Chapter 19: Performance

Contents

Overview

This chapter is an introduction to performance issues in R/3. We provide only general guidelines, not detailed performance tuning instructions. It is not possible in one chapter, to provide the breadth and depth of information available in the SAP training class or the *Performance Optimization* book. For more detailed performance tuning, we recommend the following resources:

- *BC315 – R/3 Workload Analysis* (the SAP Performance Tuning class)
- *SAP R/3 Performance Optimization*, by Thomas Schneider, SAP's TCC organization, which recently published a book on performance optimization.

Performance tuning is specialized troubleshooting. Since you are trying to solve performance issues, all troubleshooting techniques are also relevant.

Rather than using database and operating system-specific details, where possible, we will be using R/3 transactions to access relevant database and operating system data. This approach makes the information database and operating system independent.

Critical Assumption

The hardware, operating system, database, and R/3 have been properly installed based upon SAP's recommendations.

Why

As with the design of this book, performance tuning has to have a starting point. This point is the SAP-recommended configuration for hardware, database, operating system, network, etc.

An extreme example (that did occur with a customer) is where the operating system, the database, and R/3 has been installed on a single logical drive. In this situation, all the drives in the server were configured in a single RAID5 array and treated as a single, **huge** drive. This situation created a classic condition known as "head contention," where R/3, the database, and the operating system all simultaneously competing for the same disk drive head.

Head contention is similar to you being asked to do many things at the same time, such as:

- Cook dinner
- Read a book
- Help your child with homework
- Water the yard
- Fix the fence

You run around doing a little of each task then going to the next. None of the tasks get done with any reasonable speed.

This is an example of a problem that is not new. Head contention existed in the early days of computing. The solution now is essentially the same as it was back then, that is, to spread the data over multiple drives.

Priority of Evaluation

The SAP EarlyWatch group has determined that the majority of the performance issues and gains are from within R/3. This gain is followed first by database issues, then operating system, then hardware. Thus we will primarily discuss R/3 performance issues.

General Procedure

The general procedure when working on performance issues is not new. It is the standard problem-solving procedure:

- Gather data
- Analyze the problem
- Evaluate the alternatives
- Make only one change at a time
  If there is a problem, you will not know which change caused a problem. There are times where several changes need to be made to fix a problem. Even so, unless they **must** be done together, such as related program changes, make the changes one at a time.
- Document the changes.
  - If a change causes a problem, you need to undo the change.
    To do that you need to know what the configuration was before the change and what you did.
  - If the change needs to be applied to multiple systems, you need to know **exactly** what changes to make, and how to do it.
    This process must be repeated **exactly the same** on all systems.

R/3

One of the most common reasons for R/3 performance problems is poorly written custom (or modified standard) ABAP programs.

Workload Analysis of the System (Transaction ST03)

What

Workload analysis is used to determine system performance.

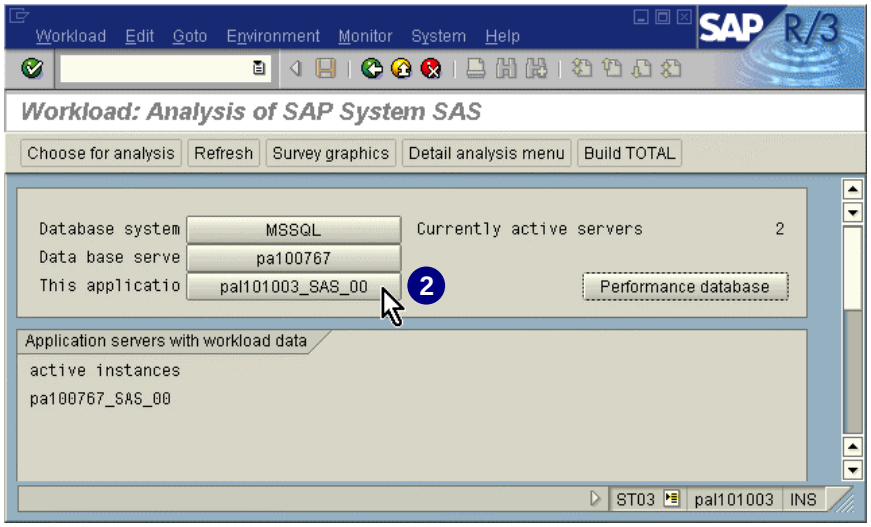
How

You should check statistics and record trends to get a "feel" for the system's behavior and performance. Understanding the system when it is running well helps you determine what changes may need to be made when it is running poorly.

