



# SAP Performance Review/System Health Check

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## **INTRODUCTION**

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**A Performance Review/System Health Check is intended to provide a review of the R/3 environment with a focus on the infrastructure, performance, and setup considerations. The review is conducted on the z/OS Database Server and the SAP Application Server.**

**The purpose of this document is to identify the steps required to conduct an SAP Performance Review/System Health Check on a production SAP system. A standard checklist of items is used in the analysis and the results can be documented in a report.**



## **HARDWARE CONFIGURATION DATA**

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The purpose of this section is to identify the base hardware configuration of the SAP Production System.

**zSeries Data Base Server Model:**

**z/OS LPAR Host Name:**

**Storage Subsystem - Description/Model/Capacity:**

**Application Servers - Description/Model/ Host Names:**

**Network Connectivity between Application Servers and Data Base Server:**

**SAP Local Printer Name (for use during the Health Check):**

## SOFTWARE CONFIGURATION DATA

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The purpose of this section is to identify the base software configuration of the SAP Production System.

**SAP SID (System Identifier):**

**SAP BASIS Release:**

**SAP Kernel Release:**

**Central Instance on zLinux/Linux Distribution (if applicable):**

**z/OS Version:**

**DB2 Version/PUT Level:**

**z/OS Production LPAR Name:**

**LPAR Setup (Weight, Logical Engines, Central Storage) for each LPAR:**



**Application Servers OS Version:**

**SAP PTF Checker operational ?:**

**z/OS PARMLIB Dataset Name:**

**z/OS PROCLIB Dataset Name:**

**ICLI Started Task Procedure Name:**

**DB2 High Level Qualifier for Dataset Allocation:**

**DB2 STEPLIB Dataset Name:**

**ICF Catalog Name:**

**z/OS TCPIP PROFILE Dataset Name:**

## BASE REVIEW TASK LIST

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The purpose of this section is to identify the checks associated with a base review of the environment. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

<b>SAP BASIS Support Package Level</b>	<b>Refer to SAP Service Marketplace Packages and Patches</b>
<b>Application Server Platform ID</b>	<b>Transaction System → Status</b>
<b>ICLI Server Level</b>	<b>Identified in ICLI Message Log or Applied ICLI PTF</b>
<b>Identify Missing R/3 Transports</b>	<b>Transaction SE09 OSS Notes 101217/407663/427748</b>
<b>R/3 Kernel Release</b>	<b>Download latest from SAP Service Marketplace</b>
<b>Review Developer Work File Messages for error or warning messages (e.g. buffer table overflows, memory issues)</b>	<b>Transactions AL11/ST11</b>

<b>Review z/OS Console Messages</b>	<b>Transaction ST04 or z/OS SDSF Utility</b>
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<b>Review ICLI Server Log Messages</b>	<b>Available through Unix System Services</b>
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<b>Review ICLI Environment File</b>	<b>Available through Unix System Services Compare with SAP Planning Guide</b>
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<b>Review ICLI Server Log Filesystem</b>	<b>Available through Unix System Services Review management methodology for ICLI Server Log Files</b>
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<b>Review ICLI Server Started Task JCL and Parameters</b>	<b>Compare with SAP Planning Guide Check REGION Parameter</b>
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<b>Review R/3 System Log</b>	<b>Transaction SM21</b>
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<b>Review DB2 MSTR Job Log</b>	<b>SDSF or z/OS Console</b>
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## APPLICATION SERVER TASK LIST

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The purpose of this section is to conduct a review of various aspects of the Application Server environment. Perform these checks for each production Application Server. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

Review TCPIP Parameters	Compare with SAP Connectivity Guide
CPU Busy consistently $\geq 70\%$ ?	Transaction ST06
Pages out/second consistently $> 10,000/\text{hour}$ ?	Transaction ST06
CPU Load average consistently $\geq 3$ ?	Transaction ST06
Lengthy I/O Waits ?	Transaction ST06
Physical memory available consistently $< 1 \text{ GB}$ ?	Transaction ST06
High value for physical memory free ?	Transaction ST06
Consistently low values for free swap space ?	Transaction ST06
Compare Roll Area used to shared memory allocation	Transaction ST02

