IBM Cloud Solution for SAP – Integrating IBM Infrastructure Management with SAP NetWeaver Landscape Virtualization Management

Applies to
SAP NetWeaver Landscape Virtualization Management, IBM Systems Director, IBM Flex System Manager, IBM Power Systems, IBM PureFlex System, AIX

Summary
The interconnection of business applications and global access to business services has made the management of the IT landscape more challenging. Manually operating and administrating a growing number of individual systems or system components is no longer an option. Here, the concepts of cloud computing not only promise to save costs but also to increase flexibility, elasticity, and automation of system operations to efficiently serve the needs of the business.

This article illustrates the benefits that can be achieved by combining IBM infrastructure technologies and SAP infrastructure management tools for more effective operations of SAP landscapes.

The focus is on showing how the processes for cloning, copying, and refreshing SAP systems can be performed faster, more flexibly and cheaper. This is achieved by leveraging cloud computing aspects (such as virtualization, standardization, and automation) and applying them to the use of SAP NetWeaver® Landscape Virtualization Management software together with IBM Systems Director® and IBM Tivoli® Storage FlashCopy® Manager as primary infrastructure management products.

The following use cases and their implementation are described:

- Cloning of an SAP system (creating an identical copy in a fenced environment)
- Initial copy of an SAP system (by changing the SAP system identifier)
- Refresh of a test SAP system with the content of a production system
- Automation of system copy/refresh post-processing activities
- Monitoring and visualization of virtualized SAP landscapes

A typical system copy scenario is discussed in detail. A sample configuration with SAP on AIX using SAN storage is described.

Additionally, information is given about the management products used:

1. SAP NetWeaver® Landscape Virtualization Management
2. IBM Systems Director® and IBM Flex System™ Manager
3. IBM Tivoli® Storage FlashCopy® Manager
Author Bio

Olena Demeter is Product Owner for Post Copy Automation ABAP (PCA). PCA ABAP is being delivered as part of the SAP NetWeaver Landscape Virtualization Management product. She is responsible for the design and implementation of Post Copy Automation with a team located in Walldorf, Germany. Prior to this, she worked as a Project Lead for the automation of the Technical Configuration for SAP Systems. Olena studied Computer Science at the University of Applied Sciences in Mannheim, Germany.

Andreas Krebs is the program architect for the SAP NetWeaver Landscape Virtualization Management product and is responsible for the overall product architecture. Prior to this, he was the responsible architect for the SAP NetWeaver Adaptive Computing Controller product. Andreas studied Computer Science at the University of Karlsruhe, Germany.

Stefan Luthe has worked as a Development Architect for SAP NetWeaver Landscape Virtualization Management since 2011. He is responsible for several areas of this product including SAP System Provisioning and the integration of virtualization and storage technologies. Prior to this, he worked as a Senior Developer for SAP NetWeaver Adaptive Computing Controller. Stefan studied information technology at the Baden-Wuerttemberg Cooperative State University, Mannheim.

Wolfgang Reichert is an IBM Distinguished Engineer. Since 1995 he has been working with SAP on supporting the SAP Business Solutions on IBM Systems. As chief technology officer he is responsible for the SAP-related development across all IBM platforms. Wolfgang studied Physics at the University of Duisburg, Germany.

Arnold Beilmann is a member of the joint development team for SAP on IBM Power platforms. He joined IBM in 2007 as a Software Developer focusing on the porting of SAP solutions to IBM Power. Arnold Beilmann worked in different projects related to SAP NetWeaver Landscape Virtualization Management, IBM Power, virtualization on IBM Power platforms and cloud computing.

Gerd Kehrer is a member of the joint IBM and SAP development team for SAP on IBM Power platforms and is currently working on the integration of the IBM Power platform into SAP NetWeaver Landscape Virtualization Management. He joined IBM in 1995 as a Software Developer focusing on Tivoli Software for SAP backup and monitoring solutions. Gerd studied Computer Engineering at the University for Applied Sciences, Mannheim.
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Managing the SAP Landscape

Along with the enterprise business applications, SAP provides a comprehensive set of management tools. The latest achievement is the SAP NetWeaver® Landscape Virtualization Management software. This product enables common cloud scenarios with the SAP software stack and the underlying infrastructure. It aims to connect application management services with system virtualization and storage management services. It is a management tool for customers who run their SAP systems in their own data center and want to become more efficient by automating provisioning and cloning tasks. Various scenarios involving System Copy and System Refresh are supported, including Post-Copy Automation. These expensive tasks have been made easy with SAP NetWeaver Landscape Virtualization Management.