Guided Tour

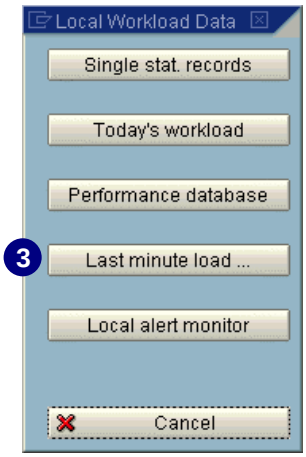
1. In the *Command* field, enter transaction **ST03** and choose *Enter*
   (or from the *SAP standard menu*, choose *Tools* → *Administration* → *Monitor* → *Performance* → *Workload* → *ST03-Analysis).*

2. Choose *Data base server* or *This application server*.
   (In this example, we chose *This application server*, *pal101003_SAS_00.*)



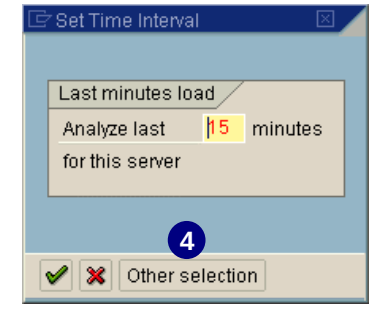
3. Select a time period to analyze.

   (In this example, we chose *Last minute load*.)

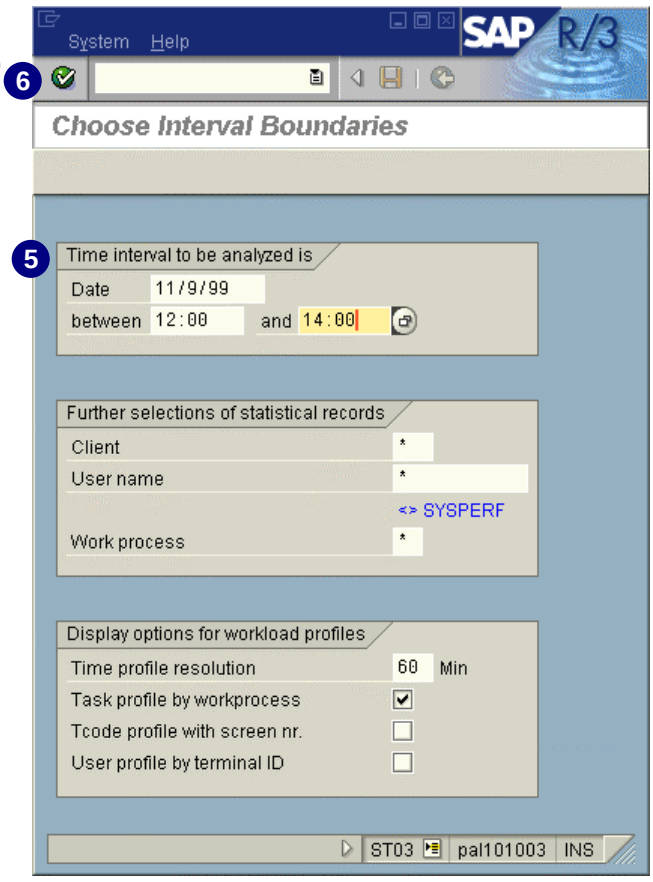


4. Enter how many minutes back to analyze, or choose *Other selection* to specify a date and time period to analyze.

   In this example, we chose *Other selection*.



