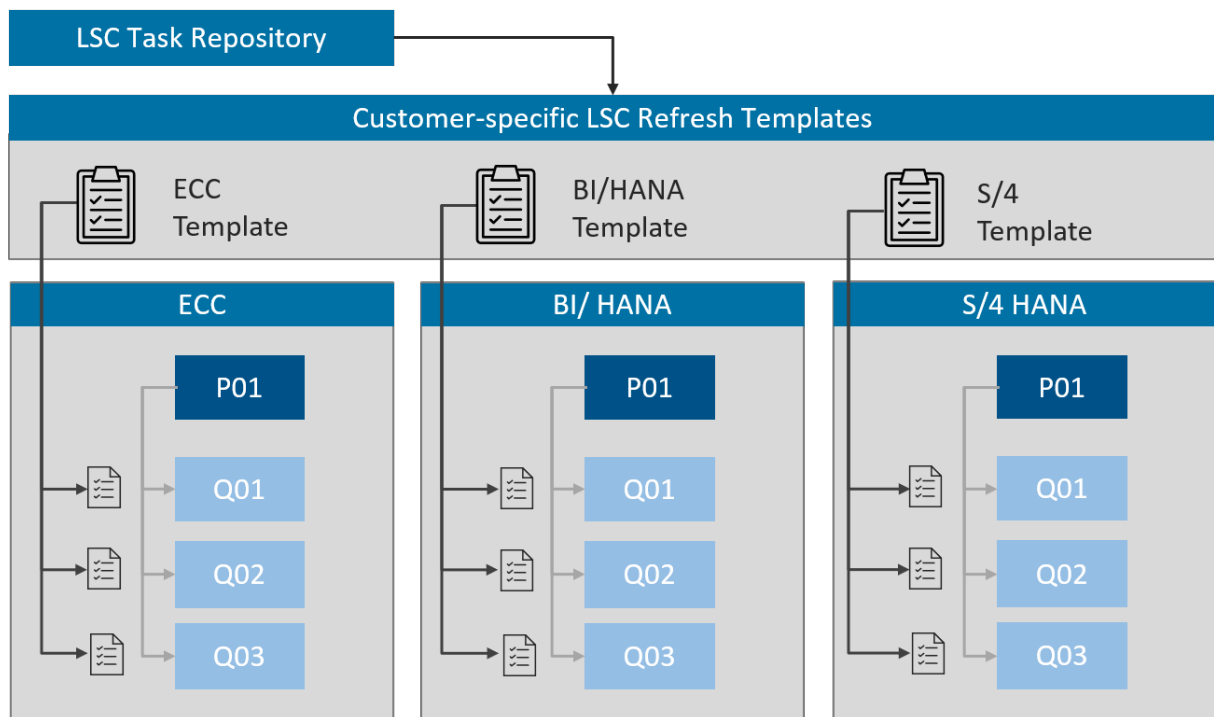


Figure 14: Refresh Template Management with LSC

6. Refresh Workflow and LSC Task Repository

LSC comes with an extensive set of nearly 500 pre-configured refresh tasks. Each single task has been carefully designed, built and tested, and is maintained by Libelle on an ongoing basis. New SAP releases might require task updates as additional tables are added. Libelle is pro-actively maintaining the tasks and updates ahead of time. Libelle also actively seeks feedback from existing customers on their refresh experience and incorporates new tasks as possible.

6.1. LSC Refresh Task Types

The LSC Task Repository can be classified into four categories:

1. **Standard Pre-Processing Tasks:** Includes the export and management of the 50-70 T-Codes or areas containing mostly configuration data. It also includes the system stop sequences for SAP Landscapes
2. **Standard Database Copy Tasks:** DB Copy Automation tasks for SAP HANA, SAP ASE, SAP MaxDB, Oracle, DB2, MS SQL Server. Copy tasks come as a variety of copy options from automated backup-restore, restore-only, database snapshots, or online copy from Production or other systems.
3. **Standard Post-Processing Tasks:** Includes the import and management of configuration tables exported in Pre-Processing. Other post-processing tasks includes logical system name conversions (BDLS), TemSe consistency checks, and system start sequences.
4. **Module-Specific and Cross-Functional Tasks:** Includes tasks specific to BI, SCM, LiveCache, CRM, and others which are not included in the standard Task Repository for NetWeaver for ECC; tasks for PI connections, CRM Middleware, RSA Admin tables, and SOA Manager; tasks for export/ import of JAVA stacks for dual-stack systems; tasks for managing Transport Deltas. Tasks for End User Messages and retention of Background Screens. System Copy or Client Copy Tasks for refreshing Development Systems.

