SAP Innovation Summer Camp
Come with a Curiosity – Leave with a Plan

July 12 - 13, 2012  |  SAP Americas HQ
www.sap.com/sapsummercamp
Disclaimer

This presentation outlines our general product direction and should not be relied on in making a purchase decision. This presentation is not subject to your license agreement or any other agreement with SAP. SAP has no obligation to pursue any course of business outlined in this presentation or to develop or release any functionality mentioned in this presentation. This presentation and SAP’s strategy and possible future developments are subject to change and may be changed by SAP at any time for any reason without notice. This document is provided without a warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. SAP assumes no responsibility for errors or omissions in this document, except if such damages were caused by SAP intentionally or grossly negligent.
Infrastructure Track

Cloud enabling of existing SAP solutions – architecture and migration options
Agenda

Methodology – detailed architecture and infrastructure definition

Architecture options with SAP solutions in private cloud datacenters

Application virtualization an overview

Infrastructure relations virtualization technologies
# Cloud Enablement Roadmap

Overview about a possible cloud enablement project

## Concept & Project Setup
- **Project Mgmt.**
  - Project definition

## Blueprint
- **Architecture Infrastructure**
  - Detailed target SAP landscape definition
  - Detailed technical infrastructure definition
  - Detailed Migration Method definition

## Realization
- **Migration Tasks**
  - Migration of non-prod systems
  - Performance, HA, Sec. tests

## Post Go-Live
- **Performance & Scalability**
  - Performance Optimization + Verification

## Cloud Enablement Planning Service
- **Architecture Options**
  - Architecture Options
- **Application Virtualization**
  - Application Virtualization
- **Infrastructure aspects of virtualization**
  - Infrastructure aspects of virtualization

## Operational Readiness
- **Inventory**
  - Procedures
  - Tools
  - Roles & Skills
- **Definition of future concept**
  - Operations procedures
  - Tool roadmap
  - Roles & Skills, training plan
Architecture and Infrastructure
Definition of Technical Details

Definition of detailed concepts
1. What changes to the master plan are required dependent on the sizing result and hardware decision?

Detailed migration method definition
1. Which migration approach will be used for each system (group) – based on a decision of costs / effort vs. downtime feasibility – agreed with business?
2. What’s the effort and time estimation per system to be migrated (based on the migration approach and required preparation tasks)?
3. How are the systems finally scheduled for migration (waves / including OS change)?

Detailed target landscape definition
1. What landscape is required for production, non-production and temporary systems used in the migration project?
2. What is the technical configuration of new or changed platforms and / or hosted software components (e.g. application servers, database)?

Detailed technical infrastructure definition
1. What resources (CPU, memory, sharing) are configured for virtual machines?
2. What is the detailed target HA/DR concept?
3. How does the storage layout look like?
4. What is the backup strategy (tools, device, scheduling)?
Agenda

Methodology – detailed architecture and infrastructure definition

Architecture options with SAP solutions in private cloud datacenters

Application virtualization an overview

Infrastructure relations virtualization technologies
Cloud Enablement Roadmap
Overview about a possible cloud enablement project
Architecture Options
Customer View - Server Platform Classification

X86 Platforms
- Linux or Windows
- XEN, KVM, VMware, Hyper-V (some of them part of the OS)
- Multi vendor strategy
- Freedom to choose HW from several server vendors

Customer perception
- Good price / performance ratio
- Less scalability compared to UNIX platforms (e.g. for very large IO intensive single node DB’s)
- Customers coming from X86 usually run everything on this platform
Architecture Options
Customer View - Server Platform Classification

UNIX / Mainframe Platforms

- AIX, HP-UX, Solaris, z/OS
- Various platform specific virtualization solutions on the different layers (HW partitioning, hypervisor, OS virtualization)
- Single vendor strategy

Customer perception

- High scale solution
- Entire platform from OS, virtualization and HW designed to scale in large SMP environments
- Customer coming from UNIX / Mainframe platform often use X86 platform (heterogeneous approach) to run e.g. for dialog instances.
Architecture
Customer Situation: Homogeneous Approach in SAP Landscape