5. Under *Time interval to be analyzed is*, enter the *Date* and time range to be analyzed.
6. Choose  .



7. Check the *Current* value under *Task types* (for example, *Total*).

   The *task types* are:

   - *Total*
   - *Dialog*
   - *Background*
   - *RFC*

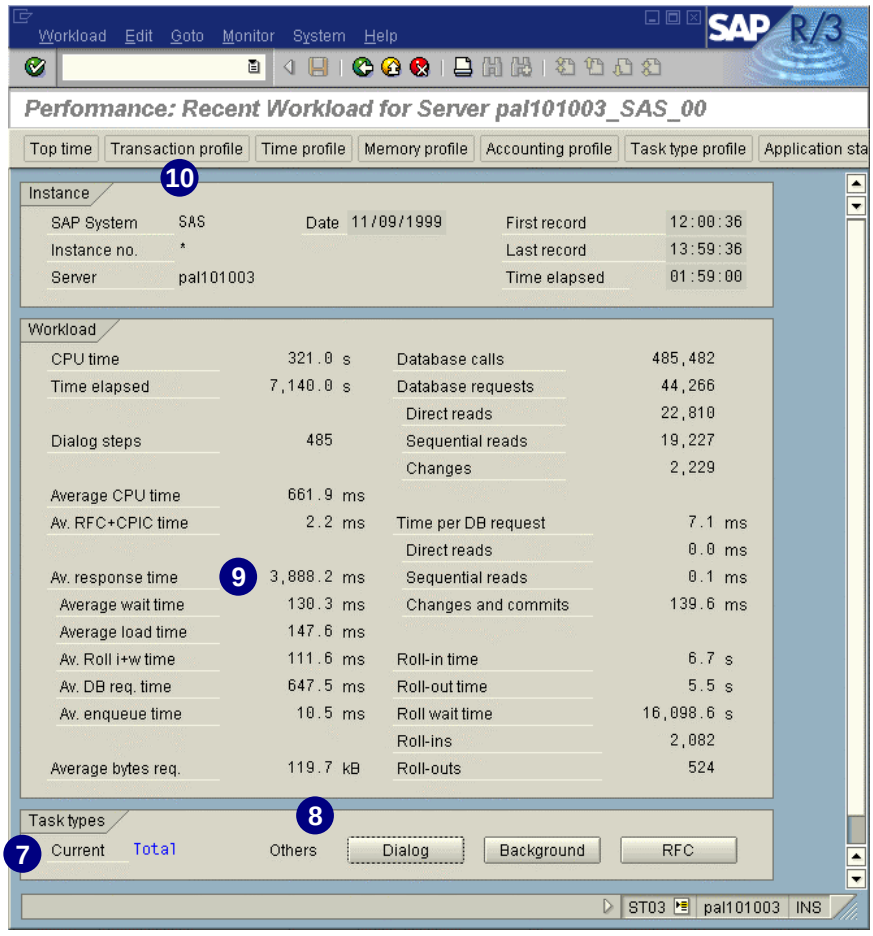
8. Choose the appropriate button to view performance values for that *Task type*.

9. Examine *Av. response time*.

   If this value is less than 1,000 ms (1 second), the response time meets the target standard response time.

   For more information on *Av. response time*, see notes below.

10. Choose *Transaction profile*.

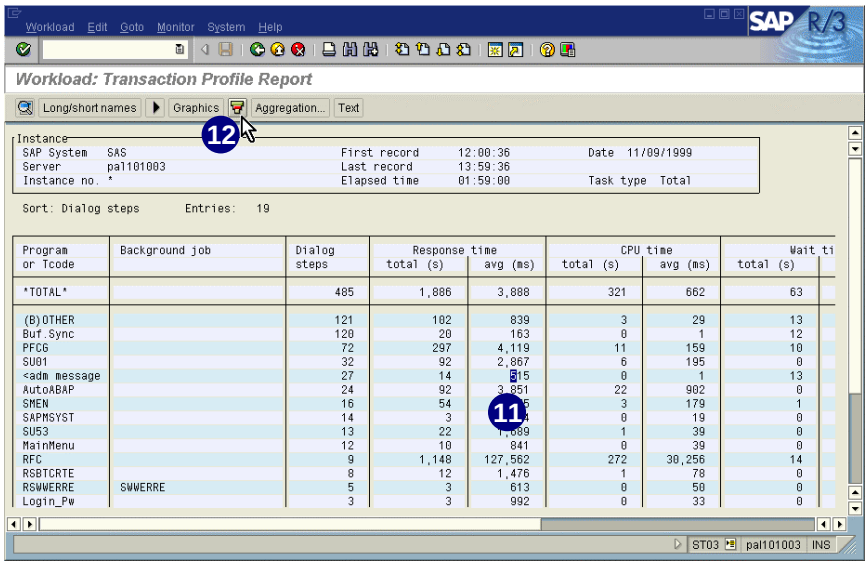


Judgment must be applied when reviewing statistical values. If you just started the R/3 System, the buffers will be empty and many of the statistics will be unfavorable. Once the buffers are loaded, values can be properly evaluated.

