1. Motivation, Scope and Approach
2. Summary
3. Future Technical Architecture
   I. Technical Platform Overview
   II. Availability SLAs
   III. HA/DR Architecture
   IV. Mapping of SAP Components to the Hardware
4. Current Landscape Overview
5. Sizing, Scalability, Performance
   I. ERP System ABC – Capacity Check
   II. EP System DEF – Capacity Check
Motivation, Scope and Approach
Starting Point

Starting Point

• <CUSTOMER> plans to migrate the technical platform of its SAP solution from AIX/Power to Linux/x86 with Red Hat Enterprise Virtualization (RHEV) with KVM virtual machines*.
• Also a migration to Oracle RAC is planned – for availability reasons**.
• The migration project is done by SAP Consulting using a NZDT approach.
• Functional changes with sizing impact are not planned.
• Go-live is planned for May 2014.
• <CUSTOMER> SAP solution comprises the following applications:
  – SAP ERP 6.03
  – SAP NetWeaver Portal
  – SAP NetWeaver 7.0 for central user administration
  – Other SAP applications like SAP SCM, SAP ERP for HR etc.

Request to SAP

• Review of the sizing and the technical architecture of the future SAP systems on Linux, RHEV/KVM* and Oracle RAC.

*VMware as initially mentioned during service scoping was replaced by RHEV during the workshop.
**During the WS it turned out that Oracle RAC is also required to scale-out databases on small standard server hardware.
Motivation, Scope and Approach

Deliverables for the IT Planning Service

Deliverables for the IT Planning Service at <CUSTOMER>

- Rough-cut sizing for SAP ERP and SAP NW Portal based on workload in current systems. Other systems were not analyzed.
- Options and best practices regarding the technical architecture (HA/DR concept, mapping of SAP solution to OS, virtualization platform and servers) for the SAP systems mentioned above. This will be based on the sizing results and <CUSTOMER> availability requirements and other boundary conditions (data centers, planned server models etc.).

Out-of-scope for the Service

- The review of the HA/DR concept will be done on architecture level. For a detailed BCM review a separate service is proposed.
Defining the Technical Architecture for SAP Systems

General Approach

Objective

• Develop a technical architecture and IT infrastructure concept for an SAP solution respecting customer’s boundary conditions.

Approach

• Understand the current solution and its qualities.
• Discuss design aspects and define technical architecture building blocks. Major topics:
  – General SAP technical architecture
  – Availability SLAs, DC strategy & HA/DR architecture
  – IT infrastructure architecture
  – Size, scalability and load balancing
  – Software change management landscape
• Develop a high-level technical deployment plan for the SAP solution.
Service Approach

- Remote preparation by <CUSTOMER>:
  - See questionnaire on next slide.
- Remote preparation by SAP:
  - Rough-cut expert sizing for SAP ERP and SAP NW Portal based on workload in current systems, 1-2 weeks before the on-site workshop.
  - Review of existing architecture documentation for the current and planned technical platform.
- On-site workshop (2 days) with representatives from <CUSTOMER> and SAP with the following high-level agenda items:
  - Recap of current landscape situation and migration project at <CUSTOMER>
  - Review of rough-cut sizing results.
  - Discussion on technical architecture options and best practices.
  - Wrap-up and next steps.
- Remote creation of final report with evaluation results and recommendations from SAP.
- If required: read-out of the final results and agreement of next steps (1 hour).
1. Motivation, Scope and Approach

2. Summary

3. Future Technical Architecture
   I. Technical Platform Overview
   II. Availability SLAs
   III. HA/DR Architecture
   IV. Mapping of SAP Components to the Hardware

4. Current Landscape Overview

5. Sizing, Scalability, Performance
   I. ERP System ABC – Capacity Check
   II. EP System DEF – Capacity Check
Summary
Executive Summary

The general technical architecture at <CUSTOMER> is fit for purpose, albeit complex. We found a number of points that need to be addressed to complete planning:

- **High availability planning**
  - Although the architecture includes several precautionary measures to ensure system availability, some error scenarios endangering the business data are not considered yet.