Virtualization technology has been pioneered and promoted by IBM for several decades. Many SAP customers utilize virtualization on IBM servers, and this technology is simply the base for cloud computing.

IBM Systems Director® today is the primary infrastructure management product used to unify and simplify the management of physical and virtual resources for IBM servers, storage, and networks.

Recently IBM announced a family of expert integrated systems. The first member of this family, IBM PureFlex™ System, provides you with a computing system that combines servers, storage, networking, virtualization and management into a single structure. The integrated IBM Flex System™ Manager is the foundation that streamlines the way you manage physical and virtual systems within this integrated computing system.

IBM Tivoli® Storage FlashCopy® Manager adds unique value for SAP landscapes. This software enables application-aware, database-consistent online backups which can be used to create the cloned system. By exploiting storage snapshot techniques, the backup is created almost instantaneously.

For product overview and features see chapter Management Products Brief on page 15 and check the referenced links on page 23.

Achieving End-to-End Management through Integration

End-to-end scenarios are enabled through the coordination and integration of the described management products. Furthermore, this integrated solution provides two additional advantages:

1. Bringing together the best of both companies. SAP knows best how to manage SAP components and applications. IBM knows best how to manage the infrastructure components consisting of IBM servers, storage, virtualization technology and operating systems.

For this reason, IBM Systems Director (or IBM Flex System Manager) and IBM Tivoli Storage FlashCopy Manager are used for all server, storage, and virtualization related tasks. For the same reason, SAP NetWeaver Landscape Virtualization Management provides management and automation functions focusing on the SAP software stack.

2. Enriching the UI the administrator is used to. The SAP basis administrator is used to the SAP products and user interfaces. Hence the infrastructure tasks are transferred to the SAP UI and are provided to the SAP administrator as self-services. At the same time, the IT administrator keeps control over the infrastructure when enabling the self-services using IBM Systems Director or IBM Flex System Manager.
IBM Cloud Solution for SAP – Integrating IBM Infrastructure Management with SAP NetWeaver Landscape Virtualization Management

Figure 1 Integrated management enabling end-to-end scenarios

Figure 1 shows the technical interconnections between the products. SAP NetWeaver Landscape Virtualization Management connects to IBM Systems Director VMControl (or IBM Flex System Manager). This basic integration with IBM Systems Director provides a wide range of management and monitoring capabilities. Besides this, the SAP NetWeaver Landscape Virtualization Management drives the IBM Storage FlashCopy Manager for online storage cloning.

From the SAP basis administrator perspective, SAP NetWeaver Landscape Virtualization Management serves as the central UI for landscape monitoring and management.

As of today, this integrated solution supports SAP NetWeaver 7.xx running on AIX® using IBM SAN Volume Controller, IBM Storwize® V7000, or XIV® Storage Systems.

Usage Scenarios

This section describes selected tasks to give the reader a feel for the value of the integrated solution. This list is not intended to be exhaustive.

Virtualization Monitoring and Management

Integration of SAP NetWeaver Landscape Virtualization Management with IBM Systems Director or IBM Flex System Manager enables end-to-end monitoring and allows a topology view of the SAP landscape. Furthermore, selected virtualization management tasks are provided to the SAP basis administrator as self-services.

Topology view – Visibility in all virtual layers

The Overview panel shows a graphic topology tree. The view is created dynamically relative to the selected object (Figure 2).
Figure 2 Topology Visualization

The Operations view lists the SAP system landscape hierarchy. The SAP administrator can navigate through the topology starting from various angles and perform management tasks.

Starting with Services, the administrator can find all SAP systems, their instances, and additional information about the instances including the physical and virtual host (for example, AIX LPAR) the service is running on.

Starting with the Virtualization view, the administrator sees the system virtualization hierarchy and can monitor performance metrics about the physical server as well as the hypervisor/virtual system layer (Figure 3). Furthermore, all SAP instances running on this physical/virtual system are listed. This enables the administrator to recognize immediately which SAP instances share or compete for physical resources.
Operating SAP on virtual systems

Selected virtualization management tasks are provided as self-services to the SAP administrator.

For example, the SAP administrator is enabled to trigger Live Partition Mobility. This makes it possible to migrate an online SAP system and/or database together with the underlying LPAR to another server without disruption.

The SAP administrator can also create a new virtual system and provide an AIX image that was prepared earlier by the IT administrator using IBM Systems Director VMcontrol.

Operating SAP instances

SAP systems and instances can be started, stopped, and relocated. These operations can be performed on individual instances or as mass operations.