In this example, the *Av. response time* of almost 4 seconds must be evaluated with other factors in mind.

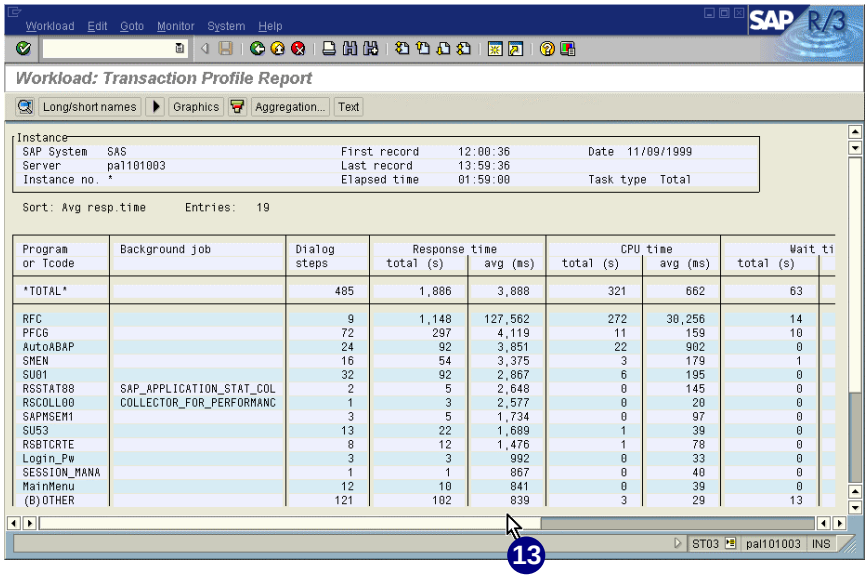
The R/3 user default for a *decimal point* is a *comma*. If your default profile for *decimal point*, (point or comma) is not appropriately set, the display may be misread. For example, rather than 3,888 ms, it would read 3.888 ms. Quite a difference!

11. Click on any cell in the *Response time avg* column.
12. Choose .



Analysis of transaction *ST03* is covered in BC315 (the Workload Analysis and Tuning class). We recommend you take this class.

13. The programs and transactions are now sorted in average response time order.



A few standard functional transactions will exceed the one-second guideline. They include, but are not limited to the following:

Type	Transaction
Create Sales Order	*VA01*
Change Sales Order	*VA02*
Display Sales Order	*VA03*
Create Billing Document	*VF01*
Create Delivery	*VL01*
Maintain Master HR data	*PA30*

Buffers (ST02)