<b>Review SAP Buffers</b>	<b>Transaction ST02</b> <b># swaps, hit ratios</b>
<b>Review ICLI Ping times</b>	<b>Transaction ST04</b> <b>~1ms for GbE, &lt;1ms for HiperSockets</b>
<b>Review Instance profile</b>	<b>Transaction SE38 (Report RSPFPAR)</b> <b>Transaction RZ10</b> <b>OSS Note 70964</b>
<b>Review memory parameters for 64 bit application server</b>	<b>OSS Note 789477</b>
<b>Verify work processes are recycled</b>	<b>OSS Note 182207</b>
<b>Review number and type of work processes - too few ? too many ?</b>	<b>Transaction SM50, SM51, SM66</b>
<b>Review SAP scheduled batch jobs against the recommendation</b>	<b>Transaction SM37</b> <b>OSS Note 16083</b>
<b>Review use of Batch Server Groups with Logon Groups</b>	<b>Transaction SM36, SMLG</b>

<b>Review SAP Alert Monitor</b>	<b>Transaction RZ20</b>
<b>Review ABAP Dump data</b>	<b>Transaction ST22</b>
<b>Review Data Base update failures</b>	<b>Transaction SM13</b>
<b>Review lock entries being held for lengthy periods</b>	<b>Transaction SM12</b>
<b>Application Table Buffer Review</b>	<b>Transaction ST10</b> Identify problem tables - tables in the wrong buffer, buffered tables that should be removed from the buffer, nonbuffered tables that are candidates for buffering. Tables accessed primarily through ABAP SELECT do not access single record buffer. Tables with a high number of changes may not be good candidates for buffering.

## WORKLOAD ANALYSIS TASK LIST

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The purpose of this section is to conduct a review of the overall dialog workload performance. An appropriate timeframe with a representative workload should be selected. Perform these checks for each production Application Server. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

<b>Review</b>	<b>Transaction ST03</b>
<b>Average response time</b>	~ 1 second
<b>Wait time</b>	~ 1% of average response time
<b>Load time</b>	< 10% of average response time
<b>Roll wait time</b>	
<b>Roll in time</b>	
<b>CPU time</b>	~ 40% of average response time
<b>DB request time</b>	~ 40-50% of average response time
<b>Lock time</b>	< 1% of average response time

<b>Database Access</b>	<b>Transaction ST03</b>
<b>Direct Read</b>	~ 2 ms
<b>Sequential Read</b>	~ 5 ms
<b>Changes</b>	~ 25 ms

<b>Review ratio of Database Calls (R/3 Application DB Calls) to Database Physical Accesses (Calls to DB2)</b>	<b>Transaction ST03 DB Calls/DB Accesses ~ 1/10</b>
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## **z/OS TASK LIST**

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The purpose of this section is to conduct a review of the z/OS environment. Perform these checks through the TSO interface of the Data Base server. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

<p><b>Review Unix System Services parameters in the BPXPRMxx member of PARMLIB</b></p>	<p><b>Compare with SAP Planning Guide</b></p>
<p><b>Review JES2 PARMLIB member or JES3 PARMLIB initialization parameter CIPARM</b></p>	<p><b>Is SWA=ABOVE on STCCCLASS macro (JES2) ?</b>  <b>Is CIPARM set to place SWA above the line (position 1 of PARM = 4,5,6, or 7) (JES3) ?</b></p>
<p><b>Review assigned dispatching priorities</b></p>	<p><b>SDSF</b></p>

<b>Review Workload Manager Service Policy</b>	<b>WLM</b> <b>Compare with SAP Planning Guide</b>
<b>Review JCL parameters for IRLM started task</b>	<b>PC=YES, DEADLOK=5,1</b>
<b>Review SMFPRMxx member of PARMLIB</b>	<b>OSS Note 173547</b> <b>DDCONS=NO</b> <b>Check for unnecessary traces as documented in Planning Guide</b>
<b>Is DB2 ICF Catalog in VLF cache ?</b>	<b>Use z/OS Command :</b> <b>'F CATALOG,REPORT,CACHE'</b>
<b>Review TCPIP parameters in TCPIP profile dataset</b>	<b>Verify MTU matches application server</b> <b>Command 'netstat -d' (OMVS)</b> <b>'netstat de' (TSO)</b>

## **zLinux TASK LIST**

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The purpose of this section is to conduct a review of the zLinux environment if it is used for application server processing. If not, then this section can be skipped. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

<b>Review OSS Notes which list supported Linux distributions, PTFs, kernel level, kernel parameters, RPM packages, z/VM PTFs, and the zLinux timer patch</b>	<b>OSS Notes 563060, 81737, 386605</b> <b>Command: rpm -qa   -i {sapinit, saplocales, deflt, glibc, cpint, snmp (for IDI), java}</b>
<b>Review the filesystems and check space</b>	<b>Command: df -k</b>
<b>Review the minimum/maximum virtual storage size of the Linux guest machine</b>	<b>VM Directory file</b>
<b>Review the Java version</b>	<b>Command: java - version</b>
<b>Review the SuSE support document identified in OSS Note 81737</b>	<b>OSS Note 81737</b> <b><i>Additional Notes for installing SAP R/3 4.6 and up on the Linux Enterprise Server 8 (9) for zSeries</i></b>
<b>Review SG24-6926 Performance Measurement/Tuning of zLinux Under z/VM</b>	<b>Redbook SG24-6926</b>