One highlight is Automatic Capacity Management. The SAP administrator specifies performance thresholds indicating when to increase/decrease the capacity of the SAP system. When the threshold is reached, SAP NetWeaver Landscape Virtualization Management automatically starts or stops additional dialog instance(s) on system(s) in the resource pool.

System Provisioning (Clone, Copy, and Refresh)

SAP administrators regularly deal with system provisioning use cases. These use cases require reconfiguration of copied systems, which is very time consuming, error-prone, and complex. SAP NetWeaver Landscape Virtualization Management – together with IBM Systems Director (or IBM Flex System Manager) and with IBM Tivoli Storage FlashCopy Manager – provides an automated end-to-end solution for system provisioning that clones source systems and automatically adapts them later.
System clone, system copy, and system refresh

System provisioning – or in other words performing and updating system clones and copies – is a fundamental task for SAP customers. This procedure needs to be executed at numerous stages of the SAP application lifecycle: either for the creation of new sandbox systems for test/demo/training purposes (initial system copy) or for regular refreshes of existing quality assurance, development, and test systems with the latest data from production systems (system refresh). Large customers perform more than 100 system copies per year.

We distinguish between three main use cases for system provisioning:

1. System clone – an isolated 1:1 copy of an existing SAP system
2. Initial system copy – the creation of new systems for test, demo, or training purposes
3. System refresh – the refresh of existing quality assurance, development, or test systems

In all cases, the content of the database and thus also many technical settings are identical directly after the copy/clone. A characteristic of the copy procedure is that the host name and the SAP system identifier (SAPSID) of the target system can be different to the source system; contrary to the clone, where the host name and system identifier stay the same for both source and target systems. Let’s take a closer look at the use cases.

System Clone

A system clone is an exact 1:1 copy of an existing SAP system without changing system-specific parameters (like SID, saplocalhost, or the instance number). It is often used by customers to perform update/upgrade checks or even for integrated upgrade scenarios like Near Zero Downtime.

There are two main flavors:

1. **Storage-based clone**
   
   If the SAP system is adaptive-enabled (that is, installed on a central storage system, with virtual host names), SAP NetWeaver Landscape Virtualization Management software uses existing central storage manager integration to create the clone of an existing SAP system. If a virtualization manager is configured, it is also possible to provision a new virtual resource on which the cloned system is started.

2. **Virtualization-based clone**

   If the SAP system is installed locally on a virtual resource (that is, the SAP system is configured with the host name of the virtual resource) and a virtualization manager is configured for this system, the SAP NetWeaver Landscape Virtualization Management software uses virtualization manager integration to clone the virtual resource, including the SAP system components.

A mixture of both flavors is also possible (for example, a storage-based clone of a database and a virtualization-based clone of SAP application server).

Common to all flavors is that the cloned system is isolated in the network so that no harmful outgoing connections can be performed by the cloned system.

System clones are also the technical basis for the end-to-end system copy and system refresh use cases.
System Copy

Usually, the technical configuration settings of the new system should be different from the settings of the source system. For example, the sandbox system should not have connections from the source system to other systems (such as to BW or CRM systems) and must not communicate with them. Spool requests coming from the source system must not be sent to the printers, TMS should have a new configuration as a local domain, and so on. This means that, after the clone, a lot of manual activities are necessary on the target system to make the copied system ready for use.

SAP NetWeaver Landscape Virtualization Management provides an integrated end-to-end copy including system rename and execution of post copy activities (Post Copy Automation).

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**Initial System Copy**

1. System copy
2. Post copy activities

**Execution of post copy activities with Post Copy Automation**

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**Figure 5 Initial System Copy**

System Refresh

To get the newest productive data from the production (PROD) to the quality assurance (QA) system, a copy from PROD to QA is performed. But in most cases, settings between the PROD and QA systems are different: users, background jobs, remote function call connections, SICF configuration, and so on. This again means that a lot of manual activities are necessary after the copy on the target system to bring the technical configuration settings back to the state before the copy.

SAP NetWeaver Landscape Virtualization Management provides an integrated end-to-end refresh including the export of settings from the system to be refreshed and the import into the newly copied system (Post Copy Automation).

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**System Copy Refresh**

1. Export
2. System Copy
3. Import

**Export and Import of tables with Post Copy Automation**

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**Figure 6 System Refresh**

**Post-Copy Automation – drastic reduction of time and effort during System Copy**

With copy-on-write cloning based either on a storage system or virtualization technology, a 1:1 clone of the system being copied takes only a few minutes. However, any manual adjustments after the copy are very time consuming and error-prone and can last for hours or days.