What

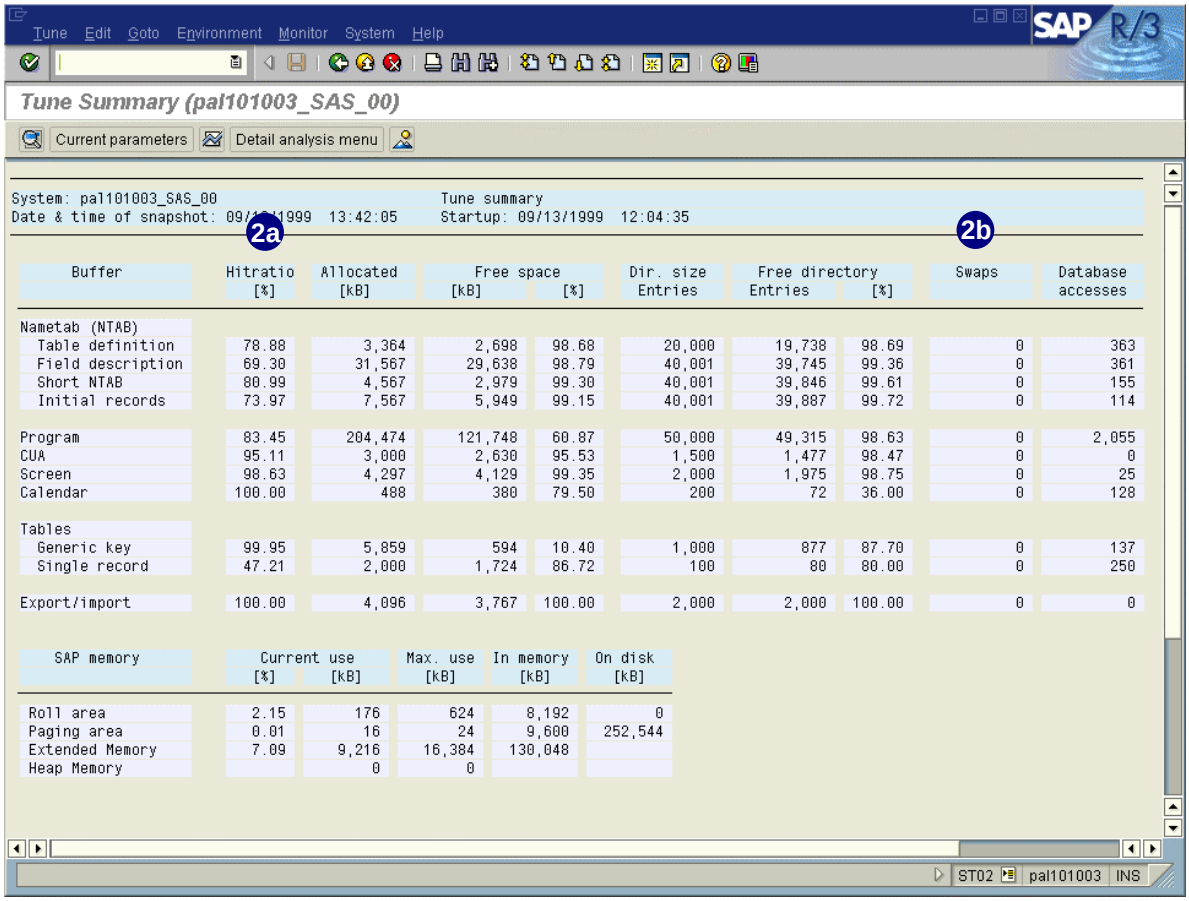
The buffer tune summary transaction displays the R/3 buffer performance statistics. It is used to tune buffer parameters of R/3 and, to a lesser degree, the R/3 database and operating system.

Why

The buffer is important because significant buffer swapping reduces performance. Look under *Swaps* for red entries. Regularly check these entries to establish trends and get a feel for buffer behavior.

Guided Tour

1. In the *Command* field, enter transaction **ST02** and choose *Enter*
   (or from the *SAP standard menu*, choose *Tools* → *Administration* → *Monitor* → *Performance* → *Setup/Buffers* → *ST02-Buffers*).



2. The two important things to review on the above screen are:

   a. *Hit Ratio*

      The target value is 95 percent and higher. Soon after starting the system, this value is typically low, because buffers are empty. The hit ratio will increase as the system is used and the buffers are loaded. It usually takes a day to load the buffers that are normally used.

   b. *Swaps*

      The target value is less than 1,000. Swaps occur when the necessary data is not in the buffer. The system has to retrieve the data from the database. The swap value is reset to zero (0) when the system is restarted.

Analysis of transaction *ST02* is covered in BC315 (the Workload Analysis and Tuning class). We recommend you take this class.

Memory Defragmentation

What

A computer's memory behaves similar to a hard disk. As different programs execute, they are loaded into, and later deleted out of, memory. Over time, like a hard disk, the usage of the computer's memory becomes fragmented with unused spaces scattered throughout.

Why

At a certain point you may have sufficient "free memory" (that is, the total of all the unused spaces), but not a contiguous (single) piece of memory large enough to allow certain programs to execute. At that point, those types of programs attempting to run that need contiguous memory will fail because they cannot be loaded into memory.

How

To defragment the system's memory:

1. Stop R/3.

   This step requires stopping R/3 on all application and database servers. (For more information, see *Start/Stop R/3* in chapter 10.)

2. Restart R/3.

   You only need to restart R/3, you do not need to cycle the server.

When R/3 is restarted, the buffers are refreshed. This process means that the first person who accesses the buffered object will have a long response because the system must get the data from disk and load it into the buffer. The second person will have a normal (quick) response time. This process repeats until all normally used objects are loaded into the buffer, which usually takes up to a day to accomplish.