<p><b>Review the z/VM LPAR setup</b></p>	<ul style="list-style-type: none"> <li>-CPU Resources (# IFLs)</li> <li>- Sufficient real memory to back the virtual storage requirements of the Linux guests ?</li> <li>- If using expanded storage for z/VM paging, the recommendation is 75% central and 25% xstore</li> </ul>
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<p><b>Review the zLinux setup</b></p>	<ul style="list-style-type: none"> <li>- Required swap space for 64 bit kernel = 20GB</li> <li>- Minidisk caching should be turned off for swap minidisks (read ratio is not balanced by write path length) Command Q MDC RDEV xxxx</li> <li>- VDISK consumes real storage, do not use if storage constrained in z/VM</li> <li>- Verify zLinux guests are not spending time in eligible list, especially E3. This points to resource constraints, with the guest machine not getting to the dispatch list</li> <li>- Linux uses aggressive caching techniques which can consume large amounts of virtual storage, causing real storage contention and paging. Increasing the virtual size of a machine does not necessarily imply improved performance. Use the Linux 'free' and 'vmstat' commands to monitor. Use the z/VM command CP IND to monitor VM virtual storage under the 2GB line (some control blocks reside under 2GB)</li> </ul>
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## RMF TASK LIST

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The purpose of this section is to identify the key RMF indicators to review for performance analysis. This data is available from the RMF III Monitor and the following RMF Reports: CPU Activity, DASD, and Paging. The time period to be reviewed should match the same period selected for the Workload Analysis review. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

Review LPAR setup - weights, # logical engines, capping	RMF CPU Activity Report Partition Report
Identify CPU contention and shortages	RMF III RMF CPU Activity Report LPAR Busy vs MVS Busy Queue Lengths
Review UIC values for central storage shortages	RMF Paging Activity Report
Review DASD utilization and concurrent activity	RMF III Delay Reports DUSG%, DDLY%
Review channel utilization	RMF III Channel Path Activity Report
Review WLM goals and results for service classes	RMF Workload Activity Report Goal Mode

## DB2 TASK LIST

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The purpose of this section is to conduct a review of the DB2 for z/OS environment. These checks are performed from both the SAP interface and the TSO DB2I interface. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

Perform BufferPool Review/Analysis	Transaction DB2B
Review BufferPool Performance	Hit Ratios, Sequential vs Random access, Exceeded Thresholds Random Hit Ratio > 95% Hit Ratio > 90%
Review BufferPool average synchronous I/O delay, maximum delay	DB2 Command : - DISPLAY BUFFERPOOL(BPx) LSTATS Average synchronous I/O time ~ 5ms Average asynchronous I/O time ~ 10 ms
Determine any DB2 Page Sets with large number of extents or Page Sets requiring an image copy or reorg	Transaction RZ08 - SAP Alert Monitor Transaction DB02
Are DB2 Catalog statistics maintained ?	OSS Notes 113008, 83335, 132424, 116698 SAP DBA Guide
Review DB2 Global Times	Transaction ST04 Other time <= 10 % ? Suspended time <= 50% ? Processing time >= 50% ?

Verify BufferPools , EDM Pool are in DataSpaces , no HiperPool assignments for zSeries technology	ZPARM Macro EDMDSPAC Command : DISPLAY BUFFERPOOL
Review DSNZPARM values	Compare against SAP DBA Guide
Verify VBLOG tables are converted to 4K Pages	OSS Note 122599 Transaction SE11 (Table VBDATA)
Review Data Dictionary and DB2 for missing indexes or inconsistent objects	OSS Notes 117219, 33814
Verify Trace Class(30) IFCID(318) is started to trace statements in Dynamic Cache	START TRACE(P) CLASS(30) IFCID(318) DEST(SMF)
Check for existence of DB2 Lockwaits	Transaction ST04
Verify that jobs RSDBA_COLLECT_HOURLY and RSDBA_COLLECT_DAILY are scheduled	Transaction SM37 SAP DBA Guide
Review EDM Pool Activity	Transaction ST04 Full Conditions = 0 Requests not found <= 1% SUM(CT + PT Pages) <= 50% of Pool SUM(DBDs + CT Pages) <= 40% of Pool
Review Dynamic Statement Cache	Transaction ST04 Global Hit Ratio >= 97%