SAP has developed ABAP Post Copy Automation to automate the ABAP post-copy activities and reduce the time and effort needed for post copy activities drastically. This solution includes several crucial building blocks:
SAPinst Rename provides the ability to rename a system clone (that is, adapt the operating system, database and SAP system to its new identity by changing the file system structure, permissions, and profile parameters, and renaming the database schema).

In post-copy automation, post-copy activities are automated, resulting in drastically reduced time and effort. Post-copy automation for ABAP-based systems has been successfully verified within the Customer Engagement Initiative with more than 30 customers worldwide. Meanwhile a pilot project for the post-copy automation for Java-based systems has been successfully finished. For the automation of ABAP post-copy configuration, LM Automation Task Manager was used as runtime (see Figure 7); for Java, LM Automation Standalone offers corresponding services – all delivered under the license of SAP NetWeaver Landscape Virtualization Management.

Due to this automation, the duration of system provisioning using system copy can be reduced drastically and copied/refreshed systems can be provided in a standardized way.

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**Figure 7 System Refresh - Task List Example**

Preserving Database Consistency – Online or offline cloning

The challenges of cloning a database are consistency and speed.

One cloning approach is to stop SAP and the database before copying the data. This is a typical scenario for non-production systems to preserve a specific state and use the source system as a template to create one or more clones.

Creating a clone of a production system does not usually have an impact on the running system. Copying a running system without special care, however, can produce inconsistent data and the copied database might be unrecoverable. Instead, the database management system must be notified so that it does not modify any data on the storage system during the cloning process. DB2 is put in suspend input/output mode and Oracle
is switched to online backup mode by SAP NetWeaver Landscape Virtualization Management to ensure data consistency.

Today’s storage systems offer snapshot (or FlashCopy) capabilities. Whenever IBM Tivoli Storage FlashCopy Manager creates a clone on the storage system, it performs a snapshot in a matter of seconds. This clone is a space-efficient snapshot of the SAP database and/or system. Optionally, a full copy clone can be created afterwards from the snapshot.

**Detailed workflow of a typical copy scenario**

This section describes an example of the steps performed when creating a system copy, such as creating a copy of a production system for test purposes. The workflow includes the steps for changing the system identifier and adjusting the SAP configuration.

**Figure 8 System Cloning and System Copy Steps**

Figure 8 shows the sequence of tasks for an SAP system copy. This scenario is composed of two phases.

1. The system cloning phase begins by creating host name mappings on a name server and is finished when the system clone is ready to be started in an isolated system environment. These steps are the same for the system copy and system cloning scenarios. At the end of this phase, a 1:1 clone of the SAP system exists on the fenced target system.

2. After the system cloning phase is completed, SAP NetWeaver Landscape Virtualization Management triggers additional automated tasks which make up the system copy scenario. This phase includes renaming the SAP system clone and adjusting the SAP configuration.

For a detailed description of the workflow, the following landscape example is used:

The source system is an SAP Web AS ABAP system running on AIX in a logical partition. The SAP system is configured with virtual IP addresses. The operating system, SAP system and database are installed on separate AIX logical volume groups. The physical disks for these volume groups are allocated on SAN storage systems. The source system is configured in SAP NetWeaver Landscape Virtualization Management.

The administrator navigates to the *Provision* view in SAP NetWeaver Landscape Virtualization Management and selects the source SAP system. After pressing the *Copy* button, the administrator is guided through a roadmap where he or she can influence the end-to-end process. While the source configuration is known by SAP NetWeaver Landscape Virtualization Management, the target configuration is specified by the administrator. Default values are mostly calculated automatically. The following parameters can be overridden (this is a non-exhaustive list):

- **Target resource**: SAP NetWeaver Landscape Virtualization Management provides the option of choosing one of the active and registered AIX systems or creating a new AIX partition (assuming that
the virtualization manager configured in SAP NetWeaver Landscape Virtualization Management is capable of creating and configuring such an operating system partition).

- Host names: The copied SAP system is given a new virtual IP address and host name. The host name can be configured manually. Alternatively, SAP NetWeaver Landscape Virtualization Management is able to update the domain name server.

- Storage volumes: SAP NetWeaver Landscape Virtualization Management uses the registered storage adapter to gather the data about the volumes attached to the source system. The information is gathered directly from the storage management system. The administrator can specify target volume names and mount points.