Database

See chapter 13 (*Database Administration – Microsoft SQL Server*) for the database-related performance tuning transactions:

- Activity - *ST04*
- Tables / Indexes - *DB02*

Operating System

Operating System Monitor (OS07)

What

The operating system monitor allows you to view relevant operating system and hardware details.

The operating system-related detail, such as:

- Memory paging
- Operating system log

In addition, the following hardware details are available:

- CPU utilization
- Free space on disks

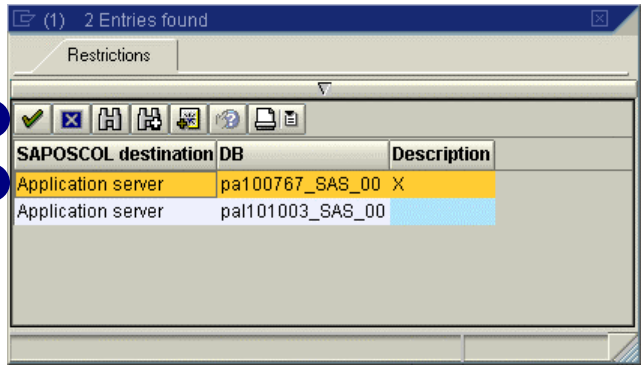
Why

Certain operating system items will impact R / 3 performance.

How

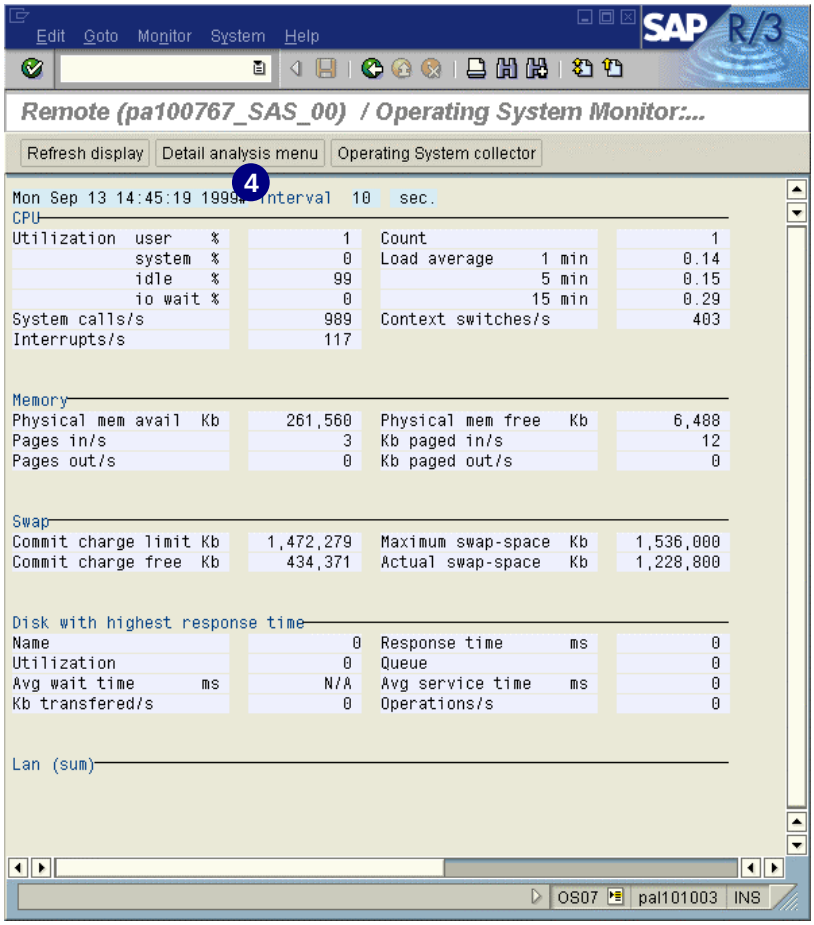
Guided Tour

1. In the *Command* field, enter transaction **OS07** and choose *Enter*
   (or from the *SAP standard menu*, choose *Tools* → *Administration* → *Monitor* → *Performance* → *Operating System* → *Remote* → *OS07-Activity*).
2. Select the appropriate server.
3. Choose ✔.