- **Deployment plan (mapping sizing requirements to physical and virtual hardware)**
  - Design architecture building blocks (e.g. VMs with an SAP AS instance) for different capacity requirements. These building blocks can then be used to finalize the deployment planning. Find a proposal for the building blocks on the next slides. The proposal integrates boundary conditions of the future x86-based hardware platform.

- **Comprehensive testing for SAP on the Oracle RAC deployment**
  - Oracle RAC is a quite scalable database platform, but requires specific efforts to optimize performance with SAP and avoid contention on concurrently changed and accessed data in the database. These test efforts should be integrated in the overall migration plan (which was not reviewed in the service).

- **Remove scalability blocks on system ABC**
  - The database of ECC system ABC is I/O bound. Already some improvement potential was discovered as part of the service. Rather large optimization potential may be discovered when dedicated database (access) optimization measures are done.

- **Continuous improvement of the technical platform**
  - The planned new technical platform is quite complex. As part or directly after the migration project, we recommend to design and install monitoring and administration tools and procedures which ensure proper end-to-end management of the entire technology stack used for SAP.
Summary
Size of Architecture Building Blocks for an AS ABAP on the New Hardware

<table>
<thead>
<tr>
<th>Building Block</th>
<th>vCPUs</th>
<th>RAM</th>
<th>WPs</th>
<th>EM</th>
<th>SAPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS ABAP Dialog Instance (large)</td>
<td>6</td>
<td>36 GB</td>
<td>32</td>
<td>32 GB</td>
<td>8 100</td>
</tr>
<tr>
<td>AS ABAP Dialog Instance (medium)</td>
<td>4</td>
<td>25 GB</td>
<td>22</td>
<td>22 GB</td>
<td>5 400</td>
</tr>
<tr>
<td>AS ABAP Dialog Instance (small)</td>
<td>2</td>
<td>12 GB</td>
<td>10</td>
<td>10 GB</td>
<td>2 700</td>
</tr>
<tr>
<td>AS ABAP Central Services (ASCS)</td>
<td>2</td>
<td>4 GB</td>
<td>-</td>
<td>-</td>
<td>2 700</td>
</tr>
<tr>
<td>AS ABAP Enqueue Replication Server (ERS)</td>
<td>2</td>
<td>4 GB</td>
<td>-</td>
<td>-</td>
<td>2 700</td>
</tr>
</tbody>
</table>

Legend:
• vCPUs = Virtual CPUs of virtual machine
• WPs = Work processes
• EM = AS ABAP Extended Memory

Recommendations
• Configure **multiple large** AS ABAP dialog instances for AS ABAP systems with a capacity requirement > 8 000 SAPS, e.g. for ECC system ABC.
• Configure **two small or medium** AS ABAP dialog instances (size depends on capacity requirement) for smaller AS ABAP systems with high availability requirements.
• Configure **single small or medium** AS ABAP dialog instances for small AS ABAP systems without high availability requirement, e.g. development systems.
• Configure an ERS for all AS ABAP systems with high availability requirement.
• The size of a building block type should not vary within in the same SAP system.
## Summary

### Size of Architecture Building Blocks for an AS Java on the New Hardware

#### Legend:
- vCPUs = Virtual CPUs of virtual machine
- Nodes = Server nodes per AS Java instance
- Heap = Java VM heap size per VM (all generations)

#### Size of **AS Java** Building Blocks on the New Hardware

<table>
<thead>
<tr>
<th>Building Block</th>
<th>vCPUs</th>
<th>RAM</th>
<th>Nodes</th>
<th>Heap</th>
<th>SAPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS Java Dialog Instance (large)</td>
<td>6</td>
<td>36 GB</td>
<td>4</td>
<td>8 GB</td>
<td>8 100</td>
</tr>
<tr>
<td>AS Java Dialog Instance (medium)</td>
<td>4</td>
<td>25 GB</td>
<td>3</td>
<td>6 GB</td>
<td>5 400</td>
</tr>
<tr>
<td>AS Java Dialog Instance (small)</td>
<td>2</td>
<td>12 GB</td>
<td>2</td>
<td>4 GB</td>
<td>2 700</td>
</tr>
<tr>
<td>AS Java Central Services (SCS)</td>
<td>2</td>
<td>4 GB</td>
<td>-</td>
<td>-</td>
<td>2 700</td>
</tr>
<tr>
<td>AS Java Enqueue Replication Server (ERS)</td>
<td>2</td>
<td>4 GB</td>
<td>-</td>
<td>-</td>
<td>2 700</td>
</tr>
</tbody>
</table>