<b>Review Locking Activity</b>	<b>Transaction ST04</b> <b>Timeouts &lt; 10 per day</b> <b>Rollbacks &lt; 10 per day</b> <b>DEADLOCKS = 0</b> <b>IRLM Latch Contention &lt;= 10% of all IRLM requests</b>
<b>Review Logging Activity</b>	<b>Transaction ST04</b> <b>Reads satisfied from archive logs = 0</b> <b>Unavailable buffers = 0</b>
<b>Review Subsystem Services</b>	<b>Transaction ST04</b> <b>One Checkpoint every 10-15 minutes</b>
<b>Review Open/Close Activity</b>	<b>Transaction ST04</b> <b>Review number of open datasets</b>
<b>Review the use of DB2 Data Compression</b>	<b>Column COMPRESS in Catalog Table SYSIBM.SYSTABLEPART</b>



## DATA SHARING TASK LIST

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The purpose of this section is to conduct a review of the SAP environment if implemented in a DB2 Data Sharing setup. If not, then this section can be skipped. These checks are performed from both the SAP interface and the TSO interface. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

Check ICLI Setup	2 ICLI Servers per SAP app server 1 primary ICLI and 1 standby ICLI See SAP Planning Guide
Check for BufferPool Tuning	Transaction DB2B
VBLOG Setup	OSS Note 116698 or SAP DBA Guide
Check that Logon Load Balancing is setup and Batch Scheduling Groups are setup	Transaction SMLG Transaction SM61
Check that VB Dispatching has been implemented	Transaction RZ10 Tables ASGRP and APSRV See SAP Planning Guide
DBM1 Virtual Storage Review	RMF Virtual Storage Report for Address Space DBM1 See SAP Planning Guide
Check SYSPLEX Failover setup	Transaction RZ10
Optionally perform a Cost of Data Sharing Analysis	Requires spreadsheets from Data Sharing Workshop taught by Competency Center Analyze CPU costs of Data Sharing
Check overall health of Data Sharing complex	Command : DISPLAY GROUP DETAIL

<b>Check for retained database locks</b>	<b>Command : DISPLAY DATABASE LOCKS</b>
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<b>Check coupling facility and links - Structure status CPU Utilization Storage Consumption Availability/Performance of paths to the CF</b>	<b>Command : D XCF,STR RMF III SYSPLEX Options 5 &amp; 6</b>
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## APPLICATION SQL TASK LIST

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The purpose of this section is to conduct a high level review of the SAP Dynamic Statement Cache to look for statements that might be candidates for improved optimization or that have the greatest impact. This review is performed from the SAP interface. Column 1 of each check is the task to perform or the resource to review, and column 2 identifies supporting or additional information related to the task.

<p><b>Review Dynamic Statement Cache for inefficient and costly SQL</b></p> <p><b>Execute EXPLAIN against suspect statements to review the access path</b></p> <p><b>Identify improvements for changes to the access path (recode the SQL, execute RUNSTATS, index changes, etc)</b></p>	<p><b>Transaction ST04</b></p> <p><b>Sort statements by multiple characteristics: number of executions, cpu used, number of getpages executed</b></p> <p><b>Look for:</b></p> <p><b>High number getpages/rows retrieved</b></p> <p><b>Lengthy CPU times to return low number of rows</b></p> <p><b>High ratio rows examined/rows retrieved</b></p>
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## HEALTH CHECK USEFUL SAP TRANSACTIONS

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### Background Processing Transactions

SM37

Job Selection

SM61

Background Controller List

### Monitoring Transactions

SM50

Work Process Overview

SM51

SAP Instance List

SM66

Systemwide Work Process Overview

RZ03

SAP Alert Monitor Review

RZ20

SAP Alert Monitor

ST22

ABAP Dump Analysis

### Performance Analysis Transactions

STAD

Statistics Display for all Instances

STAT

Local Statistics Display

STUN

Performance Monitor Menu

ST02

SAP Buffers

ST03

Workload Analysis

ST04

DB Performance Monitor Menu

DB2 (\*plus all underlying transactions)

DB Administration for DB2 on z/OS

ST05

SQL Performance Trace

ST06

Operating System Monitor

ST10

Table Call Statistics

OS07

z/OS System Monitor

### General System Administration Transactions

SM21

SAP System Log

SM12

Display Locks

SM13

Display Update (VBLOG) Records

AL11

Display SAP Directories

ST11

Display Work Logs

SE38

ABAP Editor

### System Configuration Transactions

RZ10

Profile Parameter Maintenance

### Transport System Transactions

SE01

Transport and Correction System

SE09

Transport Organizer