- Database consistency: SAP NetWeaver Landscape Virtualization Management asks whether the SAP source system is to be stopped during the cloning process or whether the system stays up and running (for example, in case of a production system). If the online mode is chosen, the administrator decides whether SAP NetWeaver Landscape Virtualization Management is responsible for database consistency. Otherwise there is no guarantee that the cloned database can be recovered and brought online. When selecting database consistency, SAP NetWeaver Landscape Virtualization Management switches the source database into online backup mode (Oracle) or into suspend i/o mode (DB2). This prevents write i/o’s to the storage volumes during the actual cloning step. Figure 9 shows a screenshot of the described dialog step.

- Target isolation: On the target system network, fencing has to be established to ensure that the cloned system can be started without interfering with other systems in the data center. This is achieved by using the IPsec feature of AIX. SAP NetWeaver Landscape Virtualization Management allows the definition of permitted outgoing network connections. All other outbound connections are blocked while incoming connections are permitted.

- SAP copy parameters: SAP NetWeaver Landscape Virtualization Management queries information about the copied SAP system, such as the new SAP system identifier (SAPSID) and master password.

- SAP copy users: SAP NetWeaver Landscape Virtualization Management allows new users to be created and defined for the copied SAP system on a central user repository.

- SAP post copy automation: SAP NetWeaver Landscape Virtualization Management allows task lists and task list variants to be selected and used for post copy automation. This can be done for multiple clients in the SAP system (such as basis tasks in ‘000’ and BDLS in ‘100’).

When all the configuration parameters have been defined, the administrator reviews the input and then starts the SAP system copy workflow.
As part of this workflow, SAP NetWeaver Landscape Virtualization Management communicates with the registered storage adapter and triggers the cloning of the relevant storage volumes. This step is split into concurrent subtasks to reduce the time where the SAP source system must stay in database consistency mode. This way, the impact on the SAP source system is minimized. Figure 10 shows that the actual cloning step where the SAP source system is affected took just 20 seconds. The other steps (prepare clone volumes, post-process clone volumes, update mount configuration, and finalize clone volumes) do not have an impact on the source system. SAP NetWeaver Landscape Virtualization Management automatically registers the target SAP system and all related attributes such as the volume names. The target system is now shown in an unprepared state.

The following tasks modify the target configuration, some of which is shown in Figure 10:

- Storage volumes containing the copied SAP system are mounted.
- SAP profiles are changed.
- Missing SAP users and groups are created.
- Virtual IP addresses with corresponding host names are defined.
- Network fencing is established.

The SAP system is renamed. Changing the SAPSID requires the directories and various file names to be modified. Furthermore, the database configuration has to be adjusted and recovered, for example any in-flight transactions have to be backed out. Now the copied and renamed SAP system is started on the isolated target system.

Finally, post copy automation takes place. During this phase the technical configuration of the SAP system is cleaned up in order to transform the cloned production system into the test system. SAP provides predefined task lists which can be customized according to customer needs.

After the system copy workflow is completed and the system has been validated, the administrator can either disable network fencing or relocate the SAP system to another AIX LPAR.
Within 20 to 30 minutes SAP system cloning is completed.

Online storage cloning of the database takes just 20 seconds.

**Figure 10 Reviewing the cloning steps**
Management Products Brief

SAP NetWeaver Landscape Virtualization Management

SUMMARY

SAP NetWeaver® Landscape Virtualization Management software lets customers manage entire SAP software landscapes and IT infrastructures. This helps reduce complexity, cut data center costs, increase hardware utilization, and achieve the flexibility and scalability needed to improve IT efficiency and value.

USAGE

Optimize IT Operations Using Virtualization

Most IT organizations today host their applications on dedicated physical servers. Because every application is considered critical whenever they deploy a new productive application, they deploy new servers to support it. Calibrated to meet peak demand rather than average demand, these dedicated servers are seldom used to full capacity. This leads to a high rate of IT spend for both hardware and maintenance – even as their IT infrastructure remains underutilized.

Virtualization technology addresses this problem. With virtualization, customers spread application instances across available server resources to maximize infrastructure utilization. They also have the flexibility to move applications from server to server as circumstances dictate. The potential for driving down IT spend is tremendous. In fact, Gartner Inc. believes that “virtualization offers IT departments opportunities to reduce cost and increase agility.”

Hiding the Complexity of the IT Landscape

SAP NetWeaver Landscape Virtualization Management provides a single point of control that allows the SAP software system administrator to visualize, monitor, and manage data center tasks for deployed SAP solutions.