#### Recommendations

- Configure **multiple large** AS Java dialog instances for AS Java systems with a capacity requirement > 8 000 SAPS (currently not required at <CUSTOMER>).
- Configure **two small or medium** AS Java dialog instances (size depends on capacity requirement) for smaller AS Java systems with HA requirements, e.g. the Portal system DEF.
- Configure **single small or medium** AS Java dialog instances for small AS Java systems without high availability requirement, e.g. development systems.
- Configure an ERS for all AS Java systems with high availability requirement.
- The size of a building block type should not vary within in the same SAP system.
Proposed Hardware Mapping Schema for SAP Components

- SAP production and non-production components are jointly mapped to three separate infrastructure segments, distributing components to the segment according to their HA and workload balancing mechanisms.

Infrastructure Segment 1 (IS1)
- SAP Central Services and Enqueue Replication Services share server hardware in both data centers and are managed by a classical cluster management solution, e.g. RHCS.
- Production and test systems may share the same infrastructure. Alternatively test systems may use a separate (additional) infrastructure segment, which would allow for isolated HA tests, but would increase the amount of required hardware.

Infrastructure Segment 2 (IS2)
- SAP Dialog Instances for ABAP or Java application servers share virtualized server hardware in both data centers. Highly available SAP systems have Dialog Instances distributed in both data centers.
- Production systems and large test systems (with multiple Dialog Instances, no Central Instances*) may share the same infrastructure.
  
  * Central Instance is here: SAP Central Services and Dialog Instance in a single VM or physical host.
Proposed Hardware Mapping Schema for SAP Components (continued)

**Infrastructure Segment 3 (IS3)**

- All remaining SAP components (Central Instances*, liveCaches, MaxDBs, …) share virtualized servers in both data centers, managed by a VM cluster manager, e.g. RHEV. The cluster manager manages the restart of VMs after server failures and manages the workload distribution.
- Production systems and test systems without production-like HA setup (i.e. Central Instances*) share the infrastructure.
- Development systems may also share this infrastructure, deployed as Central Instances*. Alternatively they can be deployed on the infrastructure for the Dialog Instances (then without cluster manager support, i.e. no specific support for restarts after server failures).

* Central Instance is here: SAP Central Services and Dialog Instance in a single VM or physical host.
Summary
Proposed Hardware Mapping Schema for SAP Components (3/3)

Segment 1
Production
Test*

Use of VMs is optional

SCS / ERS failover management via Red Hat Cluster Suite

File system mirroring

SAN

Production
Test*

Use of VMs is optional

Segment 2
Production
Test***

DI VM (S/M/L)

File system mirroring

SAN

Production
Test***

DI VM (S/M/L)

Segment 3
Production
Test**
Development

MaxDB

tliveCache

VM Cluster via Red Hat Enterprise Virtualization

File system mirroring

SAN

Test**
Development

Central

Legend

Virtual machine

DI : Dialog Instance in different sizes (small, medium, large)

ASCS, SCS, ERS : SAP Central Services & Enqueue Replication Server

* Test systems with production-like HA setup
** Test systems without production-like HA setup
*** Large test systems with multiple Dialog Instances

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**Summary**  
**Example: Deployment of ECC System ABC on the New Hardware (1/2)**