Homogeneous platform approach

**Homogeneous Server Landscape**
- One server architecture for the entire datacenter
- Just one platform to manage and to maintain

**X86 platform**
- Customers coming from X86 platform usually don’t use a second platform

**UNIX/Mainframe platform**
- Various virtualization and partitioning layers can be used to address customer requirements.
- If for specific SAP applications Windows is required ➔ only heterogeneous approach required.
Architecture Homogeneous Option

Distribution

Every SAP solution uses the same platform:
- Possible platform options:
  - “UNIX platform” based virtualization
  - “X86 platform” based virtualization

Aspects
- Still possible to use physical servers e.g. if HA cluster does not integrate virtualization or if performance requirements dictate

<table>
<thead>
<tr>
<th></th>
<th>SBX</th>
<th>DEV</th>
<th>QA</th>
<th>P-PRD</th>
<th>PRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ERP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All systems in the transport landscape on same platform

<table>
<thead>
<tr>
<th></th>
<th>SBX</th>
<th>DEV</th>
<th>QA</th>
<th>P-PRD</th>
<th>PRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>ERP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Applications with all levels of criticality on same platform

<table>
<thead>
<tr>
<th></th>
<th>DB</th>
<th>SCS</th>
<th>ASCS</th>
<th>CI</th>
<th>DI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>ERP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All instances types on same platform
Architecture
Customer Situation: Heterogeneous Approach in SAP Landscape

Heterogeneous Server Landscape

- Multiple server platforms in the SAP landscape
- Benefits for different platforms of the different usage patterns can be used
- Various platforms to manage and to maintain
- If for specific SAP applications Windows is required X86 would be available.

Heterogeneous platform approach

“X86 platform” & “UNIX platform” based virtualization

- Heterogeneous server landscape
- X86: VMware XEN, KVM, Hyper-V
- UNIX server: Containers, hypervisor, partitions
Do all systems in the transport landscape require most current or full set of production data?

- Group all systems in transport landscape which require an exact PRD set of data
  - “UNIX platform” based virtualization
- Group all systems where it is sufficient to have a limited or an outdated set of data
  - “X86 platform” based virtualization

Aspects

- If non-PRD is on different OS platform, heterogeneous system copies are required to update data.
- P-PRD can be required for performance and configuration related tests?
- Full refresh of production data in a non-PRD system may only be required for final QA, configuration or mass performance tests.
Architecture Heterogeneous Option II
Distribution - SAP Application Role

Are all SAP applications most critical and require highest scale and reliability?

- Group most critical SAP applications (under the assumption that platform is HA/DR protected) and operate on “UNIX platform”
- Group less critical SAP applications and operate on “X86 platform”

Aspects

- Define criticality criteria
  - Scaling requirement
  - SLA
  - Availability
  - System dependencies on other critical systems
- DI are no SPOF (Option 2)
Do all instances of the PRD systems require the high scale UNIX platform?

- Group instances which require the use of the “UNIX platform”
- Group instances where the scale out capability of the “X86 platform”

Aspects

- DB usually single node which requires in large environments high scale server platforms
- SAP application instances can scale out horizontally via DI’s across more VM’s
- SCS / ASCS require stable HA protection on the PRD systems
**Architecture**

**Customer Situation: Complementary Approach Application Virtualization**

---

**Application Virtualization**

- Works on physical as well as virtual servers
- SAP application decoupled from the underlying OS (logical hostnames and central storage concept)
- Relocate across same OS, but able to cross server technologies (e.g. virtual server with Linux to physical server with Linux)
Agenda

Methodology – detailed architecture and infrastructure definition

Architecture options with SAP solutions in private cloud datacenters

Application virtualization an overview

Infrastructure relations virtualization technologies
Cloud Enablement Roadmap
Overview about a possible cloud enablement project
Server vs. Application Virtualization

On-Premise Application

Application Virtualization

Operating System

Server Virtualization

Hardware

- Adaptive implementation of SAP system
- Relocate stops and starts SAP system
- Makes a relocation across physical and virtual servers with same OS possible
- Simplifies OS and SAP maintenance
- Increases application availability