6.2. Automation of Typical Refresh Tasks

The following is an overview of typical refresh tasks that are automated with LSC. This is not a complete list, but rather a selection of core steps taken.

Area	Description
Manage Transports	Refreshes require handling of pending transports in QAS systems. LSC has pre-configured tasks to export the transport request tables, creating a list of delta transports, and either imports them automatically in post-processing, or creates a list that can be validated manually by the customer prior to releasing them into the refreshed system.
Manage Batch Processing	During the refresh, Batch jobs need to be handled properly. LSC has pre-configured tasks to put batch job in suspend mode on QAS, export them in suspend state and re-import them in post-processing in suspend state.
Retain Logon Screens	Non-Production systems typically have logon screens that differ from production to indicate the type and nature of this system. LSC retains the logon screens as part of the refresh.
Broadcast SAP Messages	Users will need to log-off QAS prior to the refresh. LSC provides tasks to broadcast customizable messages inside SAP prior to the refresh.
SAP Stop and Start Sequences	During refresh, QAS will be shut down and started during post-processing. This requires a specific sequence of steps which are included with LSC.
Retain RFCs, Profiles, Users, Printers	RFCs, Profiles, Users, and Printers will be copied from Production during the refresh. LSC provides tasks to export all relevant tables during pre-processing, and re-import them in post-processing to retain settings.
Export and Import JAVA stack	For dual-stack systems, LSC provides tasks to export the JAVA settings on the file level in pre-processing, and import them in post-processing.
Central User Administration	If SAP users are administrated centrally, LSC has tasks to export all of the configuration necessary for CUA (Central user administration) and import them back after database copy into the target system.
Manage SAP Licenses	Specific tasks in LSC take care of SAP licenses including 'old' and 'new' formats of SAP licenses.

Area	Description
Retain SecStore Settings	SAP stores encrypted data required by the Application when logging on to other systems. The encrypted storage (SecStore) prevents unauthorized persons or programs to access this data. LSC tasks export and import SecStore related tables during the refresh.

Table 1: Automating typical refresh Tasks

6.3. Database Copy Automation

The database copy phase is executed following the pre-processing phase which revolved mostly around exporting configuration tables, and prior to LSC post-processing which covers all configuration table imports and post-steps such as BDLS. Libelle provides a variety of database copy tools, pre-configured workflows, repository tasks, and snapshot integration tasks to fully automate the database copy phase. Libelle supports all database platforms supported by SAP including SAP ASE, SAP MaxDB, SAP HANA, Oracle, DB2, and MS SQL Server.

LSC provides a pre-configured automated database copy via backup/ restore, database snapshots, or integrate customer scripts into the refresh workflow. It is also very simple to combine existing LSC tasks with custom requirements.

Roughly speaking, the database copy is executed in three database-specific phases: database pre-copy, database copy, and database post-copy. A specific implementation of the copy workflow is Libelle's Snapshot Integration that is available for common snapshot tools, and popular cloud platforms such as AWS, Azure, and GCP. An example of this integration is outlined in the SAP HANA section of this whitepaper.

6.4. Accelerate Logical System Name Conversions (BDLS)

The SAP transaction BDLS is executed after a System Refresh or Client Copy. BDLS converts logical system names that came from production with the database copy into the logical system names of the new target system. If there are multiple connected systems, multiple conversions are done. Runtime for a non-optimized BDLS execution can range from hours to a few days.

Executing logical System Name Conversations (BDLS) can take many hours, or even days. Libelle's BDLS implementation drastically accelerates BDLS and customers can expect a 50% improvement, though even often reduce run-time by factors 3-5.

The latest BDLS iteration brings massive performance improvements. Customer simply provide BDLS parameter such as the individual threshold for large tables, and system names during configuration of the workflow or workflow template: A highly optimized algorithm as outlined below delivers a highly accelerated execution. Paired with a fast-performing database such as SAP HANA, BDLS is no longer the bottleneck of a refresh.

LSC's BDLS Phase	Tasks Executed
Identify	Inventory of required conversions; identifies approximately 1,800 BDLS conversion tables
Prepare	Define threshold for large tables (e.g. >500k rows), identify large tables, execute standard BDLS on small tables, and handover large tables for LSC bulk-update algorithm.
Index	Create database indexes for identified large tables and drop secondary indexes.
Update	Run optimized BDLS for large tables with updates in parallel across/ within large tables.
Cleanup	Drop BDLS Indexes and rebuild secondary indexes.