Masking the underlying complexity of their IT infrastructure, this tool enables customers to manage virtualized database and application instances and freely move them between physical and virtual servers as...
needed—all without logging in to the software each time an application is moved. Best of all, by also supporting non-virtualized SAP applications in their landscape, SAP NetWeaver Landscape Virtualization Management lets customers move toward virtualization at a pace that makes sense for their business.

Manage Shifting Application Demand

SAP NetWeaver Landscape Virtualization Management lets customers respond to changing resource demands in a rapidly evolving business landscape. With just a few clicks, they can move their SAP application onto a physical or virtual server resource that best suits business requirements. If application demand grows, they can simply swap server resources to handle the extra demand.

One can even balance performance peaks by automatically allocating resources. If noticed by SAP NetWeaver Landscape Virtualization Management that demand for an application has increased—due to more users or greater individual user demands—either the application can be moved or a new instance started on any available server.

Create SAP System Copies

At several stages of the SAP application lifecycle, customers need to perform system copies—large customers perform more than 100 system copies per year. As a result, the system copy procedure is fundamental for SAP customers: either to create new sandbox systems for test/demo/training purposes (initial system copies) or for regular refreshes of existing quality assurance, development, and test systems with the latest data from production systems (system refreshes).

For all system copy use cases, the required activities to reconfigure copied systems are very time consuming, error-prone, and complex. SAP NetWeaver Landscape Virtualization Management provides an automated end-to-end solution for system copy that clones source systems and automatically adapts them afterwards.

This solution includes several crucial building blocks:

- With copy-on-write cloning based either on a storage system or virtualization technology, a 1:1 clone of the system to be copied takes only a few seconds.
- SAPinst enables the service to rename a system clone (that is, adapt the operating system, database and SAP system to its new identity by creating OS users, changing permissions and parameters, and renaming the database schema).
- With post-copy automation, post-copy activities become automated, resulting in drastically reduced time and effort. Post-copy automation for ABAP-based systems has been successfully verified within the Customer Engagement Initiative with more than 30 customers worldwide.

Due to this automation, the duration of system provisioning using system copy can be drastically reduced and copied/refreshed systems can be provided in a standardized way.

EDITIONS

The SAP Landscape Virtualization Management software is available in two different editions:

- **Standard Edition**
- **Enterprise Edition**

The standard edition covers the basic management functionality whereas the enterprise edition provides (among others) the following additional functionalities:

- Framework for SAP system cloning, system copy, and refresh, including fully automated post-copy tasks, so eliminating manual effort
- Capacity management – proposal-based dialog instance scaling
- Reporting
For the system copy/cloning configurations described in this paper, the enterprise edition of Landscape Virtualization Management is needed.


IBM Systems Director

IBM Systems Director® is the platform management backbone, providing the building block for integrated services management. Systems Director provides the IT administrator with the following features:

- Unification of the management of physical and virtual resources for IBM servers, storage, and networks.
- Automation of data center operations by implementing cloud-ready virtual infrastructures.
- A single view of the actual energy usage throughout your data center.

Systems Director provides systems management personnel with a single pane of glass, helping reduce IT management complexity and cost. Key capabilities include:

- Simple lifecycle management of your IT infrastructure – IBM Systems Director offers a core, comprehensive, unified systems management platform. It provides tools for discovery, inventory, status, configuration, system health, resource monitoring, system updates, event notification and management automation.
- Integration - with Tivoli, and third party management platforms, it provides the foundation for virtualization and integrated services management. With an extensive suite of available platform management tasks, and automated tools, Systems Director assists systems management personnel in increasing productivity, resulting in improved responsiveness and service.

The key value of IBM Systems Director is its ability to work in diverse IT environments. It dramatically reduces the number of management tools and interfaces; simplifying the way in which IT administrators perform their tasks, and freeing up their time to meet changing business requirements.
**Figure 13 IBM Systems Director enables unified physical and virtual platform management**

**IBM® Systems Director VMControl™** is the multi-platform virtualization management solution that is included with IBM Systems Director Editions or available separately as a plug-in option for IBM Systems Director.

IBM Systems Director VMControl simplifies the management of virtual environments across multiple virtualization technologies and hardware platforms, freeing you from ‘silos of virtualization’ and delivering enterprise-wide visibility and control. It brings together physical and virtual management into a single interface.