**Deployment of ECC System ABC on the New Hardware**

<table>
<thead>
<tr>
<th>Building Block</th>
<th>vCPUs</th>
<th>RAM</th>
<th>WPs</th>
<th>EM</th>
<th>DC</th>
<th>IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS ABAP Dialog Instance (large)</td>
<td>6</td>
<td>36 GB</td>
<td>32</td>
<td>32 GB</td>
<td>DC 1</td>
<td>IS 2</td>
</tr>
<tr>
<td>AS ABAP Dialog Instance (large)</td>
<td>6</td>
<td>36 GB</td>
<td>32</td>
<td>32 GB</td>
<td>DC 1</td>
<td>IS 2</td>
</tr>
<tr>
<td>AS ABAP Dialog Instance (large)</td>
<td>6</td>
<td>36 GB</td>
<td>32</td>
<td>32 GB</td>
<td>DC 2</td>
<td>IS 2</td>
</tr>
<tr>
<td>AS ABAP Dialog Instance (large)*</td>
<td>6</td>
<td>36 GB</td>
<td>32</td>
<td>32 GB</td>
<td>DC 2</td>
<td>IS 2</td>
</tr>
<tr>
<td>AS ABAP Central Services (ASCS)</td>
<td>2</td>
<td>4 GB</td>
<td>-</td>
<td>-</td>
<td>DC 1</td>
<td>IS 1</td>
</tr>
<tr>
<td>AS ABAP Enqueue Replication Server (ERS)</td>
<td>2</td>
<td>4 GB</td>
<td>-</td>
<td>-</td>
<td>DC 2</td>
<td>IS 1</td>
</tr>
</tbody>
</table>

- In addition the Oracle database of ABC has to be deployed at least on a 2-node, better a 4 node Oracle RAC cluster (as planned) with the planned hardware.

* We added a fourth Dialog Instance for better load distribution and to ensure at least 66 % Dialog capacity in case of server hardware failures.
Summary
Example: Deployment of ECC System ABC on the New Hardware (2/2)

Segment 1

DC1

- ASCS
- SCS / ERS failover management via Red Hat Cluster Suite
- Use of VMs is optional

DC2

- ERS
- Use of VMs is optional

Segment 2

DI VM (L)

DI VM (L)

File system mirroring

Segment 3

VM Cluster via Red Hat Enterprise Virtualization

SAN

SAN

File system mirroring

Legend

- : Virtual machine
- DI : Dialog Instance in different sizes (small, medium, large)
- ASCS, SCS, ERS : SAP Central Services & Enqueue Replication Server
- : Physical host
## Summary

### Summary of Recommendations

<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
</table>
| Future Technical Architecture – Technical Platform | 1 | **Technical architecture for SAP AS ABAP systems**  
- Change the architecture of Central Instances (CI) to “ABAP Central Services” (ASCS) (for all AS ABAP based systems).  
- For HA purposes use an Enqueue Replication Server (ERS) to achieve a resiliency of the entire SAP system similar to the database system on Oracle RAC (for very critical SAP systems, AS Java or AS ABAP based)  
- Define fixed-sized “building blocks” for VMs with AS ABAP or AS Java Dialog Instances. See also the proposal for small, medium and large building blocks described in the report. | Best as part of the migration project |
| | 2 | **New virtualization platform introduction**  
- Consider SAP Note [1400911](#) when setting up the virtual environment. This includes the proper setup of a monitoring environment of the AS ABAP with KVM-based virtualization.  
- Explain operations of the new virtualization platform to the respective <CUSTOMER> support teams. | Could be done after the migration project |
| | 3 | **SAP landscape management**  
- Evaluate SAP Landscape Virtualization Management (SAP LVM) as a tool for managing the complete SAP landscape in a virtual environment. | Could be done after the migration project |
## Summary
### Summary of Recommendations

<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
</table>
| Future Technical Architecture – HA/DR Architecture | 1 | **Oracle RAC implementation**  
- Include a performance test into the migration plan to ensure proper database performance for typical workload patterns (simulation of a “day in the life”).  
- Provide an overview about operations procedures of Oracle RAC to the SAP Basis team. | As part of the migration project |
| | 2 | **Improved protection against technical / logical data corruption**  
- Discuss the need of improved protection against technical corruptions. Consider the introduction of synchronous standby databases.  
- Discuss the need of protection against logical / user / operator errors. Consider a prepared setup of an analysis system (via quick database restore or storage snapshots). | Could be done after the migration project |
<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
</table>
| Future Technical Architecture – Components to hardware Map | 1 | **Hardware mapping adaptation**  
• Plan for at least one test system with a production-like HA configuration. This test system can then be used to test HA capabilities after infrastructure changes.  
• For production and (selected) test systems integrate the need for SAP Central Services / ERS replacing Central Instances. | As part of the migration project |
## Summary