- Live migration usually without downtime across physical servers within the vendors technology domain.
- Resource management
- Increases availability
- Simplifies HW maintenance
- Copy / cloning capabilities
Application Virtualization
Concept and Aspects

Concept
- Requires adaptive implementation of the SAP & DB instances (logical hostnames & central storage like FC, ISCSI, NAS)
- Installation supported by sapinst tool (option “sapinst_use_hostname”)
- Relocate stops and starts instance (short downtime)

Storage aspects
- Select storage network topology according to required SLA (FC or IP based storage protocols) for SAP system / instance
- Check reliability of storage network (e.g. separate IP based network for ISCSI and NAS)

Management aspects
- Managed manually (e.g. via scripts)
  - Usually root access required
  - Error-prone
- Managed with SAP NetWeaver Landscape Virtualization Management (LVM) tool
  - Simplified management plus additional management capabilities
  - Server platform dependencies: No support for mainframe. V2V and V2P relocations with NAS storage just require an OS library. V2V and V2P relocations with FC and ISCSI require a specific storage library (check availability with storage partner).
  - OS dependencies: UNIX / Linux / Windows supported (Windows is limited to ISCSI and FC storage and requires a specific handling of e.g. registry, DB installation)
  - Storage dependencies: NAS FS just requires an OS library for SAP NW LVM (triggers OS mount). Attach / detach ISCSI and FC requires additionally a storage and OS specific storage library (provided by storage partner) for SAP NW LVM.
Application Virtualization
Logical Hostnames

ABAP instance
DVEBMGS00 <SID>

virtual hostname: ci<SID>
IP-Address: 10.17.80.36

physical hostname: ld0539
IP-Address: 10.17.80.14

ABAP instance
DVEBMGS00 <SID>

virtual hostname: ci<SID>
IP-Address: 10.17.80.36

physical hostname: ld0540
IP-Address: 10.17.80.15
Application Virtualization
Example: Heterogeneous Storage Landscape Architecture for UNIX/Linux

- **AS**
  - Files System
    - `/sapmnt/SID` /usr/sap/SID/DV.01
    - `/sapdb/` /

- **CI**
  - Files System
    - `/sapmnt/SID` /usr/sap/SID/DV.00
    - `/sapdb/` /

- **DB**
  - Files System
    - `/sapdb/` /
    - `/var/spool/sql/` /
  - DB Datafiles

- **Storage System**
  - e.g. SAN
  - Volume Mapping

- Stared Storage
  - SAP / DB binaries
Application Virtualization with LVM
How Does Application Virtualization Work?

Computing Resources

Server
Server C1
Server
Server

Network Card
File System
Bind
Mount

Virtual Host Name V1
Mount Point M1

Database
Central Instance
Dialog Instance

ABAP System (SID S01)

Software installed on Central Storage

Server

J2EE (SID S0n)
Application Virtualization with LVM
How Does Application Virtualization Work?

Computing Resources

Software installed on Central Storage

Server C1
Central Instance

Network Card bound to V1

File System attached to M1

Start

Virtual Host Name V1

Mount Point M1

Database
Central Instance
Dialog Instance

ABAP System (SID S01)

J2EE (SID S0n)

© 2012 SAP AG. All rights reserved.
Application Virtualization with LVM
How Does Application Virtualization Work?

Relocate
1) Stop Central Instance on C1
2) Unmount / unbind on C1
3) Mount / bind on C2
4) Start Central Instance on C2

Software installed on Central Storage

Computing Resources
Agenda

Methodology – detailed architecture and infrastructure definition

Architecture options with SAP solutions in private cloud datacenters

Application virtualization an overview

Infrastructure relations virtualization technologies
Cloud Enablement Roadmap
Overview about a possible cloud enablement project