This application provides the following features that are also relevant in any SAP landscape:

- Create and manage virtual machines
- Relocate virtual machines
- Import, edit, create and delete virtual images
- Deploy virtual images

**IBM® Systems Director Storage Control** enables the management of systems and storage with a single pane of glass. This software is based on IBM Tivoli Storage Productivity Center and is distributed as a plug-in for IBM Systems Director. It integrates tightly with the IBM Systems Director environment providing integrated physical and virtual server and storage management through a single user interface.

IBM Systems Director Storage Control unifies the management of physical and virtual server and storage resources for integrated end-to-end life cycle management, including: configuration, discovery, health, capacity, inventory, provisioning, topology, updates, alerts, and retirement.

This application provides the following features that are also useful in any SAP landscape:

- Extends storage management of IBM Systems Director to cover most IBM storage systems
- Storage device discovery and coverage in integrated physical and logical topology views
- Show relationships between storage and server resources
- Ability to configure logical and physical configuration
- Ability to view controller and volume status and to set notification alerts
- Integration with IBM Systems Director VMControl storage provisioning for image creation, deployment, and cloning

**IBM Flex System Manager**

The IBM Flex System™ Manager is designed specifically to manage all resources of the IBM PureFlex™ System from a single management node. It comes pre-loaded and configured with the expertise necessary to manage the diverse assets and capabilities of the system.

It is a single point of control maintaining an integrated view of the entire IBM PureFlex System, physical, as well as virtual, including servers, storage and network devices.

- IBM Flex System Manager will auto-discover new and existing components, as well as automatically initiate and perform set-up tasks. As part of this discovery process, IBM Flex System Manager prepares and maintains complete, detailed front, back and chassis map views of each chassis and all physical compute nodes and virtual servers that exist in the rack.
- Management and control of the physical and virtualized infrastructure includes initiating the detailed tasks required for full life-cycle management of virtualized devices, including their creation, provisioning, configuration, operation and de-provisioning. It can build and maintain a library of pre-defined virtual devices. This allows fast automated, on-demand adjustments in server, storage and network capacities in response to changing business and operational needs.

The management node acts as a single-point of support across all assets and resources in IBM PureFlex Systems for the complete range of management tasks, including service requests, incident handling and problem resolution.

IBM Flex System Manager and IBM Systems Director provide the same set of REST Web services as needed for the integration with SAP NetWeaver Landscape Virtualization Management.

**IBM Tivoli Storage FlashCopy Manager**

IBM Tivoli® Storage FlashCopy® Manager software provides fast application-aware backups and restores, so leveraging advanced snapshot technologies in IBM storage systems.

This application provides the following features:

- Near-instant application-aware snapshot backups, with minimal performance impact for IBM DB2, Oracle, SAP, Microsoft SQL Server, and Exchange
- Improvement in application availability and service levels through high-performance, near-instant restore capabilities that reduce downtime
- Integration with IBM Storwize® V7000, IBM System Storage DS8000, IBM System Storage SAN Volume Controller and IBM XIV Storage System on AIX, Solaris, Linux, and Microsoft Windows
- Fulfillment of advanced data protection and data reduction needs with optional integration with IBM Tivoli Storage Manager

In the context of SAP landscape management, IBM Tivoli FlashCopy Manager is utilized to create instantaneously a consistent copy of an online SAP system.

**Supported Configurations**

For an up-to-date list of supported configurations, refer to SAP Notes 1527538 and 1644520.

**Sample Configuration**

This section describes a sample configuration as tested by customers as well as in the IBM SAP Competence Center. The prerequisites depend on the desired use cases. The configuration described here allows you to implement all usage scenarios mentioned in this paper.
Management System

SAP NetWeaver Landscape Virtualization Management 1.0 integrates with the following IBM management products:

- IBM Systems Director with VMControl or IBM Flex System Manager

  IBM Systems Director with VMControl is required for virtualization monitoring and management as well as for the operating system provisioning scenarios. The VMControl Enterprise Edition is needed for AIX provisioning scenarios.

  On IBM PureFlex System the integrated Flex System Manager is used for virtualization monitoring, management and operating system provisioning.

- IBM Tivoli Storage FlashCopy Manager

  Tivoli Storage FlashCopy Manager is required for storage cloning of online SAP systems.

The management products can be installed on a single AIX LPARs as shown in Figure 14. Alternatively, the products might be installed on different servers, for example SAP NetWeaver Landscape Virtualization Management may run on any of supported SAP platforms.

![Figure 14 Management System](image)

Managed SAP Landscape

At the time of writing, the following IBM infrastructure is supported by SAP NetWeaver Landscape Virtualization Management:

- IBM Power Systems
- IBM PureFlex System
- AIX
- IBM SAN Volume Controller (SVC)
- IBM Storwize V7000
- IBM XIV Storage System

IBM intends to support additional operating systems, storage technologies, and configuration options in the future.