### Summary of Recommendations

<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Landscape Overview</td>
<td>1</td>
<td><strong>Redefine backup strategy</strong></td>
<td>As soon as possible (independent from migration project)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SAP generally recommends to cover a range of 28 days with backups from production systems. This can be achieved by retaining a similar amount of backups as today, e.g. by retaining backups for the days 1-7, 9, 11, 14, 17, 21, 24, 28, 35.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• There should always be one restore-tested backup available. All log files should be available to restore to enable a full recovery.</td>
<td></td>
</tr>
</tbody>
</table>
## Summary

### Summary of Recommendations

<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECC System ABC Capacity</td>
<td>1</td>
<td><strong>Database performance optimization</strong>&lt;br&gt;• Create 2 indexes to avoid full table scans.&lt;br&gt;• Temporarily un-buffer table A018 to avoid unnecessary load on the database (until archiving of conditions has been done).&lt;br&gt;• An increase of the database buffer to 50 GB would be desirable, but is currently not possible due to limited free main memory in the server. The increase of the database buffer should be done on the new hardware.</td>
<td>As soon as possible</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td><strong>Archiving of pricing conditions</strong>&lt;br&gt;Archive old pricing conditions to reduce the size of the condition tables and re-enable SAP buffering for them.</td>
<td>Could be done after the migration project</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td><strong>Perform a TPO service for Oracle</strong>&lt;br&gt;Reduce the currently high share of database processing time, compared to application processing time.&lt;br&gt;Schedule a remote service with the help of your TQM.</td>
<td>Could be done after the migration project</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td><strong>Optimization of top resource consumer transactions</strong>&lt;br&gt;To increase system performance SAP recommends to optimize:&lt;br&gt;• Transaction ZMRO&lt;br&gt;• Reports: ZPP_PICK_LIST, RSBDCBTC_SUB, SAP AGS may support if required.</td>
<td>Could be done after the migration project</td>
</tr>
</tbody>
</table>
## Summary

### Summary of Recommendations

<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECC System ABC Capacity</td>
<td>5</td>
<td><strong>Change configuration of workload monitor (transaction ST03N)</strong> Extend the hourly time profile used in transaction ST03N (see SAP Note: 910897).</td>
<td>Could be done after the migration project</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td><strong>Enable OS monitoring from SAP</strong> Restart SAPOSCOL on ABC instance XYZ_ABC_54</td>
<td>As soon as possible</td>
</tr>
</tbody>
</table>
# Summary

## Summary of Recommendations

<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>Recommendation</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP System DEF Capacity Check</td>
<td>1</td>
<td><strong>Heap usage often reaches 100 % while the OS is paging</strong></td>
<td>As part of the migration project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase the heap size on the new hardware to at least 4 GB.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td><strong>Processes of other SAP systems run on the same hosts as DEF</strong></td>
<td>As part of the migration project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider to install systems on separated (virtual) hosts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td><strong>The Host agent of Wily Introscope is not installed on the hosts of DEF</strong></td>
<td>As soon as possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Install host agents on all hosts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td><strong>Most of the components in the system is on Patch Level 0</strong></td>
<td>As part of the migration project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider to install the newest components, e.g. as part of a development release.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td><strong>IBM JVM is not supported any more</strong></td>
<td>As part of the migration project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Switch to SAP JVM.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td><strong>Log Severity Setting Incorrect</strong></td>
<td>As soon as possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set all Logging Categories and Tracing Locations to Error.</td>
<td></td>
</tr>
</tbody>
</table>
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The remaining part of the service report has been removed.
Thank you

SAP Active Global Support
SAP AG