- Project definition
- Detailed target SAP landscape definition
- Detailed technical infrastructure definition
- Detailed Migration plan
- Performance Baseline - KPI
- Detailed Migration Method definition
- Sandbox Migrations
- Detailed test planning
- Performance Optimization + Verification
- Infrastructure setup & configuration
- Migration of non-prod systems
- Performance, HA, Sec. tests
- Test Material Development
- Cut-over rehearsal
- Production cut-over
- Performance Monitoring
- Performance Optimization
- Operations procedures
- Tool implementation
- Trainings
- Operations handover to new technology
- SLA verification
- Operations procedures
- Tool roadmap
- Roles & Skills
- Definitions of future concept
- Performance Baseline - KPI
- Sizing
- Source Scalability check
- Inventory
- Procedures
- Tools
- Roles & Skills
- Definition of future concept
- Operations procedures
- Tool implementation
- Trainings
- Operations handover to new technology
- SLA verification
- Project tracking
- Q – Gate Def.
- Q-Gate management
- Issue tracking
- Concept & Project Setup
- Blueprint
- Realization
- Post Go-Live

Topics covered in this session
Architecture Options
Additional Architectural Aspects in Virtualization Migration Projects

Storage
• Storage topology (FC, ISCSI, NAS)
• Storage load distribution (stripe across disc & controller)
• Raid protection
• Storage layout for Application & VM’s (LUN design, storage technology, RAW devices, …)
• Storage I/O capacity
• Clone & snapshots on storage or on VM
**Storage Architecture Option 1**

**Application Virtualization on VMware – VMDK Model**

![Diagram showing VMDK architecture]

**VMFS datastores & application virtualization**

- All storage resources on in datastores on vmdk files
- Application relocation process
  - Stop SAP & DB
  - OS umount & VMware Un-map of vmdk from source VM
  - VMware map of vmdk and OS mount to target VM
  - Un-map logical hostnames from source VM and map logical hostnames to target VM
  - Start SAP & DB
- **Manual relocation** of SAP and DB with VMware & OS means
- Aspects:
  - Use case e.g. OS maintenance
  - Only possible within VMware technology (no relocation to pure physical servers)
  - vMotion still working
  - OS handles mapped vmdk files as block devices
Storage Architecture Option 1
Application Virtualization on VMware – VMDK Model

VMFS datastores & application virtualization
- All storage resources on in datastores on vmdk files
- Application relocation process
  - Stop SAP & DB
  - OS umount & VMware Un-map of vmdk from source VM
  - VMware map of vmdk and OS mount to target VM
  - Un-map logical hostnames from source VM and map logical hostnames to target VM
  - Start SAP & DB
- Manual relocation of SAP and DB with VMware & OS means
- Aspects:
  - Use case e.g. OS maintenance
  - Only possible within VMware technology (no relocation to pure physical servers)
  - vMotion still working
  - OS handles mapped vmdk files as block devices
Storage Architecture Option 2
Application Virtualization on VMware – RDM Model

RDM’s & application virtualization

• As an example the OS in VM’s is installed in datastores (vmdk files), on physical server on internal disk
• Storage resources of SAP & DB are installed on FC LUN’s
  – Attached to VMware as RDM’s
  – Attached to physical server as FC connect
• Application relocation process:
  – Stop SAP & DB
  – VMware Un-map RDM and OS umount LUN from source VM/physical server and VMware map RDM and OS mount LUN to target VM/physical server
  – Un-map logical hostnames from source VM/physical server and map logical hostnames to target VM/physical server
  – Start SAP & DB
• Manual relocation of SAP and DB with VMware / OS means
• Aspects:
  – Relocation with across VM’s and physical servers possible
  – vMotion still working (only with “not shared” RDM’s)
Storage Architecture Option 2
Application Virtualization on VMware – RDM Model

RDM’s & application virtualization
- As an example the OS in VM’s is installed in datastores (vmdk files), on physical server on internal disk
- Storage resources of SAP & DB are installed on FC LUN’s
  - Attached to VMware as RDM’s
  - Attached to physical server as FC connect
- Application relocation process:
  - Stop SAP & DB
  - VMware Un-map RDM and OS umount LUN from source VM/physical server and VMware map RDM and OS mount LUN to target VM/physical server
  - Un-map logical hostnames from source VM/physical server and map logical hostnames to target VM/physical server
  - Start SAP & DB
- Manual relocation of SAP and DB with VMware / OS means
- Aspects:
  - Relocation with across VM’s and physical servers possible
  - vMotion still working (only with “not shared” RDM’s)
RDM’s & application virtualization