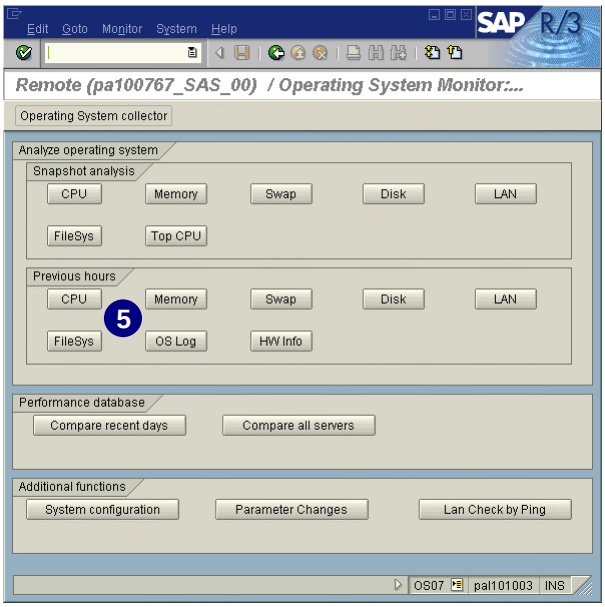


This screen is a snapshot of the *CPU*, *Memory*, *Swap*, and *Disk response* data.

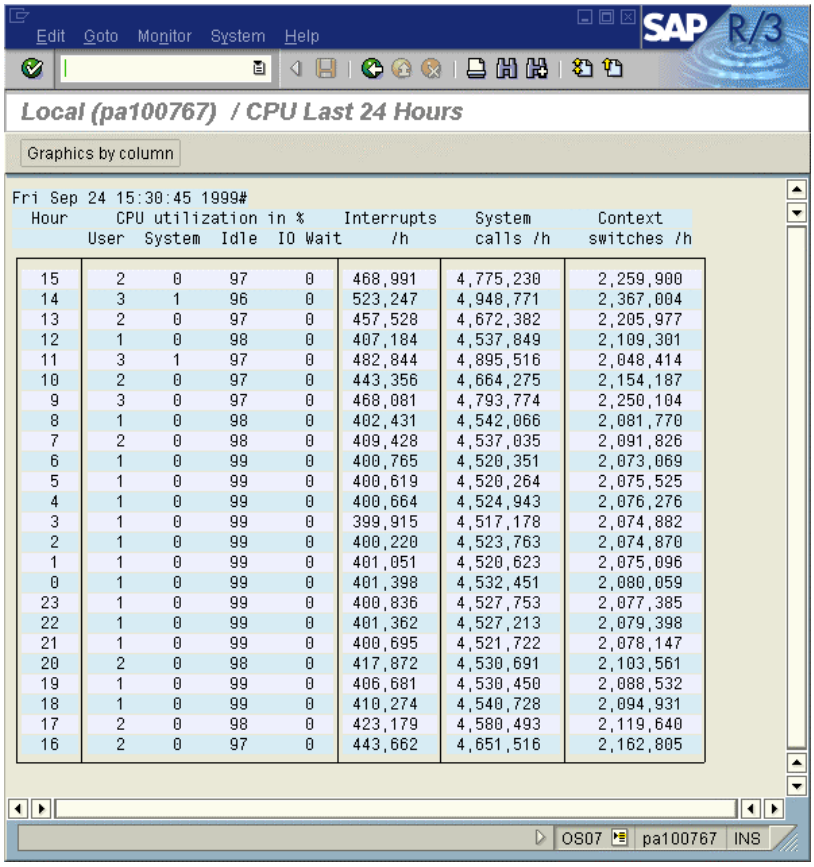
4. To analyze, choose *Detail analysis menu*.