Table 2: Steps for Accelerated BDLS Execution

7. Refreshing SAP HANA with LSC

Since SAP released the very first version of SAP HANA, Libelle has been diligently adopting and expanding LSC to support refreshes for SAP HANA. LSC has been successfully supporting countless customers migrating their refresh workflows to Suite on HANA and S/4 HANA. Over the years of executing refreshes for SAP HANA, we gained valuable insights and best practices for the latest platform and include many of them in this chapter. This chapter covers both Suite on HANA and S/4 HANA refreshes.

7.1. SAP HANA vs. Legacy Refreshes: Key Points

From a technical perspective – and except for managing the database copy during the Refresh Copy Phase – the refresh workflow for SAP HANA does not fundamentally differ from refresh workflows for legacy systems. Suite on HANA and S/4 HANA are fully running on the SAP NetWeaver platform and thus most steps for a refresh are identical. However, there are a few exceptions and best practices to follow as outlined in here. Not all SAP HANA related steps are covered in this whitepaper.

Compared to Legacy SAP Platforms and except for the database copy phase, the vast majority of the workflow of Legacy Refreshes versus SAP HANA is identical. Most of the changes are driven by newly available tools and covering a few additional new objects.

7.1.1. SAP HANA means higher Grade of Standardization

SAP HANA means highly standardized SAP operation. For decades, SAP supported a large number of operating systems and databases. This was opening up opportunities, but also meant a fragmentation where almost no single SAP installation was matching another. Each SAP installation was unique starting with a combination of Operating System and Database

platform and a myriad of different landscape management options such as system management, backup tools, and more.

With SAP HANA, systems are installed and operated very uniformly. Solutions such as LSC can now provide even more standardized workflows that suits the vast majority of customers. Result is a more uniform, faster, and highly orchestrated process.

7.1.2. Simplified Database Handling with SAP HANA

Overall, SAP HANA is simple to operate and manage compared to legacy platforms. Besides providing the key concepts of in-memory storage and a column-oriented DBMS, SAP consequently incorporated best practices when SAP HANA was designed and built. SAP has nearly three decades of working with different database technologies and with SAP MaxDB and SAP ASE actively developed its own DBMS for years. This results in noticeable simpler database handling with less moving pieces that have to be taken in consideration.

In context of system refreshes, the backup, restore, and database snapshot commands required for a database copy are straight-forward, easy to execute, thus easy to automate and incorporate in an end-to-end automated workflow. HANA DB backup and restore executes very fast from the internal algorithms, and are further accelerated by powerful hardware, storage, I/O bandwidth, and the fact that HANA DBs are generally smaller in size than legacy databases.

7.1.3. Potential for Speed

SAP HANA runs on very powerful hardware in terms of available I/O, storage, memory, and number of CPUs. Even an unoptimized or only semi-automated system refresh workflow will see reasonable improvements in execution times. Still, hardware alone cannot fix inefficient algorithms. An example is the sequential execution of BDLS of large table. Libelle has been optimizing refresh workflows for years to overcome hardware limitations, ad worked in extreme requirements such as updating tables with hundreds of millions of rows for BDLS conversions.

Libelle System Copy feeds powerful algorithms to powerful hardware reducing end-to-end refresh execution times to hours from days.

7.2. SAP HANA – Database Copy Automation

The database copy phase in the context of System Refreshes is the process of orchestrating a full database copy as outlined generically in a previous section. This section outlines the specifics of HANA database copy automation which can be achieved by automating database backup/ restore commands or by using HANA DB snapshots. Either scenario is fully supported by LSC.

HANA DB Backup and Restore executes very fast due to the availability of powerful hardware, and fairly efficient algorithms. Additional speed can be achieved by utilizing HANA DB Snapshots.

8. Specifications and Key Features

8.1. Specifications

- Supported Scenarios: Homogeneous System Copies, Local/ Remote Client Copies
- Supported SAP Systems: Any SAP NetWeaver >7.0; Prior versions with custom repository
- Supported Platforms: Linux, Windows, UNIX
- Supported Databases: SAP HANA, SAP ASE, SAP MaxDB, Oracle, DB2, MS SQL Server
- Refresh Task Repository: Nearly 500 pre-configured tasks
- Architecture: Central Master Server with worker agents
- Supported Task Types: R3Trans Export/Delete/Import, Shell Scripts, ABAP executions, etc.