- As an example the OS in VM’s is installed in datastores (vmdk files), on physical server on internal disk
- Storage resources of SAP & DB are installed on FC LUN’s
  - Attached to VMware as RDM’s
  - Attached to physical server as FC connect
- Application relocation process:
  - Stop SAP & DB
  - VMware Un-map RDM and OS umount LUN from source VM/physical server and VMware map RDM and OS mount LUN to target VM/physical server
  - Un-map logical hostnames from source VM/physical server and map logical hostnames to target VM/physical server
  - Start SAP & DB
- Manual relocation of SAP and DB with VMware / OS means
- Aspects:
  - Relocation with across VM’s and physical servers possible
  - vMotion still working (only with “not shared” RDM’s)
NAS & application virtualization

- As an example the OS in VM’s is installed in datastores (vmdk files), on physical server on internal disk
- Storage resources of SAP & DB are installed on NFS shares using NAS storage
  - Attached to the VM’s and the physical server via OS mounts
- Process:
  - Stop SAP & DB
  - Un-mount NFS share from source VM/physical server and map NFS share to target VM/physical server
  - Un-map logical hostnames from source VM/physical server and map logical hostnames to target VM/physical server
  - Start SAP & DB
- Manual relocation of SAP and DB with OS means
- Managed relocation of SAP and DB with LVM
  - Storage with all NFS based storage systems (NAS) supported
- Aspects:
  - Relocation with across VM’s and physical servers possible
  - vMotion still working
Storage Architecture Option 3
Application Virtualization on VMware – NAS Model

NAS & application virtualization
- As an example the OS in VM’s is installed in datastores (vmdk files), on physical server on internal disk
- Storage resources of SAP & DB are installed on NFS shares using NAS storage
  - Attached to the VM’s and the physical server via OS mounts
- Process:
  - Stop SAP & DB
  - Un-mount NFS share from source VM/physical server and map NFS share to target VM/physical server
  - Un-map logical hostnames from source VM/physical server and map logical hostnames to target VM/physical server
  - Start SAP & DB
- Manual relocation of SAP and DB with OS means
- Managed relocation of SAP and DB with LVM
  - Storage with all NFS based storage systems (NAS) supported
- Aspects:
  - Relocation with across VM’s and physical servers possible
  - vMotion still working
NAS & application virtualization

- As an example the OS in VM’s is installed in datastores (vmdk files), on physical server on internal disk
- Storage resources of SAP & DB are installed on NFS shares using NAS storage
  - Attached to the VM’s and the physical server via OS mounts
- Process:
  - Stop SAP & DB
  - Un-mount NFS share from source VM/physical server and map NFS share to target VM/physical server
  - Un-map logical hostnames from source VM/physical server and map logical hostnames to target VM/physical server
  - Start SAP & DB
- Manual relocation of SAP and DB with OS means
- Managed relocation of SAP and DB with LVM
  - Storage with all NFS based storage systems (NAS) supported
- Aspects:
  - Relocation with across VM’s and physical servers possible
  - vMotion still working
Architecture Options
Additional Architectural Aspects in Virtualization Migration Projects

Network
- Network I/O capacity in normal operation and during online migration of VM’s

HA / DR
- Does the virtualization solution provide features to fulfill SLA’s regarding availability (e.g. no need for HA cluster for certain systems)?
- How can HA functions/tools be integrated with virtualization

Backup / Restore
- Do the technical mechanisms of the physical world work also with virtualization?

Security
- Does the virtualization platform (even more with clouds) fulfill security requirements?
Thank You!

Contact information:

Gunther Schmalzhaf
IT-Planning Architect
gunther.schmalzhaf@sap.com