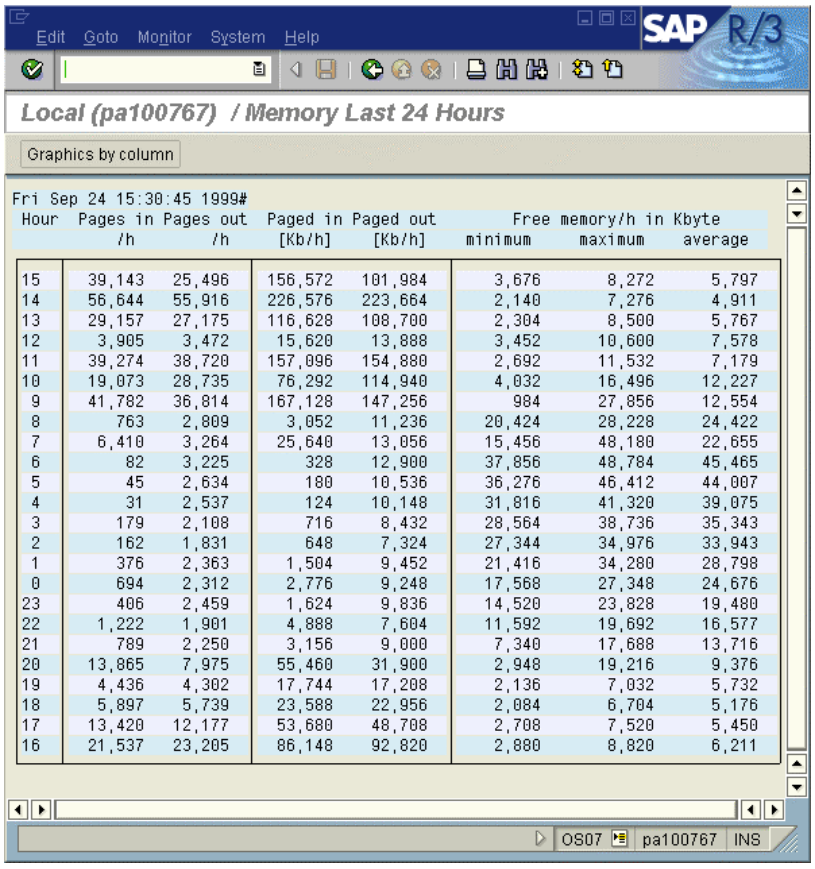
5. Choose an item under *Previous hours* (for example, *Memory* or *OS Log*).



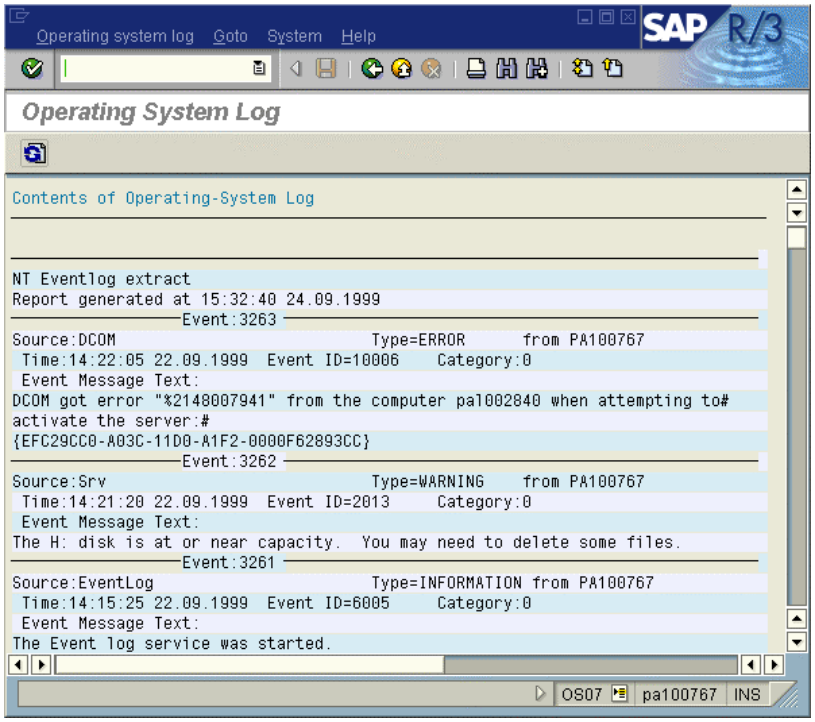
This screen shows CPU utilization over time.



This window shows the memory paging and free memory over time.



This is the *Operating System Log*.



Hardware

CPU and Disk

Also see *Operating System – Operating System Monitor (OS07)* to get data on:

- CPU utilization
- Free space on disks

Memory

The hardware item that has the largest effect on R/3 performance is memory. The R/3 System uses memory extensively. By keeping data in buffer, physical access to the drives is reduced. Thus, in general, the more memory you have, the faster R/3 will run.

Physical access to the drives is the slowest activity.