8.2. Key Features

- Complete Refresh: Covers thoroughly all aspects of SAP pre-processing (e.g. exports), complete database copy (e.g. snapshots or backup/ restore), and SAP post-processing (e.g. imports, BDLs, TemSe).
- Independent: Runs on a separate EC2 instance without requirement to make any changes to existing SAP landscape or apply transports. Task executions are worker-agent based using Libelle Connectors.
- Powerful Connectors: Generic connectors to execute R3Trans (Table Export, Delete, Import), SQL programs (e.g. SAP HANA, SAP ASE, SAP MaxDB, Oracle, etc.), ABAP executors, Shell Script executors, and many more.

Libelle and Stonebranch sees their joined solution as market leader in terms of completeness of its task repository, performance and operational simplicity.



- Complete Repository: Covers nearly 50-70 T-Codes required for refreshes, cross-functional tasks such as transport delta management or SOA Manager, and application-specific tasks such as tasks specific to BI, LiveCache, or CRM Middleware configurations.
- Simple to implement and simple to use: Up and running in as little as three days for a standard NetWeaver system.
- Web Based Monitoring, Auditing and Reporting – Available as SaaS in the AWS Cloud
- Single SAP certified solution for SAP System Refresh, SAP and NON-SAP Scheduling

9. Why UAC integrated with Libelle for System Refreshes?

Below a few points for consideration when choosing a solution for system refreshes.

- **One-stop Solution** – One single solution for System Refreshes, System Clones, Client Copies, and Data Masking for any SAP System including HANA and S/4 HANA deployments
- **Cloud Ready** – Use your existing Scheduling Team to schedule and operate your SAP System copy process from the Cloud – No SAP Expert required
- **Single solution for Scheduling** of SAP System Copies, SAP and Non-SAP activities
- **Task Repository and Task Updates** – Pre-configured System Refresh workflow, and not a collection of scripts. The pre-configured tasks are carefully designed, engineered, documented with input and output parameters, versioned, regularly updated, and deployed as standard tasks. Other vendors may not provide standard tasks or may provide shell scripts that have been used at another customer and leave the new customer with maintaining scripts. We know from talking to customers using tools from other vendor that once that implementation is completed, scripts must be 100% maintained by customer afterwards.
- **Highly Flexible** – The solution runs 'outside' SAP providing support for tasks running inside and outside SAP if SAP is not running. The solution supports tasks including R3 Trans Task, Exports/ Imports, Database SQL tasks, ABAP programs, running reports, shell scripts and interactive tasks (manual breakpoints for customer to start/ stop/ divert workflow). There is no requirement to load transports into SAP or make any changes to the SAP landscape.
- **Automated Database Copy** – The solution includes Libelle's standard software solution to automate the Database Backup/ Restore/ Rename incl. SAP HANA Snapshot support. It includes an end-to-end database copy phase with the option to split up the Backup and the Restore phases. Also, the automated database copy is fully integrated into the System Copy workflow and framework as part of implementation. Other vendors may only provide options to develop scripts for the workflow.
- **Optimized BDLS** – Libelle provides a highly optimized BDLS implementation as part of the standard repository.

10. Participating Companies

Company	About
	<p>Libelle is a software solution provider with its U.S. headquarters based in Atlanta Georgia. The company was founded in 1994 with its worldwide head-quarters in Stuttgart Germany. Libelle’s solution portfolio includes three main divisions: (1) Complete Data Replication with Libelle BusinessShadow for Oracle, DB2, MS SQL Server, SAP HANA®, SAP MaxDB, SAP ASE® and File Replication; (2) System Refresh Automation for SAP® Systems with Libelle System Copy including add-ons to facilitate Client Refreshes and System Clones, Database Copy Automation, Data Obfuscation automation; (3) Enterprise Data Obfuscation with Libelle DataMasking. Libelle has more than 500 customers across all products worldwide with its solutions installed over 2,000 times combined. Thereof, Libelle System Copy is installed at 250+ customers with thousands of known refresh configurations.</p>
	<p>Stonebranch builds IT orchestration and automation solutions that transform business IT environments from simple IT task automation into sophisticated, real-time business service automation. No matter the degree of automation, the Stonebranch platform is simple, modern, and secure. Using the Stonebranch Universal Automation Platform, enterprises can seamlessly orchestrate workloads and data across technology ecosystems and silos. Headquartered in Atlanta, Georgia, with points of contact and support throughout the Americas, Europe, and Asia, Stonebranch serves some of the world's largest financial, manufacturing, healthcare, travel, transportation, energy, and technology institutions.</p>



About Stonebranch

Stonebranch builds dynamic IT automation solutions that transform business IT environments from simple IT task automation into sophisticated, real-time business service automation, helping organizations achieve the highest possible Return on Automation.

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