While designing the product, typical customer installations as well as best practices for virtualization, storage layout, and high availability were considered. A sample configuration is shown in Figure 15.

SAP NetWeaver 7.x using IBM DB2 LUW, Oracle Database, or SAP MaxDB is supported.
It is assumed that the storage is attached using single or dual VIOS (IBM PowerVM Virtual I/O Server). For the storage cloning scenario, the storage system must be attached in NPIV mode. NPIV or N_Port ID Virtualization is a fibre channel feature that allows multiple logical partitions to share a physical port.

The clone is created utilizing the snapshot feature of the XIV Storage System. This method creates a space-efficient logical copy of the volumes which means that unchanged data is shared between the original and the cloned system. This is especially beneficial in cloud environments where many clones of a master system are created. Optionally, a full copy of the snapshot can be created. On SAN Volume Controller and Storwize V7000 the FlashCopy feature is utilized for storage cloning.

It is good practice to use virtual host names for the SAP instances. SAP NetWeaver Landscape Virtualization Management creates the cloned system with virtual host names, independent of the source configuration.

Many AIX customers consolidate multiple SAP systems per LPAR. Special considerations are needed here because the post-copy automation tasks are performed on the active cloned system. To ensure integrity, SAP NetWeaver Landscape Virtualization Management establishes network fencing on the target AIX system before starting the SAP system. The implication is that the target system should be dedicated to the cloned system because otherwise other SAP or non-SAP applications on the same LPAR would be affected. One suggestion is to define particular AIX partition(s) as intermediate cloning targets and then – after post-copy automation has been completed and the SAP system has been validated – relocate the copied SAP system to the final destination. This relocation can be done easily with SAP NetWeaver Landscape Virtualization Management.

For a detailed description of the infrastructure setup, see SAP Note 1644520.

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**Figure 15 Managed SAP Landscape**

**Additional Information**

The solution has been developed as modular building blocks. This provides a high degree of flexibility and extensibility. The following table shows which products and editions are utilized for each scenario.
<table>
<thead>
<tr>
<th>Systems Director Flex System Manager (*)</th>
<th>System monitoring</th>
<th>SAP relocate</th>
<th>VM relocate</th>
<th>AIX provisioning</th>
<th>SAP Clone/Copy/Refresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMControl Express Edition</td>
<td>(not needed)</td>
<td>VMControl Express Edition</td>
<td>(not needed)</td>
<td>VMControl Enterprise Edition Storage Control (optional)</td>
<td>(not needed)</td>
</tr>
<tr>
<td>FlashCopy Manager</td>
<td>(not needed)</td>
<td>(not needed)</td>
<td>(not needed)</td>
<td>(not needed)</td>
<td>required</td>
</tr>
<tr>
<td>Storage</td>
<td>any</td>
<td>NFS, GPFS, XIV, SVC, or V7000</td>
<td>any</td>
<td>any</td>
<td>XIV, SVC, or V7000</td>
</tr>
</tbody>
</table>

(*) On IBM PureFlex Systems, IBM Flex System Manager is used instead of IBM Systems Director. It is packaged with all needed features; consequently there is no need to add controls.

SAP has cooperated with other partners to provide support for additional platforms and storage solutions. For example, network-attached storage (NAS) using NetApp is also supported by SAP NetWeaver Landscape Virtualization Management and has been tested with AIX.

Post-Copy Automation is a technically independent building block of this solution; it is platform neutral and can be used independently of the described virtualization or storage cloning scenarios. Post-Copy Automation is supported with SAP NetWeaver 7.x on any operating system and database platform where NetWeaver runs.
Related Content

SAP Product Documentation and SAP Notes

Online documentation – SAP NetWeaver Landscape Virtualization Management
SAP Note 1527538 – SAP NetWeaver Landscape Virtualization Management 1.0
SAP Note 1644520 – Integration of IBM Components into SAP NetWeaver Landscape Virtualization Management
SAP Community Network: SAP NetWeaver Landscape Virtualization Management at a Glance

Related IBM Documentation

Presentation: Introduction to an Integral IBM / SAP Cloud Solution for SAP Landscape Management
IBM Systems Director
IBM Flex System Manager
IBM Tivoli Storage FlashCopy Manager
IBM PureFlex System
IBM Power Systems
IBM XIV Storage System
IBM SAN Volume Controller
IBM SmartCloud – Overview on cloud technologies and offerings